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COLLEGE OF HEALTH SCIENCES

SCHOOL OF MEDICINE

DEPARTMENT OF SURGERY

FREQUENCY AND BARRIERS TO UPPER GASTROINTESTINAL ENDOSCOPY AMONG PATIENTS WITH DYSPEPSIA AT MULAGO AND KIRUDDU HOSPITALS: A PROSPECTIVE COHORT STUDY.

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I, AGABA RAYMOND, do declare that this dissertation is my original work and has never been submitted wholly or partially for publication in any journal, or an award of a degree in this university or any other. The views expressed herein are therefore mine unless otherwise stated, and where such has been the case, an acknowledgement or a reference has been quoted.

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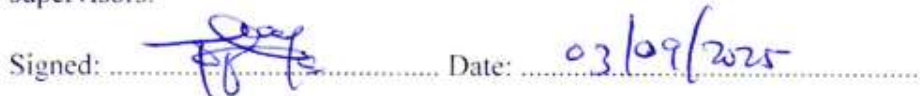

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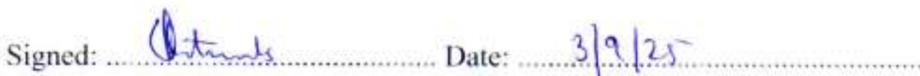

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This dissertation is dedicated to my beloved wife, Dr. Nakato Janepher, and my dear sister, Ms. Atukwase Ritah. The Lord is my Shepherd, … (Psalms 23: 1 – 6).

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LIST OF ABBREVIATIONS

AOR:	Adjusted Odds Ratio
CI:	Confidence Interval
COR:	Crude Odds Ratio
DF:	Degrees of Freedom
GD:	Gastroduodenitis
DU:	Duodenal Ulcer
EGC:	Early Gastric Cancer
EGD:	Esophagogastroduodenoscopy
Ga:	Gastritis
GERD:	Gastroesophageal Reflux Disease
GI:	Gastrointestinal
GU:	Gastric Ulcer
HH:	Hiatal Hernia
IQR:	Interquartile Range
KNRH:	Kiruddu National Referral Hospital
LRT:	Likelihood Ratio Test
MAK-SOMREC:	Makerere University School of Medicine Research Ethics Committee
MNRH:	Mulago National Referral Hospital
N.EGD:	Normal Endoscopy
NHIS:	National Health Interview Survey
NSAIDs:	Non-Steroidal Anti-inflammatory Drugs
OC:	Oesophageal Candidiasis
OM:	Oesophageal Mass
OPD:	Outpatient Department
OR:	Odds Ratio
OS:	Oesophageal Stricture
OV:	Oesophageal Varices
PPIs:	Proton Pump Inhibitors
PSM:	Propensity Score Matching
PUD:	Peptic Ulcer Disease

ROC:	Receiver Operating Characteristic
RR:	Relative Risk
SD:	Standard Deviation
SEM:	Socioecological Model
SSA:	Sub-Saharan Africa
STATA:	Statistics and Data
UD:	Uninvestigated Dyspepsia
UGX:	Ugandan Shillings
UNCST:	Uganda National Council of Science and Technology
VIF:	Variance Inflation Factor

OPERATIONAL DEFINITIONS

Alarm Gastrointestinal Symptoms

This refers to symptoms of Vomiting, Bleeding or Anaemia, Anorexia, Unintentional weight loss, Abdominal mass, or Dysphagia (Sadowski & van Zanten, 2015).

Barriers to Esophagogastroduodenoscopy

These are factors that prevent patients with dyspepsia from accessing esophagogastroduodenoscopy.

Dyspepsia

The Rome IV criteria define this as any combination of 4 symptoms: postprandial fullness, early satiety, epigastric pain, and epigastric burning that are severe enough to interfere with the usual activities and occur at least 3 days per week over the last 3 months with an onset of at least 6 months in advance (Stanghellini et al., 2016).

Esophagogastroduodenoscopy (Upper GI Endoscopy)

This is a procedure where a flexible fiberoptic tube is passed down to visualize the esophagus, stomach, and up to the second part of the duodenum.

ABSTRACT

Background: Uganda has a high prevalence of over 50% of uninvestigated dyspepsia, which delays the timely diagnosis of potentially curable diseases like early gastric and oesophageal cancer. Notably, more than 90% of dyspepsia patients in Uganda have structural causes, underscoring the importance of esophagogastroduodenoscopy (EGD) as a definitive diagnostic method. However, the majority of patients with dyspepsia do not undergo EGD due to certain unknown barriers.

Objectives: To determine the frequency of EGD and analyze patient-level barriers to EGD among dyspeptic patients at Mulago and Kiruddu Hospitals.

Methods: This prospective cohort study was conducted over three months (December 2024–February 2025) and included 423 dyspeptic patients aged 30 years or older who were recommended for EGD at the GI clinics of Mulago and Kiruddu hospitals. Data were collected via interviewer-administered questionnaires during initial in-person interviews and one-month follow-up telephone calls. The primary outcome was EGD attendance.

Results: A total of 402 participants were successfully followed up. The cohort had a male-to-female ratio of 1:2.8 and a mean age of 50.4 years (SD ±12.7). The one-month frequency of EGD was 4.48%. The high price of EGD 0.139 (-3.832 – -1.296) was a significant limiting factor to attending EGD. Furthermore, a positive family history 0.27 (0.08 – 0.89) and social history 0.05 (0.01 – 0.20) of GI cancer was a significant barrier to undergoing EGD. However, abstaining from tobacco smoking 5.72 (1.04 – 31.46) as well as former tobacco smoking 9.66 (2.38 – 39.20) and alcohol use 9.12 (2.66 – 31.23) were all significant facilitators to attending EGD.

Conclusion: This study experienced a minimal follow-up loss of 4.96%, allowing for a precise estimate that only 4.48% of dyspeptic patients underwent EGD within one month, despite receiving a doctor's recommendation. We recommend a policy review to reduce the price of EGD, which may include a national health insurance scheme that provides for public hospitals, to make EGD more affordable at Mulago and Kiruddu Hospitals. Secondly, qualitative mixed-methods studies with extended follow-up periods are recommended to provide an in-depth understanding of the barriers to attending Endoscopy among patients with dyspepsia.

Key words: Endoscopy, Frequency, Barriers, Dyspepsia

CHAPTER 1: INTRODUCTION

1.1. Background

Uninvestigated Dyspepsia (UD) is a clinical diagnosis made after accurate history taking and physical examination of a patient with dyspepsia, but in the absence of "Alarm" symptoms and signs (Douglas A Drossman, 2016). In Uganda, the prevalence of UD is estimated to exceed 50% (Y. J. Lee et al., 2019). Symptomatic management of UD often leads to missed diagnoses of significant pathology, notably oesophageal and gastric cancer, with patients presenting later in advanced stages of disease and with poor outcomes (Ibingira, 2001; Mbiine, Nakanwagi, & Kituuka, 2021).

Esophagogastroduodenoscopy (EGD) remains the gold standard for the evaluation of dyspepsia, offering direct visualization of the upper gastrointestinal (GI) tract, biopsy and subsequent histopathological examination of suspicious lesions (Asombang, Rahman, & Ibdah, 2014; Schmidt, Peitz, Lippert, & Malfertheiner, 2005). Over 90% of patients with dyspepsia in Uganda have a structural cause with peak prevalence reported in 31.17 – 64.23-year age group (Mbiine et al., 2021), underscoring the importance of EGD in timely and definitive diagnosis. Despite this, EGD remains underutilized, particularly for patients without alarm features.

A one-year (May 2023 – April 2024) retrospective pilot study at Mulago Hospital Endoscopy Unit revealed that only 33.4% (144 out of 431) of EGDs were performed for dyspepsia without alarm symptoms (unpublished observations), despite dyspepsia being the leading indication for EGD and the most common complaint among patients attending GI clinics in Mulago Hospital (Mbiine et al., 2021). In Uganda patients undergo EGD on a referral basis where general practitioners from lower-level health institutions refer patients with dyspepsia to specialist gastroenterologists for EGD (Galukande et al., 2008), which leads to a missed opportunity to diagnose early potentially curable disease among patients with dyspepsia who do not undergo EGD due to certain unknown barriers.

This study described and analyzed patient-level barriers to undergoing EGD based on a conceptual framework adopted from the Socioecological Model (SEM). The SEM was first introduced as a conceptual model for understanding human development by Urie Bronfenbrenner in the 1970s and later formalized as a theory in the 1980s (Bronfenbrenner, 1977, 2000, 2013) and the initial theory was illustrated by nesting circles that place the individual in the center surrounded by various systems to propose that human behaviour was influenced by progressively more complex reciprocal interactions with persons, ideas, and

objects in their environment (Bronfenbrenner, 1994). The Centers for Disease Control and Prevention have adopted the SEM to include spheres of intrapersonal, interpersonal, organizational, community, and policy factors (Kilanowski, 2017), for various health promotion endevours, such as studies on health access barriers. The SEM has also been applied to study barriers to EGD in both qualitative and quantitative research especially in Asian countries with a high incidence of GI cancers, for instance Korea (Bae et al., 2008).

A 2021 systematic review of 13 studies identified common patient-level barriers to EGD uptake, including: lack of awareness of symptoms, fear of the procedure or results, embarrassment, and high procedural costs (Sare Hatamian, Shokoofe Etesam, Afrooz Mazidimoradi, Zohre Momenimovahed, & Hamid Salehiniya, 2021). Another systematic review of 22 studies confirmed similar obstacles, adding young age, low socioeconomic status, limited access, and absence of symptoms as predictors of low EGD attendance (Mazidimoradi, Momenimovahed, & Salehiniya, 2022). Further studies found that low income and education levels were linked to lower acceptance of EGD, while perceived personal risk and knowledge of disease increased acceptance (Liu et al., 2019; Mansour-Ghanaei, Joukar, Soati, Mansour-Ghanaei, & Naserani, 2012; Oh, Choi, Shin, & Bang, 2009b; Park et al., 2017). Three cross-sectional studies reported that over 35% participants on average had declined endoscopy due to lack of time (Cho et al., 2006; Liu et al., 2019; Park et al., 2017).

There was paucity of data in Africa, Sub-Saharan Africa (SSA), and Uganda regards barriers to EGD. However, a review of responses from digestive health professionals in Kenya, Ethiopia, Zambia, and Malawi reported that patients' financial constraints were not a significant barrier to undergoing endoscopy (Mwachiro et al., 2021), while a prospective study in Eastern Uganda reported that almost half of the participants were fearful of getting an endoscopy (Mogili et al., 2024).

However, existing research has limitations. Some studies were cross-sectional limiting causal inference, relied on self-reported data limited by response-bias, and were geographically restricted in setting making them less generalizable (He, Qian, Zhao, & Qi, 2022; Huang, Hu, Wong, & Lin, 2023). A survey to determine barriers to EGD in Korea used a nationally representative sample with good generalizability but the researchers did not study influence of the doctor's recommendation to patients on attending endoscopy (Shin & Lee, 2012). Similarly, studies done in Uganda were representative of specific regions and non-generalizable, which warrants the study of patient-level barriers to EGD among dyspeptic patients at a national

referral hospital that receives a more diverse patient population from all regions in Uganda (Mbiine et al., 2021).

To increase the attendance rate of EGD and improve early diagnosis, treatment and survival of patients with dyspepsia, the identification and removal of potential barriers to endoscopy are likely of great importance (Shin & Lee, 2012). Therefore, this study aimed to determine the frequency of EGD and analyze patient-level barriers to EGD among patients with dyspepsia at Mulago and Kiruddu National Referral Hospitals.

1.2. Problem Statement

Early oesophageal and gastric cancer commonly presents as dyspepsia (McColl, Kidd, & Gillen, 2001). In Uganda, Dyspepsia is the most common presenting complaint among patients at the GI clinics (Mbiine et al., 2021), and the peak prevalence of organic dyspepsia was observed in the younger >30-year age group. Furthermore, Uganda has a high prevalence of over 50% of uninvestigated dyspepsia (Y. J. Lee et al., 2019), which delays timely diagnosis of potentially curable disease like early gastric and oesophageal cancer (Asombang et al., 2014). Notably, over 90% of dyspepsia patients in Uganda have structural causes (Mbiine et al., 2021), which underscores the importance of EGD as a definitive diagnostic method (Asombang et al., 2014; Ikenberry et al., 2007; Schmidt et al., 2005). However, the majority of patients with dyspepsia in Uganda are not getting EGD done due to certain unknown barriers (Galukande et al., 2008; Obayo, Lukwago, Orem, Faulx, & Probert, 2017). Therefore, the aim of this study was to identify key patient-level barriers to EGD and explore strategies to improve EGD utilization, facilitating earlier diagnosis and intervention for high-risk patients with dyspepsia.

1.3. Justification of The Study

This study aimed to identify key patient-level barriers to undergoing EGD and key facilitators for attending EGD among patients with dyspepsia in Uganda. This was important because it would aid in identifying strategies to improve EGD utilization and facilitate earlier diagnosis and intervention for patients with oesophageal and gastric malignancies.

1.4. Research Questions

1. What is the frequency of EGD among patients with dyspepsia at Mulago and Kiruddu Hospitals?
2. What are the barriers to EGD among patients with dyspepsia at Mulago and Kiruddu Hospitals?

1.5. Objectives

1.5.1. Main Objective

To determine the frequency of EGD and analyze patient-level barriers to EGD among patients with dyspepsia at Mulago and Kiruddu Hospitals in Uganda over 5 months from December 2024 through April 2025.

1.5.2. Primary Specific Objectives

1. To determine the frequency of EGD among patients with dyspepsia at the gastroenterology departments of Mulago and Kiruddu Hospitals over 5 months from December 2024 through April 2025.
2. To analyze patient-level barriers to EGD among patients with dyspepsia at the gastroenterology departments of Mulago and Kiruddu Hospitals over 5 months from December 2024 through April 2025.

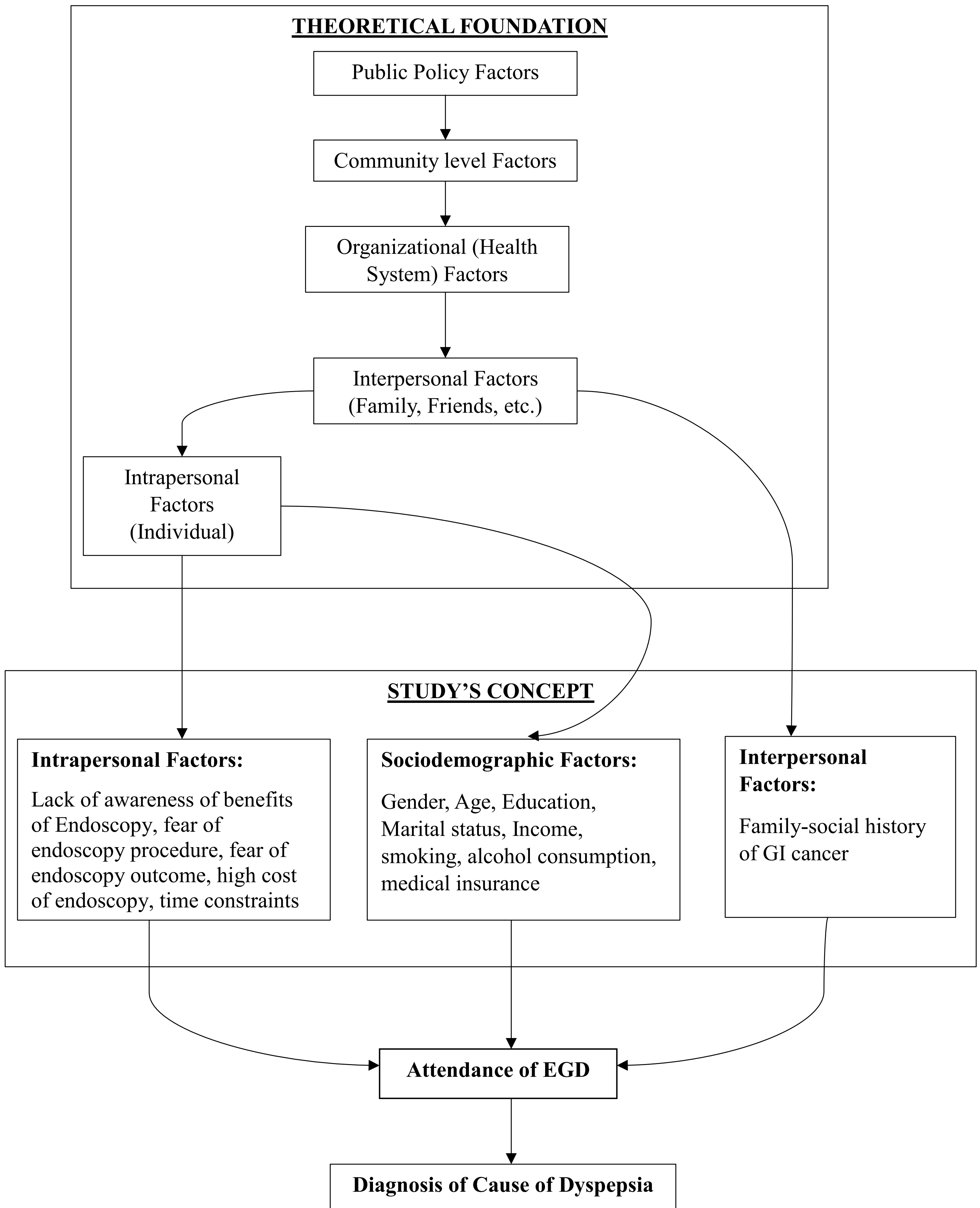
1.5.3 Secondary Specific Objective

To describe diagnostic findings among the recruited dyspeptic patients who will have undergone EGD over 5 months from December 2024 through April 2025.

1.6. Conceptual Framework

The conceptual framework was adopted from a cross-sectional study to measure barriers to EGD in Korea (Bae et al., 2008), which used the socioecological model to examine barriers at the patient level, community level, institutional health barriers, and public policy barriers. However, the scope of this study focused on patient-level barriers to EGD, and hence, the framework adopted for this study examined patient-level barriers to EGD at three levels: sociodemographic factors, intrapersonal factors, and interpersonal factors. The following illustration represents the conceptual framework adopted for this study, where the independent variables are grouped into sociodemographic factors, intrapersonal factors, and interpersonal factors that act as barriers preventing patients from accessing EGD. The dependent variable and hence primary outcome was attendance of EGD, which ultimately led to a diagnosis of the cause of dyspepsia as a secondary outcome.

Figure 1: Conceptual Framework



CHAPTER 2: LITERATURE REVIEW

2.1. Overview

The definition of dyspepsia has been modified based on clinical and diagnostic research findings. For example, Dyspepsia is defined as symptoms of epigastric pain, burning, postprandial fullness or early satiety, sometimes with heartburn (Sadowski & van Zanten, 2015). The Rome III criteria define dyspepsia as the presence of at least one symptom, including bothersome postprandial fullness, early satiation, epigastric pain, and epigastric burning. The Rome III criteria identified dyspeptic patients with 60.7% sensitivity, and 68.7% specificity, and hence performed only modestly as compared to previous definitions (Ford et al., 2014).

The Rome IV criteria define dyspepsia as any combination of 4 symptoms: postprandial fullness, early satiety, epigastric pain, and epigastric burning that are severe enough to interfere with the usual activities and occur at least 3 days per week over the last 3 months, with an onset of at least 6 months in advance (Stanghellini et al., 2016). After an accurate history taking and physical exam, in the absence of alarm symptoms and signs, patients are diagnosed as being affected by uninvestigated dyspepsia (UD) (Douglas A Drossman, 2016) and if a work-up shows structural disease as the cause of symptoms then the patient has organic dyspepsia. An estimated 50% of individuals were affected by dyspepsia worldwide (Talley, Zinsmeister, Schleck, & Melton III, 1992).

UD is the most important indicator of barriers to timely diagnosis, early treatment, improved quality of life, and survival of patients with dyspepsia (Schmidt et al., 2005). The peak prevalence of organic dyspepsia was found in the 31.17 – 64.23 year age group, with a male to female ratio of 1:1 at MNRH Uganda (Mbiine et al., 2021).

In a Ugandan retrospective study in 5 regional referral hospitals (Mbarara University Regional Referral Hospital, Uganda Cancer Institute Kampala, Lacor Hospital, Mbale Hospital, and Ministry of Health Department of Epidemiology Kampala Uganda) from 2002 to 2011 researchers identified 1,468 GI cancer cases among which oesophageal and gastric cancer that commonly present as dyspepsia were the most prevalent at 28.8% and 18.4% respectively, and recommended esophagogastroduodenoscopy (EGD) or double contrast upper gastrointestinal series (UGIS) to assess symptomatic individuals and to screen high index patients (Obayo et al., 2017).

This study described and analyzed patient-level barriers to undergoing EGD based on a conceptual framework adopted from the Socioecological Model (SEM). The SEM was first introduced as a conceptual model for understanding human development by Urie Bronfenbrenner in the 1970s and later formalized as a theory in the 1980s (Bronfenbrenner, 1977, 2000, 2013). The initial SEM theory by Bronfenbrenner was illustrated by nesting circles that place the individual in the center surrounded by various systems (Bronfenbrenner, 2000). The microsystem closest to the individual contains the strongest influencers and encompasses the interactions and relationships of the immediate surroundings. The second circle is the mesosystem that looks beyond immediate interactions and includes those the individual has direct contact with, such as work, school, church, and neighbourhood. The exosystem does not directly impact the individual, but exerts both negative and positive interactive forces on the individual, such as community contexts and social networks. The macrosystem includes societal, religious, cultural values, and influences. Lastly, the chromosystem contains both internal and external elements of time and historical content.

The revised versions of the SEM include the influence of policy, for instance the Centers for Disease Control and Prevention adopted the SEM to include spheres of intrapersonal, interpersonal, organizational, community, and policy factors (JF, 2008) to reflect the multilevel approaches to various health promotion endevours, such as studies on health access barriers. The SEM has been applied to studying barriers to EGD in both qualitative and quantitative studies, especially in Asian countries with high incidence of GI cancer, for instance Korea (Bae et al., 2008).

2.2. Indications and Findings of EGD among Patients with Dyspepsia

Esophagogastroduodenoscopy is a procedure in which a flexible fiberoptic tube is passed down to visualize the oesophagus, stomach, and duodenum. Techniques commonly used are white light endoscopy, magnifying endoscopy with narrow-band imaging (NBI), and chromoendoscopy.

In Uganda, EGD is recommended for patients older than 40 years with new-onset dyspepsia and patients (regardless of age) with long histories of dyspepsia (Galukande et al., 2008) which is similar to the worldwide recommendation of EGD in dyspeptic patients older than 40 years (Choi & Suh, 2014; Liou et al., 2005). Furthermore, a patient who has “Alarm” features should be investigated with an EGD (Sadowski & van Zanten, 2015).

In SSA, a case series of 170 patient endoscopic examinations in Nigeria showed that the commonest indications for EGD were dyspepsia, followed by upper GI bleeding, refractory peptic ulcer disease and retrosternal pain (Onyekwere, Hameed, Anomneze, & Chibututu, 2008). A retrospective chart review of 1,960 patient endoscopy reports in Eldoret, Western Kenya, for 10 years from 1993 – 2003 showed dyspepsia as the most common symptom with 1,059/1,960, i.e., 62.7% (Ayuo, Some, & Kiplagat, 2014).

In Uganda a retrospective chart review of 356 patient endoscopy reports at MNRH for a period spanning January 2018 through July 2020 included 159 reports with a referral indication of dyspepsia and found that gastritis was the most common finding at 43.4%, followed by gastroesophageal reflux disease at 19.5%, gastric cancer at 6.92%, oesophageal cancer at 4.4%, duodenal ulcers at 3.14%, hiatal hernia at 2.52% and the least common finding was gastric ulcers at 1.89% and oesophagitis at 1.26% (Mbiine et al., 2021). The study also found that organic dyspepsia was more common, at 90.57%, than functional dyspepsia, at 9.43%. Therefore, this study showed that structural pathology is a very prevalent cause of dyspepsia in the Ugandan population, with a high prevalence of gastroesophageal cancers.

2.3. Importance of EGD Work-Up among Patients with Dyspepsia

American Gastroenterological Association guidelines state that dyspepsia in an individual above 40 years old is a recommendation for prompt endoscopy and a retrospective case series which examined 128 patients with dyspepsia in Germany found that 121 (97.7%) of the dyspeptic patients were eligible for prompt endoscopy and eligibility for EGD need not be based on alarm symptoms or prolonged duration of symptoms of dyspepsia because none of these factors influenced favourable stage of disease at diagnosis (Schmidt et al., 2005). Furthermore, researchers found that reducing the age threshold for prompt endoscopy from above 45 years to above 40 years decreases the rate of missed diagnoses of potentially curable diseases to 0.8% (Schmidt et al., 2005).

Results from a large randomized study showed that 12% of patients in the “test and treat” group were dissatisfied with their treatment plan versus only 4% in the “initial endoscopy” group (Lassen, Pedersen, Bytzer, & de Muckadell, 2000), implying that patients with dyspepsia who get EGD done have more satisfaction with their diagnosis and treatment than those who are screened and treated for *H. pylori* infection. Furthermore, a negative endoscopy in the evaluation of patients with dyspepsia results in a reduction in anxiety and an increase in patient satisfaction (Quadri & Vakil, 2003; Rabeneck, Wristers, Souchek, & Ambriz, 2003).

A literature review of studies conducted in Western countries found a low 5-year survival rate of only 10% among patients with dyspepsia because the disease is often diagnosed late, at an inoperable stage (Axon, 2006). The low survival rate was due to symptomatic treatment of dyspepsia with PPIs, which masks premalignant lesions and delays diagnosis of potentially resectable disease.

In Uganda, symptomatic treatment of dyspepsia with antacids, H2 receptor antagonists, PPIs, and NSAIDs results in treatable disease being missed, only to present late in an advanced stage (Ibingira, 2001; Mbiine et al., 2021), which correlates with survey findings of a high prevalence of over 50% of Uninvestigated Dyspepsia in Uganda (Y. J. Lee et al., 2019). It is worth noting that 90.57% of patients with dyspepsia in the Ugandan population have a structural pathology as the cause (Mbiine et al., 2021) and that studies done in Europe and SSA, including a meta-analysis, have shown EGD to be a definitive method to investigate patients with dyspepsia (Asombang et al., 2014; Ikenberry et al., 2007; Schmidt et al., 2005). The proven benefits of EGD among patients with dyspepsia include: timely diagnosis, early treatment, and improved survival of patients with dyspepsia (Galukande et al., 2008; Obayo et al., 2017).

2.4. Barriers to attending EGD Among Patients with Dyspepsia

According to the socioecological model, barriers to EGD include sociodemographic, intrapersonal, and interpersonal patient-level barriers as well as health provider barriers, community, and public policy barriers (Shin & Lee, 2012).

In a prospective study involving 992 patients recruited from five rural clinics in Greece, researchers examined patient-level barriers to the uptake of EGD among patients with dyspepsia. Using the "identification of dyspepsia in the general population" questionnaire, 159 out of 992 patients were found with dyspepsia and among them, 83.6% refused EGD despite their doctor's recommendation to do the procedure. The main barriers to EGD were male gender, fear of procedure, and fear of the outcome of EGD (Oikonomidou et al., 2011).

According to a systematic review of thirteen studies conducted to determine patient-level barriers and facilitators to EGD; the most common obstacles to timely diagnosis included people's lack of awareness about symptoms, fear of endoscopy procedure, delay in obtaining medical care, while other commonly reported barriers were fear of endoscopy outcome, cost of endoscopy, and embarrassment (Sare Hatamian et al., 2021).

In a systematic review of Medline, Web of Science, and Scopus databases, which included 22 articles, the most common barriers to endoscopic diagnosis were young age, male sex, low

socioeconomic status, access to endoscopy services, lack of insurance coverage, and lack of symptoms (Mazidimoradi et al., 2022).

A systematic review of thirteen studies published in PubMed, Scopus and Web of Science found that low household income, low educational status and young age were associated with low attendance of EGD, while acceptance of EGD increased with age, and the highest percentage was reported in the 50-59 year age group (Sare Hatamian et al., 2021).

Studies found that patients' poor knowledge of symptoms was related to low attendance of EGD (Mansour-Ghanaei et al., 2012), while patient's adequate knowledge of symptoms was related to increased acceptance of EGD (Liu et al., 2019). Furthermore, it was found that increasing awareness about the risk factors of the disease increases the acceptance of EGD in society (Oh, Choi, Shin, & Bang, 2009a).

Four studies (Cho et al., 2006; Liu et al., 2019; Mansour-Ghanaei et al., 2012; Park et al., 2017) examined patients' lack of symptoms as an important barrier to endoscopy, and researchers found that 77.8% of study participants would not perform EGD if they had no symptoms.

Other studies (Cho et al., 2006; Liu et al., 2019; Park et al., 2017; Shin & Lee, 2012) examined patients' perceived risk of disease and how it influences attendance of EGD. The researchers found that high-risk people were more likely to attend EGD, the belief that the procedure saved lives through early diagnosis was related to increased acceptance of the procedure, and that a cancer diagnosis in family members motivated other family members to attend EGD.

Four studies (Liu et al., 2019; Mansour-Ghanaei et al., 2012; Park et al., 2017; Shin & Lee, 2012) assessed patients' fear of the procedure and fear of the results, and how this influenced their acceptance of EGD. It was found that only 29.8% of subjects would accept endoscopy, and the majority (70.2%) of subjects reported fear that gastroscopy may cause gastric cancer or damage to the stomach.

In three cross-sectional studies, researchers assessed the influence of time constraints on the attendance of endoscopy (Cho et al., 2006; Liu et al., 2019; Park et al., 2017). It was found that a significant percentage, 35.8% of participants, reported they had refused EGD due to a lack of time.

As far as the patient's Gender was concerned, most population-based studies were able to obtain a male-to-female ratio of 1 while examining the role of gender in attendance of EGD, implying that gender did not significantly affect patient acceptance of EGD (Mahadeva & Goh, 2006).

Most studies did not examine the role of ethnicity in the prevalence of EGD because they were done on populations of similar ethnic groups however, in one study involving subjects of several ethnic backgrounds from a single institution in the US, African-American race was associated with low attendance of EGD (Shaib & El-Serag, 2004).

Several studies examined the influence of unhealthy lifestyle and behaviour on attendance of EGD, e.g., regular smoking was associated with a low attendance in the US (Shaib & El-Serag, 2004), Canada (Tougas, Chen, Liu, & MMS, 1999), the UK (Moayyedi et al., 2000) and in India (Shah, Bhatia, & Mistry, 2001) because people with unhealthy behaviour tend to minimize their own health risk (Aldoori et al., 1997). In India (Shah et al., 2001) and New Zealand (Haque, Wyeth, Stace, Talley, & Green, 2000) there was a definite association between alcohol and low attendance of EGD (Mahadeva & Goh, 2006).

Patient's self-medication was strongly associated with low attendance of EGD, e.g., regular use of NSAIDs and aspirin bought over the counter were strongly associated with low participation (Shaib & El-Serag, 2004). In Nigerian highlanders, indulgence in self-medication was a significant barrier to EGD, and although this may have included traditional medicines, it is probable that NSAIDs accounted for a sizeable amount of "self-medication" (Ihezue, Oluwole, Onuminya, & Okoronkwo, 1996).

Among 8,047 subjects tested for H. pylori, those infected had more dyspeptic symptoms (44%) than those who were negative (36%) (Moayyedi et al., 2000). Subsequent analysis revealed *H. pylori* status to be predictive of delay in endoscopic diagnosis of gastric cancer, with a 5% Population Attributable Risk for missed early gastric cancer diagnosis, and thus assuming a causal association.

In the US, there was a strong relationship between lower household income and larger household membership, with a low frequency of EGD (Douglas A Drossman et al., 1993). In Canada, there was a lower frequency of EGD in adults with lower household income, those unemployed, and those with lower educational levels (Tougas et al., 1999). In Britain, rented accommodation and low educational levels (crowded household) were barriers to EGD in adults (R. Jones et al., 1990).

Studies in China, the US, Denmark and Australia examined the impact of psychological barriers to EGD. In China, dissatisfaction with financial income was associated with a low attendance of EGD in an urban population, while in the US, sexual, emotional and verbal abuse in childhood and adulthood were significantly associated with a low prevalence of EGD

(Talley, Fett, Zinsmeister, & Melton III, 1994). In Denmark, there was a low frequency of EGD in adults who had psychological vulnerability (Kay & Jørgensen, 1994). In Australia (Koloski, Talley, & Boyce, 2002) and China (Li, Nie, Sha, & Su, 2002) adults with high scores of anxiety and depression were less likely to attend EGD.

A survey to explore barriers to endoscopy among a nationally representative sample of 4,464 non-institutionalized Korean civilians from 2007 to 2009 (Shin & Lee, 2012) showed that the most common barriers included; low educational level, people living without a spouse; frequent alcohol binge drinkers and current tobacco smokers. However, dietary barriers and low household monthly income were not significant after adjusting for other variables in multivariate analysis because the Korea National Cancer Screening Program provides free endoscopy services for insurance beneficiaries within the lower 50% income bracket (Han, Choi, Park, Moore, & Park, 2011). Secondly, higher income groups are more likely to eat vegetables or fruits and have food as bland as possible. Social interactions, e.g., advice and encouragement from family and social contacts, positively influence attendance; and that is why people living without a spouse are less likely to attend EGD, while frequent alcohol binge drinkers and current smokers were less likely to attend because such behaviour makes them deny their own risk i.e., optimistic bias (Wardle, McCaffery, Nadel, & Atkin, 2004).

Therefore, the most common patient level barriers to endoscopy include; low educational status, low income, young age below 40 years, living without a spouse, low knowledge of symptoms, low perceived risk for disease, low perceived benefit from endoscopy, fear of endoscopy procedure, fear of endoscopy results and delay in accessing medical care.

2.5. Knowledge Gap on Barriers to attending EGD

A survey to determine barriers to EGD in Korea was limited because it was a cross-sectional design that could not establish a causal association, it neglected doctor's recommendations to patients, and patients' access to hospital (Shin & Lee, 2012).

Online population-based surveys to examine barriers to EGD in China were limited because the exact number of participants to online questionnaires was unknown and hence impossible to the calculate response rate, EGD attendance among participants was self-reported and hence a high chance of response bias, studies were conducted in a single province of China and hence results were not generalizable to the general Chinese population, and the studies did not examine harms of EGD and hence subjects may have over-estimated the benefits of EGD (He et al., 2022; Huang et al., 2023).

There was paucity of data in Africa, Sub-Saharan Africa (SSA), and Uganda regards barriers to EGD. However, a review of responses from digestive health professionals in Kenya, Ethiopia, Zambia, and Malawi reported that patients' financial constraints were not a significant barrier to undergoing endoscopy (Mwachiro et al., 2021), while a prospective study in Eastern Uganda reported that almost half of the participants were fearful of getting an endoscopy (Mogili et al., 2024). Therefore, studies done in Uganda were representative of specific regions and non-generalizable, which warrants the study of patient-level barriers to EGD among dyspeptic patients at a national referral hospital that receives a more diverse patient population from all regions in Uganda (Mbiine et al., 2021).

2.6. Strategies to Improve EGD Utilization, Early Diagnosis and Timely Treatment among Patients with Dyspepsia

It is vital to identify and remove potential barriers to EGD, with more focused interventions directed to vulnerable populations, such as groups with low socioeconomic status or unhealthy behaviours and new promotional campaigns and health education to provide information targeting these vulnerable populations (Shin & Lee, 2012).

2.7. Summary of Literature Review

Table 1: Indications of diagnostic EGD in SSA

Author	Study Design	Findings	Critique of the study
Onyekwere, et al. (2008).	Retrospective case series in Nigeria	The most common indication for EGD in Nigeria was dyspepsia	Reviewed a few (only 170 patient endoscopy reports) and thus had limited generalizability and low power of the study.
Ayuo, et al. (2014).	Retrospective chart review in Kenya	Dyspepsia was the most common indication for EGD in Kenya.	Reviewed 1,960 patient endoscopy reports over 10 years and hence the findings were reliable.
Mbiine, et al. (2021).	Retrospective patient chart review in Uganda	Over 90% prevalence of organic dyspepsia at MNRH. Dyspepsia was the most common complaint at GI clinics of MNRH.	Study setting as MNRH receives a diverse patient population from all regions in Uganda, making the findings generalizable to the Ugandan population.

Table 2: Importance of EGD among patients with dyspepsia

Author	Study design	Findings	Critique of the study
A. Axon (2006).	Literature Review	Symptomatic treatment of dyspepsia with PPIs leads to a missed opportunity for diagnosis of potentially resectable disease among patients with dyspepsia in Western countries.	A comprehensive review of several studies from Western and Asian countries, which ensures the reliability of the findings.
C. Ibingira (2001).	Prospective descriptive study	94.5% of patients presented with advanced-stage disease due to symptomatic treatment of dyspepsia in Uganda.	The study setting is a national referral hospital, which allowed generalizability of findings to the Ugandan population.
Schmidt, et al. (2005).	Case series	-97.7% of patients with dyspepsia were eligible for prompt EGD. -Lowering the age threshold for endoscopy from > 45 years to > 40 years decreases the rate of missed diagnoses of potentially curable diseases to 0.8%.	Demonstrated EGD as a definitive method of detecting early, potentially curable disease among patients with dyspepsia.
Lassen, et al. (2000).	Randomized study	Patients with dyspepsia who underwent initial endoscopy were more satisfied with their diagnosis and treatment than patients in the test and treat control group who were screened and treated for H. pylori.	Provided a high level of evidence for EGD as a preferred method of evaluation of patients with dyspepsia.

Table 3: Barriers to EGD among patients with dyspepsia

Author	Study Design	Findings	Critique of the study
Hatmian, et al. (2021).	Systematic review and meta-analysis	Most common barriers to EGD include: lack of awareness of symptoms, fear of procedure, delay in obtaining medical care, fear of results, and cost of EGD.	Comprehensive review of 13 population-based surveys in different countries
Shin & Lee (2012).	National survey in Korea	Most common barriers to EGD include: low education level, living without a spouse, frequent alcohol Binge drinking, and current tobacco smoking.	The study yielded reliable findings that are generalizable to the population; however, it neglected important factors, such as doctors' recommendations to patients and patients' access to healthcare.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Study Design

This was a prospective cohort study at the gastroenterology departments of Mulago and Kiruddu National Referral Hospitals.

3.2. Study Setting

Mulago National Referral Hospital (MNRH) is the largest hospital in Uganda, located in the Kawempe North Division of Kampala, with an established bed capacity of 1,790 and an average annual occupancy rate of 100%. The MNRH gastroenterology department has an average annual attendance of 2,500 – 3,000 patients, and the endoscopy centers perform 883 EGDs annually. Kiruddu National Referral Hospital (KNRH) is situated on Buziga Hill, Makindye Division, Kampala District, with an outpatient department that receives over 250 patients daily and a 200-bed capacity inpatient department.

The study was conducted in the gastroenterology departments of MNRH and KNRH, specifically in the outpatient department (medical and surgical GI clinics located on level 4G and endoscopy units located on level 2B of MNRH, as well as the GI clinic located on the ground floor and the endoscopy unit located on level 7 of KNRH). The Medical GI clinics run once weekly on Wednesdays at both MNRH and KNRH. The Surgical GI clinics run twice a week, on Tuesdays and Thursdays, at MNRH. The endoscopy units see patients daily, Monday through Friday, within working hours. Patients are seen by doctors at various cadres, including junior house officers, medical officers, senior house officers, registrars, and consultants, in the practice of gastroenterology. Patients access these clinics mainly through referrals from lower-level hospitals and clinics across all regions in Uganda.

3.3. Study Population

- The Target Population was patients with dyspepsia in Uganda.
- The accessible population consisted of patients with dyspepsia who attended the Gastroenterology units of MNRH and KNRH from December 2024 to February 2025.
- The study population consisted of all patients with dyspepsia who attended the gastroenterology units of MNRH and KNRH from December 2024 through February 2025, met the eligibility criteria for inclusion in the study, and voluntarily consented to participate.

3.4. Study Period

The study was conducted over 3 months, from December 17, 2024, to February 27, 2025.

3.5. Inclusion Criteria

- Patients at medical and surgical GI clinics of Mulago and Kiruddu Hospitals with presenting complaints of dyspepsia according to the Rome IV criteria.
- Patients who were 30 years or older.
- Patients who the doctor recommended to do esophagogastroduodenoscopy after being seen at the GI clinic for complaints of dyspepsia.
- Patients who voluntarily offered their written informed consent to participate in the study.

3.6. Exclusion Criteria

- Patients who had been referred to Mulago and Kiruddu Hospitals with an indication for endoscopy, or patients who visited the GI clinic with prior recommendation to undergo endoscopy.
- Patients with altered mental status.

3.7. Sample Size Calculation

Objective 1

For the first study objective, the patient sample size was calculated using the precision-based approach for calculating a single proportion (Hanley & Moodie, 2011; Kotrlik & Higgins, 2001; Sargeant & O'Connor, 2020); $N = \frac{z_{\alpha}^{2} \rho q}{d^{2}}$; where N= sample size, Zα= 1.96 which is the critical standard normal value at 95% confidence interval and level of significance (α) of 5% or 0.05, and a conservative anticipated proportion, p= 50%=0.5 was the assumed frequency of EGD among dyspeptic patients in Uganda because the actual frequency of endoscopy was unknown, and the value of 50% would yield the maximum patient sample size, q= 1- p = 1-0.5=0.5, and d= 0.05 is the total width of the confidence interval with precision set at 5%. Thus, N= 384.16. Note that 10% of the calculated sample size (38.416 participants) was adjusted in the sample size calculation to address the loss of participants to follow up, which, when added, adjusts the sample size to a minimum of 422.576 participants. Therefore, the sample size for the first objective was 423 patients with dyspepsia.

Objective 2

For the second study objective the patient sample size was calculated using the Fleiss formula with continuity correction for comparing two proportions (Fleiss, Levin, & Paik, 2013), i.e., to compare barriers between participants who attend EGD and those who do not, as follows;

$$N = \frac{[z_\alpha \sqrt{P(1-P)(1/q_1 + 1/q_2)} + z_\beta \sqrt{P_1(1-P_1)(1/q_1) + P_2(1-P_2)(1/q_2)}]^2}{(P_1 - P_2)^2}.$$

N = sample size.

$Z\alpha = 1.96$ is the standard normal value at a 95% confidence interval with level of significance, a = 5% = 0.05.

$Z\beta = 0.84$ is the standard normal value at a 90% confidence interval with $\beta = 0.215$ and power of study at 80%.

Participant's fear of EGD procedure is one the most common clinically important barriers to EGD in Uganda (Mogili et al., 2024) and procedural-related fear was also a statistically significant barrier to EGD in Asian and European countries, for instance Greece (Oikonomidou et al., 2011). Thus;

P_1 = proportion of non-attendees who perceived fear of EGD procedure as a barrier was 22.9% = 0.229 according to a prospective study of barriers to EGD among dyspeptic patients recommended to do EGD in Greece (Oikonomidou et al., 2011), and thus $q_1 = 1 - P_1 = 0.771$.

P_2 = proportion of attendees who perceived fear of EGD procedure as a barrier was 46.7% = 0.467 according to a prospective study in Eastern Uganda (Mogili et al., 2024), and thus $q_2 = 1 - P_2 = 0.533$.

$P = p_1q_1 + p_2q_2 = 0.42547$, and thus $N = 103.36$, $N \approx 103$ patients.

Since the sample size for objective 1 was greater than that for objective 2, we took the study sample size as 423 patients with dyspepsia.

3.8. Sampling Technique

Consecutive sampling was employed, where every patient who visited the GI clinics and met the study's eligibility criteria was included until the desired sample size of 423 patients were enrolled.

3.9. Study Procedure

3.9.1. Screening and Enrollment

Patients aged ≥ 30 years with dyspepsia whom the doctor newly recommended for endoscopy, were recruited during current GI clinic visits. Those eligible provided written informed consent. Patients with prior endoscopy referrals were excluded.

3.9.2. Data Collection Methods

We used an interviewer-administered questionnaire adopted from Chinese studies on barriers to EGD (He et al., 2022; Huang et al., 2023), covering sociodemographic and treatment-seeking history. Initial physical interviews to collect sociodemographic data were conducted at clinic visits. After one month, participants were re-interviewed by telephone (guided by a bi-lingual telephone script) to determine EGD attendance and identify facilitators and barriers to undergoing EGD. Attendees were asked to share their findings. For those who underwent EGD at Mulago or Kiruddu hospitals, permission was sought to access their endoscopy reports directly from the hospital units. For the non-attendees, the questionnaire also included an open-ended question where participants were asked if they had other reasons for avoiding endoscopy.

3.10. Study Variables

3.10.1. Independent Variables

Initial physical interviews captured the following data: Age in years, gender (male/female), education (none, primary, secondary, university/tertiary), marital status (living with or without a spouse), and monthly household income. Medical insurance was categorized as insured, uninsured, or unknown. Smoking tobacco was classified as never-smokers, current-smokers, or quitters (stopped ≥1 month ago). Alcohol use was grouped as lifetime abstainers, daily drinkers, binge drinkers (≥4–5 drinks on occasion), or quitters (stopped ≥1 year ago). Family and social history of GI cancer meant any first-degree relative (parent, brother, sister) and social contact (friend, neighbour, colleague) with a GI cancer diagnosis, respectively.

After one month, follow-up telephone interviews captured the uptake of EGD and patient-level barriers, e.g., not knowing EGD's benefits, fear of the procedure and its outcome, high cost of EGD, and time constraints, as well as other reasons participants had for avoiding EGD.

3.10.2. Dependent Variables

The primary outcome for both study objectives was undergoing an EGD at the Mulago and Kiruddu gastroenterology departments. The secondary outcome was determining the cause of dyspepsia among participants who underwent EGD.

3.11. Quality Assurance and Control

The questionnaire, developed by experts and pilot tested in prior studies (He et al., 2022; Huang et al., 2023), was re-tested with five participants for consistency before this study; their responses were excluded from analysis. Research assistants received thorough training and reassessment to ensure complete understanding of procedures and relevant details before data collection began.

To ensure data validity and reliability, standardized questionnaires were administered by the principal investigator (PI) and trained assistants. Informed consent forms followed UNCST guidelines and were available in English and Luganda, as were questionnaires, to ensure participant comprehension. A bilingual (English and Luganda) telephone script guided follow-up interviews for sensitive topics, promoting participants' comfort and consistency of responses. The PI reviewed questionnaire entries daily for completeness and accuracy. Data from questionnaires were coded, extracted, and entered into Kobo Toolbox software by two independent assistants, with daily oversight by the PI. Electronic data was password-protected, and hard copies were securely stored under lock and key to maintain privacy and data safety.

3.12. Data Analysis and Presentation Methods

Questionnaires were checked, coded, and double-entered into Kobo Toolbox. They were then cleaned and exported to MS Excel (Office 2019), STATA v18, and R v4.4.3 for analysis.

3.12.1. Objective 1

To determine the frequency of EGD among dyspeptic patients, descriptive statistics were used. Univariate analysis summarized 10 sociodemographic predictors using means and medians for continuous variables (age and income), given their skewed distributions, while frequencies and percentages described categorical variables (gender, education, marital status, alcohol and smoking history, family and social history of GI cancer, and medical insurance).

The one-month frequency of EGD was calculated as the proportion of participants scoped out of the total participants followed up over one month, which was compared with the follow-up loss rate. A histogram showed the age distribution of attendees, diagnostic findings were

clustered, and age-related variation in EGD diagnoses was illustrated using a box plot (see Results chapter).

3.12.2. Objective 2

To analyse patient-level barriers to EGD, we used binary logistic regression, which is appropriate for the binary outcome (attendance vs. non-attendance). Guided by the conceptual framework, univariable regression was used to identify individual associations between each predictor and the outcome, with a liberal p-value threshold of < 0.2 to avoid excluding potentially important variables too early. A multivariable model was then built, adjusted for age, gender, and hospital. Predictors with $p < 0.2$ were included in the multivariable model to assess their independent effects, with significance set at $p < 0.05$.

Odds ratios (OR) were reported to quantify the strength of associations between predictors and the outcome, while 95% confidence intervals (CI) and p-values assessed statistical significance of those associations.

For sociodemographic factors, univariable analysis was performed using the Chi-square and Mann-Whitney tests to examine the independent effect of each categorical and continuous variable on the outcome of EGD attendance, respectively (see Results chapter).

The multivariable model was assessed using the Hosmer-Lemeshow test, expanded propensity score matching, and visual comparison for robustness, the ROC curve for predictive accuracy, and sensitivity analyses for stability of coefficients, to ensure the assumptions of logistic regression were met (see supplementary material under the Results chapter).

Associations between sociodemographic variables and EGD attendance were successfully analysed using multivariable logistic regression, with results presented below. Follow-up interview predictors, such as not knowing the benefits of EGD, time constraints, the high cost of EGD, and fear of the procedure and its outcome, were then tested as barriers among 402 respondents. However, model fitting failed due to probabilities nearing 0 or 1. Multicollinearity or separation was subsequently ruled out as the cause.

We used R Commander to run a Variance Inflation Factor (VIF) analysis, which showed that all predictor VIFs were well below 10 (the level at which multicollinearity is considered statistically problematic), indicating only mild multicollinearity, not enough to explain the

model fitting issue. Visual inspection and correlation analysis revealed that separation was the cause of the extreme probabilities. To address this, Firth's Penalized Logistic Regression was applied, using penalized maximum likelihood to reduce bias, prevent infinite estimates, and improve model stability, accuracy, and generalizability in a third "correction" stage.

The model used 402 respondents, corresponding to 5 degrees of freedom (df) associated with the five predictor variables (lack of knowledge and time, cost, fear of EGD and its outcome), to assess the independent effects of each predictor on the binary outcome, using the "intercept" as a reference. The likelihood ratio test (LRT) results showed strong statistical significance, highlighting the associations between barriers and EGD attendance (see Results chapter).

Finally, both 95% CIs for the effects of tobacco smoking and alcohol use on EGD attendance were wide, even after running both standard (univariable and multivariable) logistic regression and simple separate logistic regression models that included only the outcome and one exposure variable. This indicates imprecise estimates, likely due to low event counts and sparse data in some categories. To address this, penalized logistic regression, which is robust to accommodate low cell counts, was used, and still the difference in the 95% CIs was negligible. Therefore, while the wide 95% CIs for both smoking and alcohol use highlight the uncertainty in the estimate, the analysis remains significant (see Results chapter).

Furthermore, Expanded Propensity Score Matching (PSM) was used to evaluate the robustness of the observed associations in the multivariable logistic regression model. Specifically, both one-to-one nearest neighbour matching (PSM-NN) and kernel matching (PSM-Kernel) techniques were applied. Visual Comparison of odds ratios obtained from the original multivariable logistic regression, PSM-NN, and PSM-Kernel showed consistency with minimal differences in effect estimates across methods. Most notably, variables such as smoking tobacco, alcohol consumption, and social or family history of GI cancer showed strong and consistent associations with the outcome, regardless of the analytical approach used (see Supplementary Material under Results Chapter).

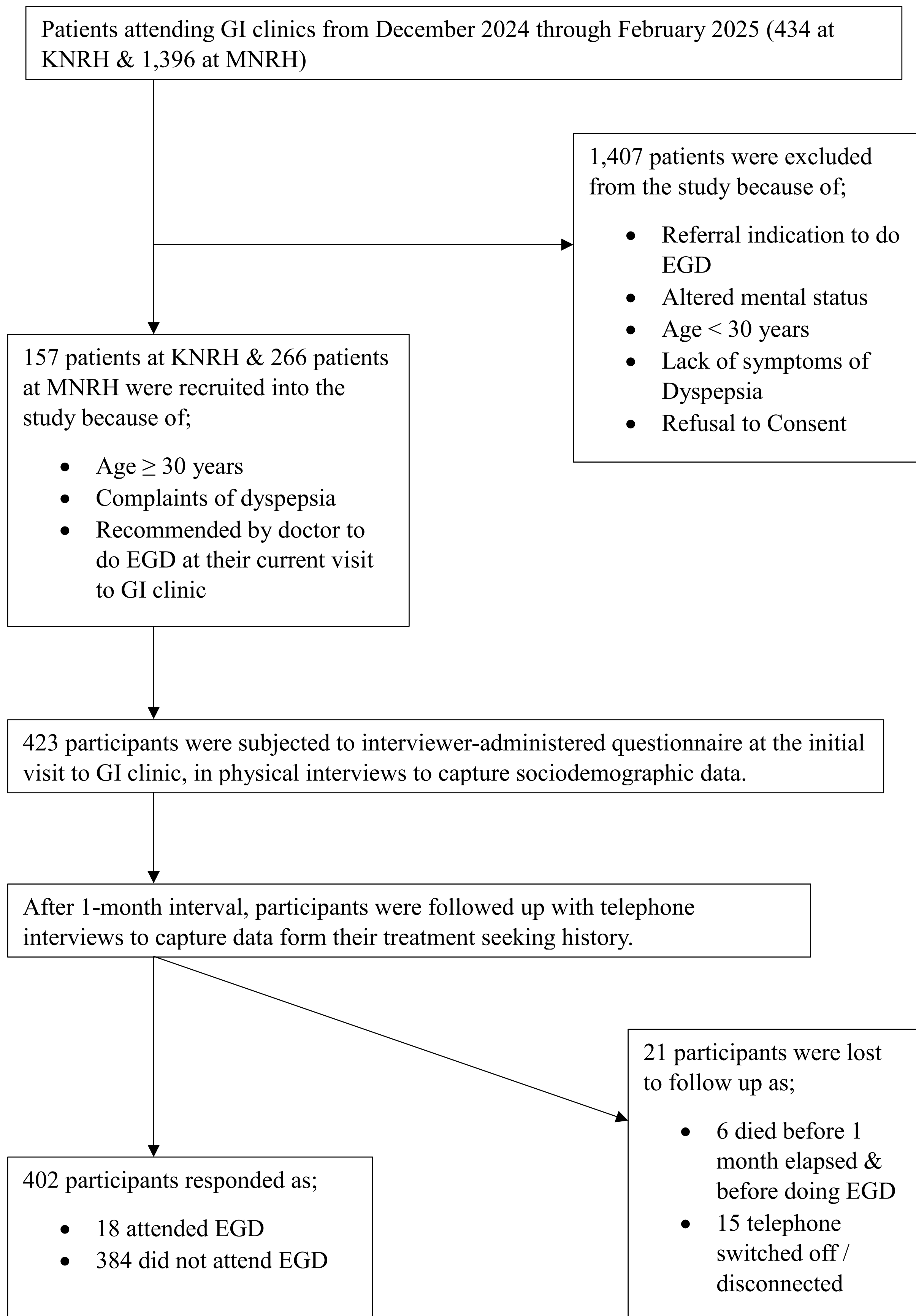
3.13. Ethical Considerations

Participants' autonomy was respected through written informed consent, and they were informed of their right to withdraw at any time. Confidentiality was ensured by assigning participants study numbers and omitting identifiable information. Ethical approval (Ref: Mak-SOMREC-2024-1035) was granted by MAK-SOMREC and UNCST (see Appendix X), with administrative clearance from Mulago (Ref: MHREC 2847) and Kiruddu (Ref: KRD/ADM/3/101/1) Hospitals (see Appendix XI and XII). All data used in this study were exclusively for this study.

CHAPTER 4: RESULTS

This study was conducted from December 17, 2024, to February 27, 2025, at the GI clinics of Mulago and Kiruddu National Referral Hospitals, which received a total of 1,830 patients. Of these, 1,407 patients were excluded because of referral indication for endoscopy, altered mental status, age < 30 years, lack of symptoms of dyspepsia, and refusal to consent. Four hundred twenty-three dyspeptic patients aged ≥ 30 years who the doctors newly recommended EGD were recruited from current GI clinic visits and followed up over one month. Twenty-one participants were lost to follow-up; 6 died, and 15 had their telephone disconnected. Among the 402 respondents, 18 attended the EGD, while 384 did not (see Figure 2).

Figure 2: Patient Flow Chart



4.1. Participants' Sociodemographic Characteristics

A total of 402 participants were successfully followed up, with a male-to-female ratio of 1:1.3 among EGD attendees and 1:2.9 among non-attendees (see Table 4). Overall, the cohort consisted of 296 females and 106 males, with a male-to-female ratio of 1:2.8.

4.1.1. Age

Overall, the cohort had a median age of 50.0 years (IQR 40.0; 58.0) and mean age of 50.4 (SD ± 12.7), minimum of 30 years and maximum of 87 years (range 57).

The majority (55.6%) of EGD attendees were in the younger 30–40-year age group, with a median of 40.0 years (IQR 39.0; 54.3) and a mean age of 46.6 years (SD ± 13.3) see Figure 3.

In contrast, the majority (80.7%) of EGD non-attendees fell within a wider 30–60-year age group, encompassing both young and middle-aged groups, with a median age of 50.0 (IQR 40.8; 58.0) and a mean age of 50.1 years (SD ± 12.6). See Figure 4.

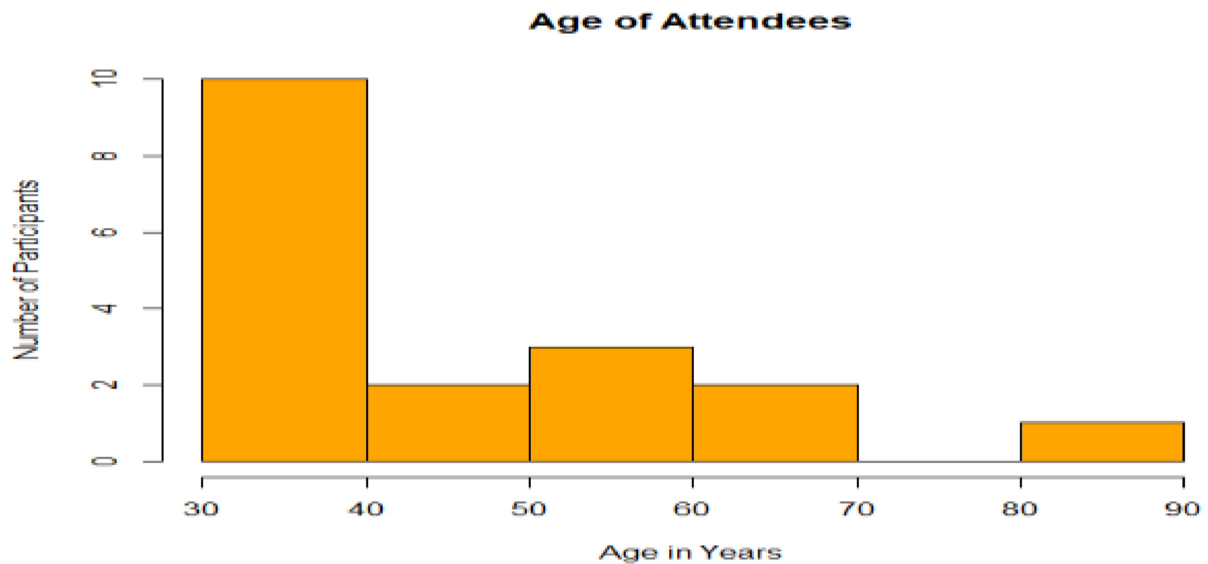


Figure 3: Age of EGD Attendees

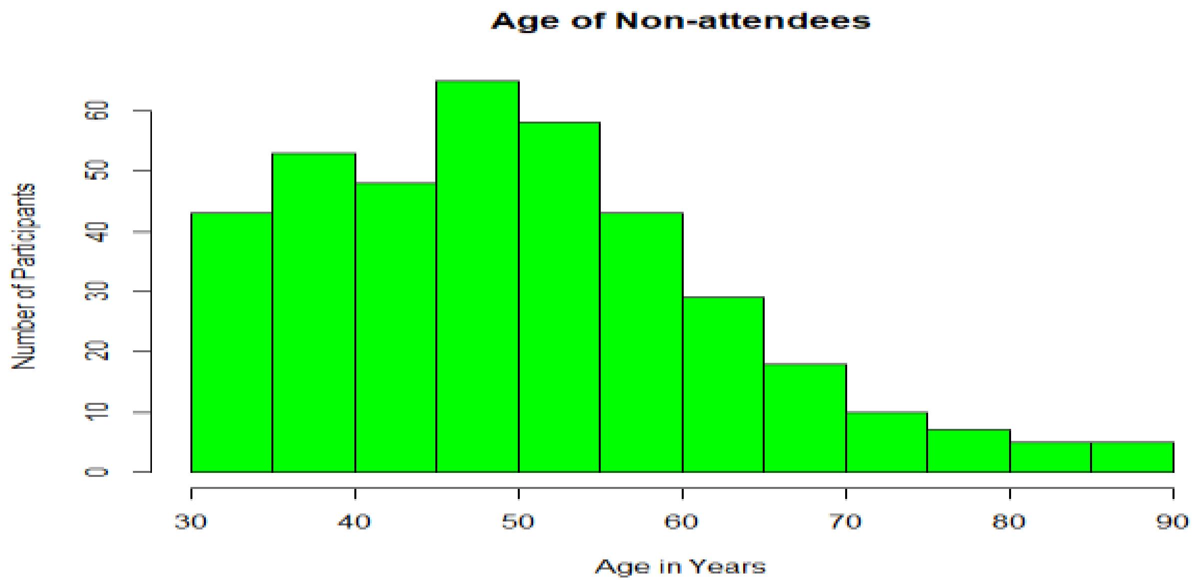


Figure 4: Age of EGD Non-attendees

4.1.2. Monthly Household Income

Overall, the cohort had a median income of 150,000 UGX (IQR 70,000; 300,000) and a mean of 313,490 UGX (SD ± 1,277,309). Fixed multiples of the overall median income were used to classify income as follows; the majority of participants were in middle-income class (75,000 – 225,000 UGX) with 50% of EGD attendees and 38.8% of EGD non-attendees, followed by high-income class (> 225,000 UGX) with 33.3% of EGD attendees and 35.4% of EGD non-attendees, and low-income class (< 75,000 UGX) with 16.7% of EGD attendees and 25.8% of EGD non-attendees (see Figures 5 and 6). There were 2 outliers among EGD non-attendees who earned 5,000 UGX and 25,000,000 UGX, respectively.

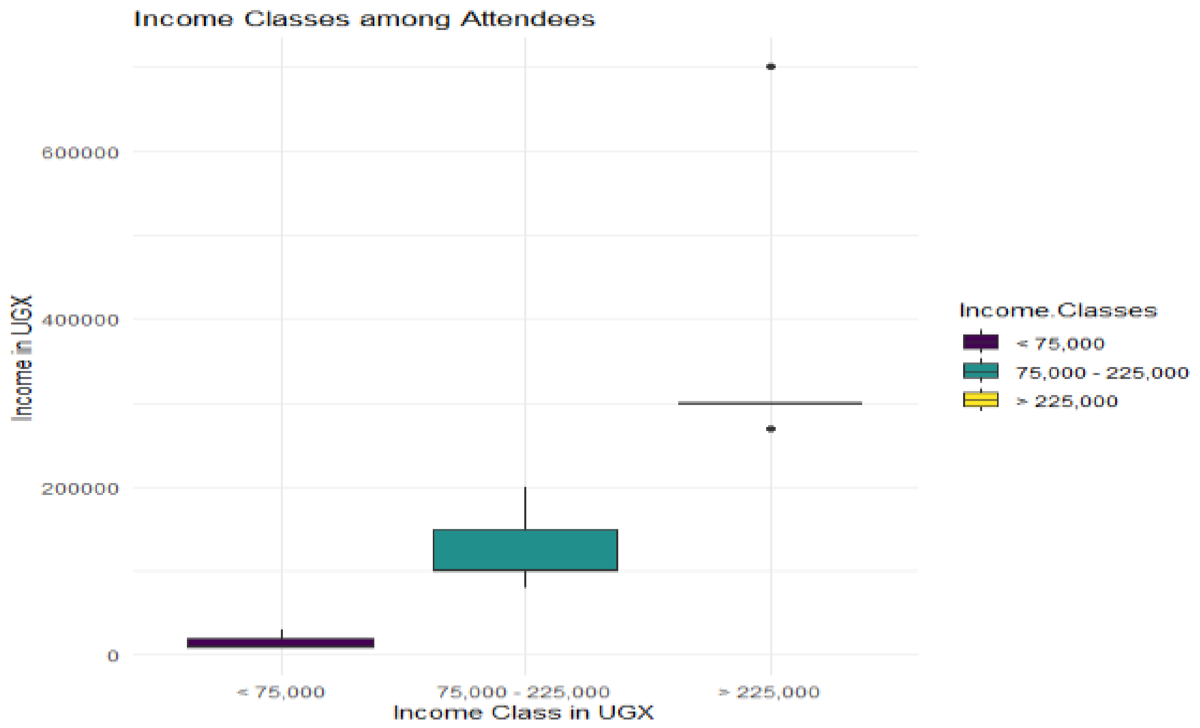


Figure 5: Income Classes among EGD Attendees

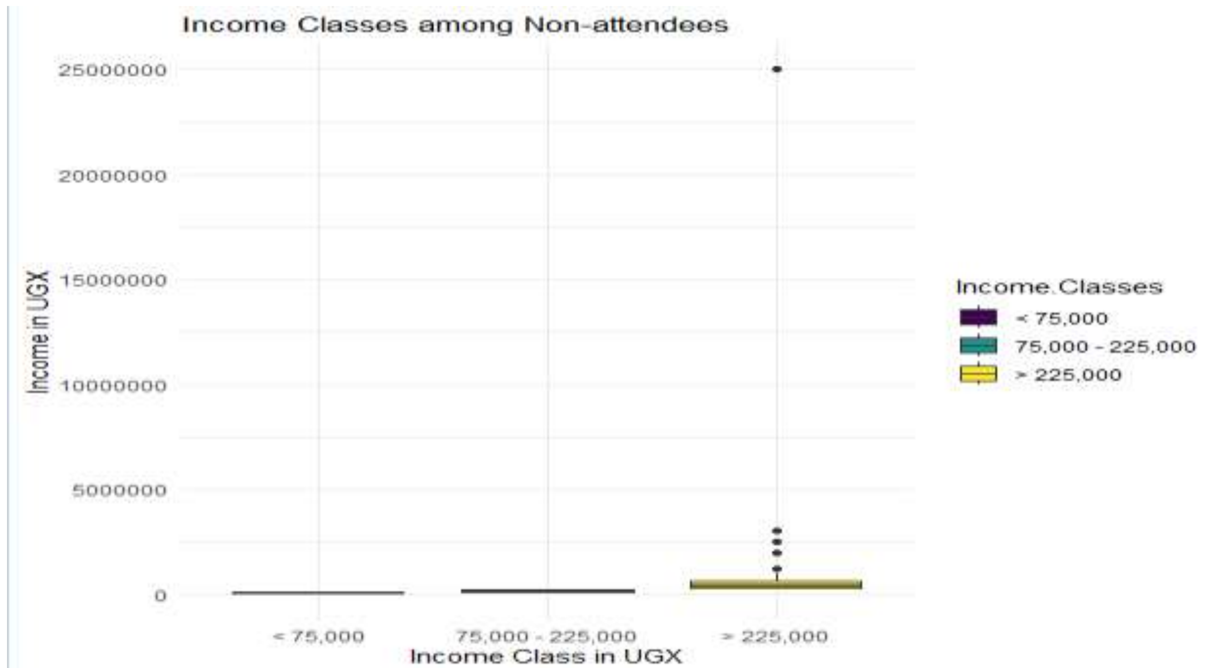


Figure 6: Income Classes among EGD Non-attendees

Table 4: Participants' Sociodemographic Characteristics

Factor	Level	EGD Attendees (n =18) Frequency (Percentage)	EGD Non-attendees (n=384) Frequency (Percentage)
Gender			
	Female	10 (55.6%)	286 (74.5%)
	Male	8 (44.4%)	98 (25.5%)
Age in years	Median (IQR)	40.0 (39.0; 54.3)	50.0 (40.8; 58.0)
	Mean (± SD)	46.6 (± 13.3)	50.6 (± 12.6)
Monthly Household Income in UGX	Median (IQR)	125,000 (100,000; 292,500)	150,000(60,000; 300,000)
	Mean (± SD)	183,333 (± 164, 567)	319,591 (± 1,306,200)
Education Level	No Formal Education	2 (11.1%)	14 (3.6%)
	Primary School	10 (55.6%)	173 (45.1%)
	Secondary School	3 (16.7%)	154 (40.1%)
	University/Tertiary Institute	3 (16.7%)	43 (11.2%)
Marital Status			
	Not living with Spouse	8 (44.4%)	175 (45.6%)
	Living with Spouse	10 (55.6%)	209 (54.4%)
Family History of GI cancer	Positive	4 (22.2%)	155 (40.4%)
	Negative	13 (72.2%)	208 (54.2%)
	Unknown	1 (5.6%)	21 (5.4%)
Social History of GI cancer	Positive	5 (27.8%)	227 (59.1%)
	Negative	13 (72.2%)	149 (38.8%)
	Unknown	0	8 (2.1%)
Smoking Tobacco			
	Current Smoker	2 (11.1%)	10 (2.6%)
	Never Smoker	12 (66.7%)	361 (94.0%)
	Former Smoker	4 (22.2%)	13 (3.4%)
Alcohol Consumption			
	Daily Drinker	0	8 (2.1%)
	Binge Drinker	1 (5.6%)	26 (6.8%)
	Quitters	7 (38.9%)	51 (13.3%)
	Lifetime Abstainer	10 (55.6%)	299 (77.9%)
Medical Insurance Status	Insured	0	8 (2.1%)
	Not insured	17 (94.4%)	369 (96.1%)
	Unknown	1 (5.6%)	7 (1.8%)

4.2. Frequency of EGD

Over the study period of 3 months (December 2024 – February 2025), the one-month frequency of EGD among patients with dyspepsia at Mulago and Kiruddu Hospitals was 4.48% with a male to female ratio of 1:1.3 (see Figure 7).

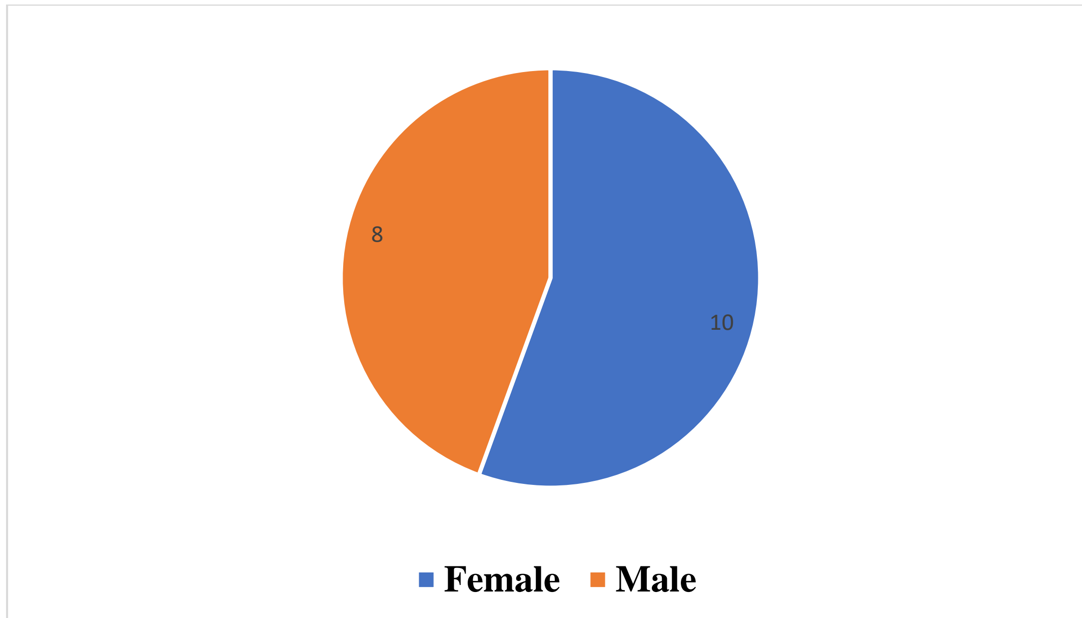


Figure 7: Frequency of EGD in males and females

4.2.1. Variation of EGD Attendance Rate with Age

Among the 18 attendees, higher endoscopy attendance was observed in the younger 30 – 40-year age group than the older 40 – 70 and 80 – 90-year age groups. Notably, there was no attendance in the 70 – 80-year age group (see Figure 3 above).

4.2.2. Participants Lost to Follow-Up

21 participants out of 423 recruited participants were lost to follow up as;

- 6 died before 1 month elapsed since their recruitment and before doing EGD.
- 15 participants had their telephone switched off / disconnected.

Therefore, the loss to follow-up rate was 4.96%.

4.3. EGD Findings

4.3.1. Frequency of EGD Findings by Gender

Among the 18 attendees, the most common diagnosis overall was Oesophageal Varices at 22.2% with equal gender distribution, followed by Oesophageal Stricture at 16.7% with female predominance, while Oesophageal Mass (male predominance), Hiatal Hernia (male predominance), GERD (female predominance), Normal Endoscopy (female predominance), and Gastritis (equal gender distribution) each had a frequency of 11.1%. The least common diagnoses were gastric ulcer (female predominance), PUD (female predominance), gastroduodenitis (female predominance) and oesophageal candidiasis (male predominance) each with frequency of 5.6% (see Figure 8).

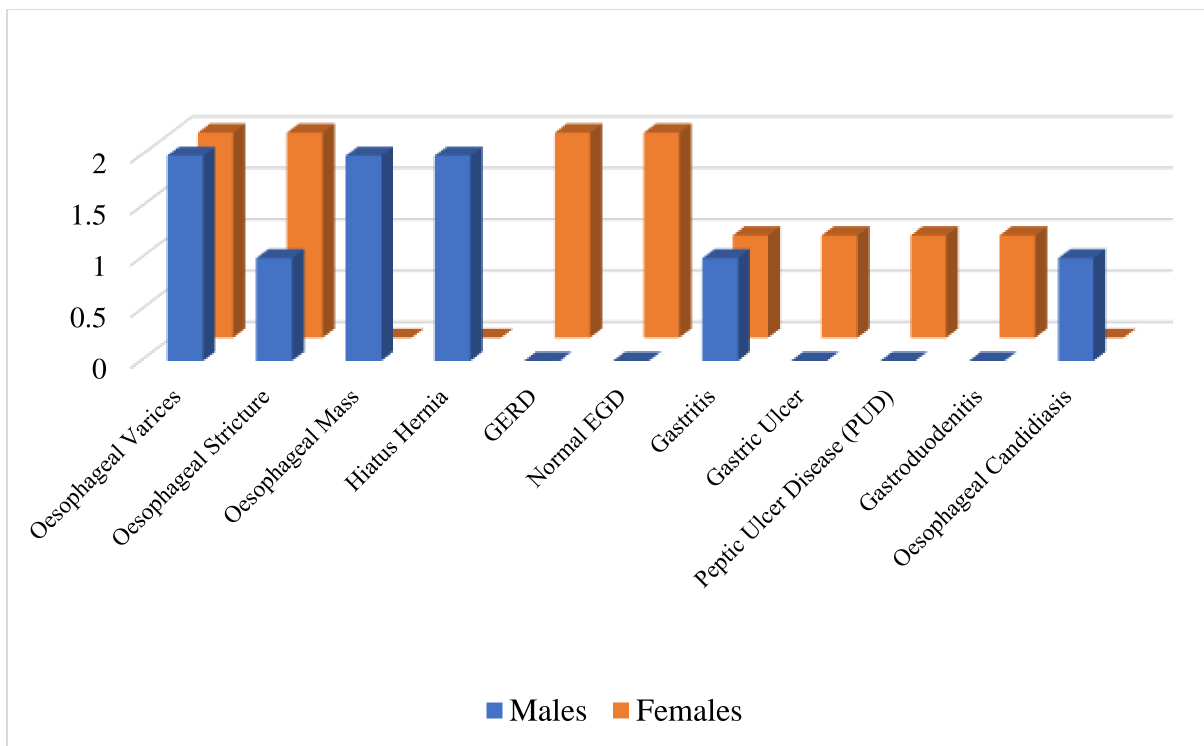


Figure 8: Frequency of EGD Findings by Gender

4.3.2. Variation of EGD Findings with Age

Hiatal Hernia span the widest age group of 35–85 years among study participants, followed by Oesophageal Stricture (35–65-years), while Gastritis and Normal Endoscopy both span the 30–55-year age group. Oesophageal Mass, Oesophageal varices, and GERD span the 50–65, 30–45, and 40–45-year age groups, respectively. Gastroduodenitis, Gastric Ulcer, Oesophageal Candidiasis and Peptic Ulcer Disease span very narrow age groups (see Figure 9).

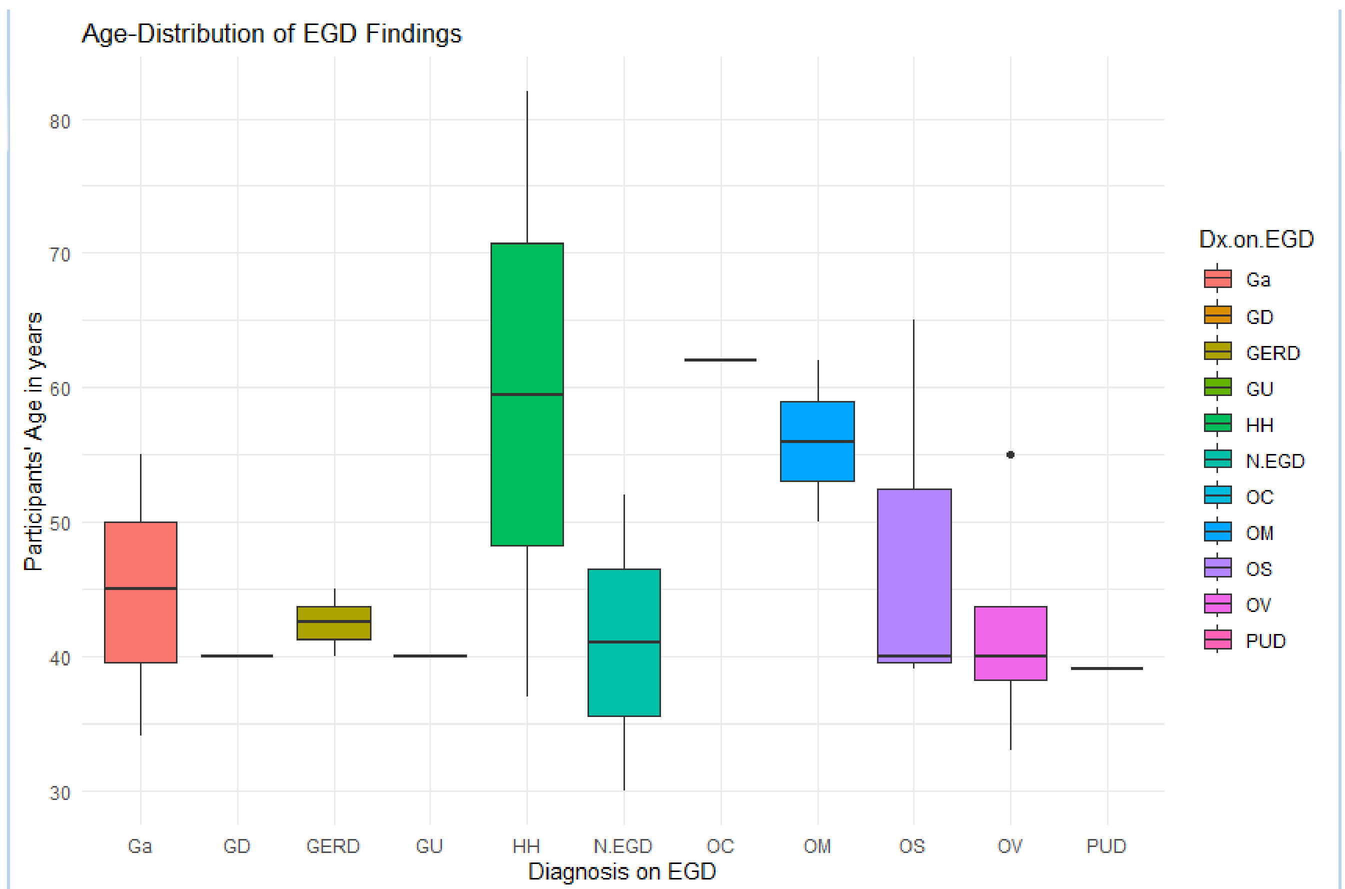


Figure 9: Variation of EGD Findings with Age

Key: Ga = Gastritis, GD = Gastroduodenitis, GERD = Gastroesophageal Reflux Disease, GU = Gastric Ulcer, HH = Hiatal Hernia, N.EGD = Normal Endoscopy, OC = Oesophageal Candidiasis, OM = Oesophageal Mass, OS = Oesophageal Stricture, OV = Oesophageal Varices, PUD = Peptic Ulcer Disease

4.4. Barriers To EGD

4.4.1. Association between Sociodemographic variables and EGD Attendance

In univariable analysis, both the Chi-square test with Mann-Whitney tests and the standard univariable logistic model showed that gender, age, education, social history of GI cancer, tobacco smoking, and alcohol use were all associated with attending EGD ($p < 0.2$) and had similar p-values in both tables. Except for family history of GI cancer, which had $p < 0.2$ only under standard logistic regression (see Tables 5 and 6).

Table 5: Independent Association between each Sociodemographic predictor and Attendance of EGD (Univariable analysis – Chi-square & Mann-Whitney tests)

Factor	Level	EGD Non-attendees Frequency (%)	EGD Attendees Frequency (%)	p-value
Gender	Female Male	286 (74.5%) 98 (25.5%)	10 (55.6%) 8 (44.4%)	**0.075**
Age in years	Mean (± SD)	50.6 (± 12.6)	46.6 (± 13.3)	**0.187**
Monthly Household Income in UGX	Mean (± SD)	319,591(±1,306,200)	183,333(±164,567)	0.659
Education Level	No Formal Education Primary School Secondary School University/Tertiary Institute	14 (3.6%) 173 (45.1%) 154 (40.1%) 43 (11.2%)	2 (11.1%) 10 (55.6%) 3 (16.7%) 3(16.7%)	**0.128**
Marital Status	Single Married Separated /Divorced/Widowed	92 (24.0%) 209 (54.4%) 83 (21.6%)	5 (27.8%) 10 (55.6%) 3 (16.7%)	0.859
Family History of GI cancer	Positive Negative Unknown	155 (40.4%) 208 (54.2%) 21 (5.4%)	4 (22.2%) 13 (72.2%) 1 (5.6%)	0.294
Social History of GI cancer	Positive Negative Unknown	227 (59.1%) 149 (38.8%) 8 (2.1%)	5 (27.8%) 13 (72.2%) 0	**0.018**
Smoking Tobacco	Current-smoker Never-smoker Former-smoker	10 (2.6%) 361 (94.0%) 13 (3.4%)	2 (11.1%) 12 (66.7%) 4 (22.2%)	**< 0.001**
Alcohol Consumption	Daily-drinker Binge-drinker Quitters Lifetime-abstainer	8 (2.1%) 26 (6.8%) 51 (13.3%) 299 (77.9%)	0 1 (5.6%) 7 (38.9%) 10 (55.6%)	**0.025**

Medical Insurance Status	Insured Not insured Unknown	8 (2.1%) 369 (96.1%) 7 (1.8%)	0 17 (94.4%) 1 (5.6%)	0.453

In multivariable logistic regression, A positive family history of GI cancer significantly reduced the likelihood of attending endoscopy with AOR = 0.27, 95% CI (0.08; 0.89), and p = 0.032. A positive social history of GI cancer significantly lowered the likelihood of attending endoscopy with AOR = 0.05, 95% CI (0.01; 0.20), and p < 0.001.

For participants' history of smoking tobacco; both Never-smokers and Former-smokers had higher likelihood of attending endoscopy than Current-smokers with strong statistical significance (p = 0.003). However, Former-smokers (AOR = 9.66, 95% CI; 2.38 – 39.20) had higher likelihood of attending EGD than Never-smokers (AOR = 5.72, 95% CI; 1.04 – 31.46).

For participants' history of alcohol consumption, both Quitters and Binge-drinkers had higher likelihood of attending endoscopy than lifetime abstainers, with statistical significance (p = 0.002). There was strong evidence that quitters (AOR = 9.12 and 95% CI; 2.66 – 31.23) were more motivated to attend EGD than life-time abstainers. However, there was no substantial evidence that binge-drinkers (AOR = 1.70 and 95% CI; 0.19 – 15.24) were more motivated to attend EGD than life-time abstainers (see Table 6).

Table 6: Association between Sociodemographic variables and attendance of EGD – standard logistic regression (*Adjusted for age, gender & hospital as confounders)

		Univariable Logistic Regression		Multivariable Logistic Regression	
FACTOR	LEVEL	CRUDE ESTIMATES		ADJUSTED MODEL	
		Odds Ratio (95% CI)	**p-value**	**Odds Ratio (95% CI)**	**p-value**
Gender					
	Female	**Reference**	**0.083**		0.127
	Male	2.33 (0.89; 6.08)		2.12 (0.80; 5.58)	
Age in years	Per unit increase	0.97 (0.93; 1.01)	**0.188**	0.97 (0.94; 1.01)	0.279
Monthly Household Income in UGX	Per unit increase	0.99 (0.99; 1.00)	0.349	0.99 (0.99; 1.00)	0.220
Education Level	No formal Education	**Reference**			
	Primary School	0.40 (0.08; 2.03)	**0.176**	0.31 (0.05; 1.71)	0.066
	Secondary School	0.13 (0.02; 0.88)		0.07 (0.01; 0.55)	
	University/Tertiary Institute	0.48 (0.07; 3.22)		0.22 (0.03; 1.69)	
Marital Status					
	Single	**Reference**			
	Married	0.88 (0.29; 2.64)	0.860	0.97 (0.31; 3.00)	0.840
	Separated/Divorced/Widowed	0.66 (0.15; 2.86)		1.53 (0.27; 8.53)	
Family History of GI Cancer	Negative	**Reference**	**0.128**		***0.032***
	Positive	0.41 (0.13; 1.29)		0.27 (0.08; 0.89)	
	Unknown	-		-	
Social History of GI Cancer	Negative	**Reference**	**0.010**		***< 0.001***
	Positive	0.25 (0.08; 0.72)		0.05 (0.01; 0.20)	
	Unknown	-		-	
Smoking Tobacco	Current-Smoker	**Reference**	**< 0.001**		***0.003***
	Never-Smoker	6.01 (1.18; 30.50)		5.72 (1.04; 31.46)	
	Former-Smoker	9.25 (2.62; 32.62)		9.66 (2.38; 39.20)	
Alcohol Consumption	Life-time Abstainer	**Reference**			
	Quitter	4.10 (1.49; 11.27)	**0.022**	9.12 (2.66; 31.23)	***0.002***
	Binge-Drinker	1.15 (0.14; 9.33)		1.70 (0.19; 15.24)	
	Daily-Drinker	-		-	
Medical Insurance Status	Not Insured	**Reference**	-		-
	Insured	-		-	
	Unknown	-		-	

Given the low 4.48% attendance of EGD (outcome), the reported Odds Ratios (OR) provide a close approximation of the Relative Risk (RR).

4.4.2. Variance Inflation Factor (VIF) of predictors of EGD Attendance

Given that the VIF for each predictor variable was less than 10 (the level at which multicollinearity is considered statistically problematic), multicollinearity was ruled out as the cause of model fitting probabilities coming close to 0 or 1 (see Table 7).

Table 7: Results of VIF among predictors

Predictor Variable	Frequency (Percentage), n = 402	VIF
Do not know the benefits of EGD	25 (6.2%)	1.175
No time for EGD	32 (8.0%)	1.143
High price of EGD	351 (87.3%)	1.078
Fear of EGD	52 (12.9%)	1.000
Fear of the outcome of EGD	12 (3.0%)	1.045

4.4.3. Association between Barriers and EGD Attendance

Firth's analysis of associations between barriers and attendance of EGD showed that the baseline likelihood of attending endoscopy when all predictor variables are at their reference category or zero were 0.003. Individuals who were unaware of the benefits of EGD had 1.81 times higher likelihood of attending an endoscopy compared to those who were aware. Those who did not have time for EGD had 56% lower likelihood of attending endoscopy compared to those who did not cite this reason. Participants who perceived EGD was too expensive had much lower likelihood (86%) of attending EGD. Those who feared the procedure had 46% lower likelihood of attending EGD. Individuals who feared the possible outcome of the EGD had nearly twice the likelihood (1.93 times) of attending EGD (see Table 8).

Table 8: Association between barriers and EGD Attendance

Predictor Variable	Intercept	Do not know the benefits of EGD	No time for EGD	High Price of EGD	Fear of EGD	Fear of the outcome of EGD
Coefficient	-5.719	0.591	-0.815	-1.974	-0.622	0.656
Exponentiated coefficients (Odds Ratios)	0.003	1.806	0.443	0.139	0.537	1.928

Likelihood ratio test (LRT) = 78.61928 on 5 df, p = 1.665335e-15, n = 402

4.4.4. Firth's reduced-bias logistic regression for associations between barriers and attending EGD

The High Price of EGD is a statistically significant barrier to endoscopy, while the other barriers all had p-values > 0.050 and were not statistically significant concerning attendance of endoscopy (see Table 9).

Table 9: Significance of association between Barriers and EGD Attendance

Predictor	**Coefficient (estimate)**	**Standard Error**	**95% CI (lower)**	**95% CI (upper)**	**Chi-square**	***p-value***
Intercept	-5.719	1.089	-10.725	-4.066	Inf	***0.000***
Do not know the benefits of EGD	0.591	0.395	-0.909	1.932	0.718	*0.397*
No time for EGD	-0.815	0.517	-2.628	0.161	2.225	*0.136*
High price of EGD	-1.974	0.431	-3.832	-1.296	Inf	***0.000***
Fear of EGD	-0.622	0.450	-2.368	0.159	2.252	*0.133*
Fear of the outcome of EGD	0.656	0.293	-0.225	1.524	2.550	*0.110*

Likelihood ratio test = 78.61928 on 5 df, p = 1.665335e-15, n=402

Wald test = 34.30922 on 5 df, p = 0.000002066222 NULL

4.4.5. Other Reasons for Not Attending EGD

During follow-up interviews, non-attendees were asked an open-ended question to which 180 participants reported additional reasons for not attending endoscopy and these were clustered (see Table 10).

Table 10: Clustered reasons (barriers) for not having the EGD

Category of Reason / Barrier	**Frequency**	**Percentage**
Financial Constraints (e.g., cannot afford endoscopy, prioritising school fees, dependent on family, unemployed)	85	47.2%
Medical Reasons (e.g., symptoms improved with medication, diet modification, alternative treatments, prioritising other serious illnesses)	50	27.8%
Logistical Barriers (e.g., long distance to endoscopy centres, waiting for scheduled endoscopy appointment, family decision pending)	30	16.7%
Personal Circumstances (e.g., recent illness, caring for sick family members, bereavement, not mentally ready)	15	8.3%

n=180

4.5. Supplementary Material

4.5.1. Expanded Propensity Score Matching (PSM)

PSM was used to evaluate the robustness of the observed associations in the multivariable logistic regression model. Specifically, both one-to-one nearest neighbour matching and kernel matching techniques were applied. The covariates used for propensity score estimation included age, gender, monthly household income, education level, marital status, and medical insurance status. Nearest Neighbour Matching (1:1, no replacement); matches each treated individual with the closest untreated individual based on the propensity score. Kernel Matching uses a weighted average of all individuals in the control group to construct the counterfactual outcome, providing smoother estimates (see Figure 10)

4.5.2. Visual Comparison of Results

Figure 10 below displays a comparison of ORs obtained from the original multivariable logistic regression, PSM with nearest neighbour (NN) matching, and PSM with kernel matching for all key variables of interest. The consistency of the estimated effects across methods further supports the stability and robustness of the findings.

The visual comparison demonstrates minimal differences in effect estimates across methods. Most notably, variables such as smoking tobacco, alcohol consumption, and social or family history of GI cancer showed strong and consistent associations with the outcome, regardless of the analytical approach used (see Figure 10).

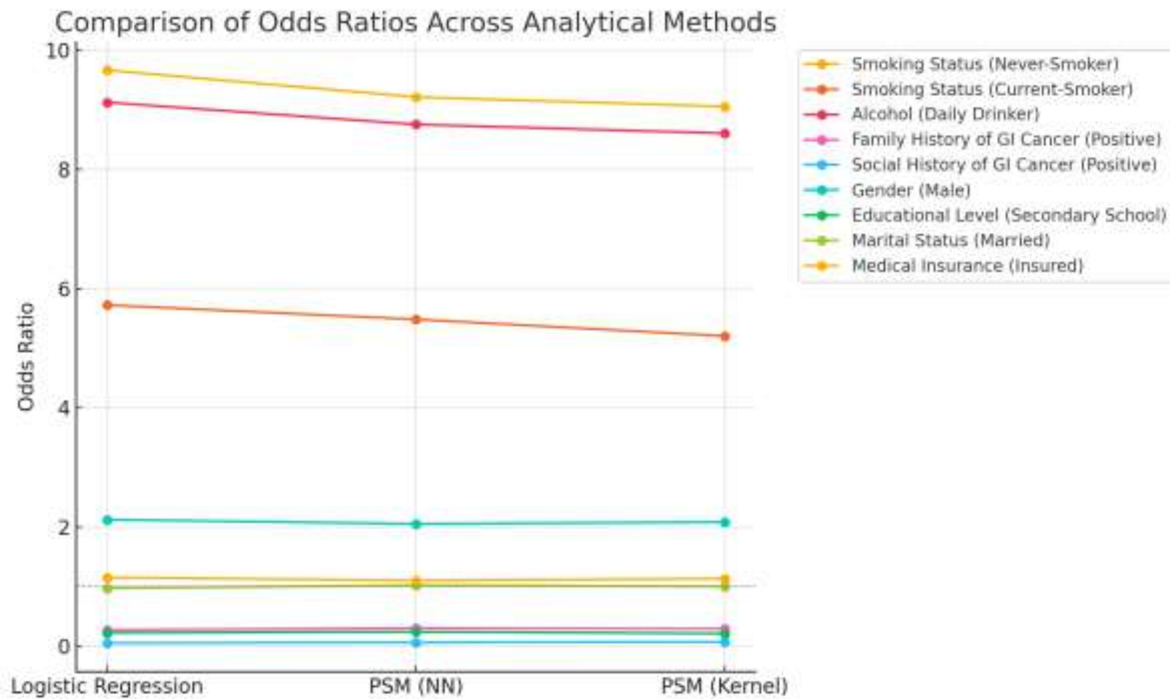


Figure 10: Comparison of ORs across Analytical Methods

4.5.3. Comprehensive Sensitivity Analyses for Logistic Regression Model

To ensure the robustness and reliability of the findings from the primary logistic regression model, a series of sensitivity analyses were conducted. These analyses assessed how various assumptions, data handling approaches, and model specifications might influence the strength and direction of associations between predictor variables and the outcome. The sensitivity analyses focused on the following domains: handling of missing data, alternative coding of categorical variables, exclusion of influential observations, model specification checks, stratified subgroup analyses, and alternative outcome definitions.

The sensitivity analyses conducted confirm the robustness and reliability of the findings from the main logistic regression model. Across a range of alternative model specifications, including complete-case analysis, variable recategorization, exclusion of influential observations, and stratified subgroup analyses, the direction and magnitude of key associations remained largely consistent (see Table 11).

Notably, the associations between smoking tobacco, alcohol consumption, and the outcome remained statistically significant and robust under various analytical conditions (see Table 11).

Table 11: Results of Sensitivity Analyses

Analysis Description	Variable	Adjustment or Change Made	Adjusted OR (95% CI)	p-value	Interpretation
Complete case analysis (exclude all missing data)	Smoking Tobacco (Current-Smoker)	Dropped all participants with any missing covariates	5.20 (1.01–27.03)	0.048	The association persists, indicating that missing data is unlikely to bias the findings.
Recategorization of Alcohol (Drinker vs Non-Drinker)	Alcohol Consumption	Grouped all categories of drinkers into one category	6.10 (2.20–17.00)	0.001	Strengthens the association, suggesting that the main effect was diluted by category fragmentation.
Exclude influential points (Cook's D > 4/n)	Family History of GI Cancer (Positive)	Excluded three influential observations	0.34 (0.10–1.12)	0.076	The point estimate slightly increases; the inference remains similar.
Dropped "Unknown" responses from analysis	Family History of GI Cancer	Dropped 10 "Unknown" values from the variable	0.30 (0.09–0.95)	0.041	Results remain robust, confirming that ambiguous responses do not significantly impact the findings.
Omit Age and Income from the multivariable model	Education Level (Secondary School)	Removed continuous covariates (age, income)	0.25 (0.04–1.40)	0.110	No significant change was observed, supporting the independent effect of education.
Model run only among males	Alcohol Consumption (Daily-Drinker)	Limited sample of male participants	10.5 (2.90–37.50)	0.001	The effect is stronger in males, suggesting possible effect modification.
Stricter case definition for outcome (exclude borderline cases)	Smoking Tobacco (Never-Smoker)	Removed mild cases from outcome definition	9.60 (2.50–36.90)	0.002	Findings are robust to alternative case definitions.

CHAPTER 5: DISCUSSION

5.1. Frequency of EGD among Patients with Dyspepsia

The present study found a low frequency of 18 EGDs in one month but higher than a retrospective study in Eastern Uganda (Doe, Bua, Obbo, Bisso, & Olupot-Olupot, 2021) which reported 8 EGDs monthly. The study in Eastern Uganda was conducted at a single regional referral hospital, whereas our study was conducted at two national referral hospitals with broader catchment areas. This likely explains the higher frequency observed.

The present study observed a lower frequency of EGD than proportions reported in international high-volume settings. For instance, a 34-month (2008–2010) prospective study in Japan reported a one-month frequency of 954.4 EGD among 32,450 cases (Matsuda, Tanaka, Kida, & Oda, 2011). This higher rate may be attributed to the inclusion of multiple indications and the setting in high-capacity centres. Similarly, a long-term retrospective study in Finland found a steady annual increase in diagnostic EGD frequency over eight years, reflecting evolving clinical practices over time (Nurminen et al., 2024). In contrast, the present study was limited to two national referral hospitals, focused specifically on dyspeptic patients, and had a shorter follow-up period, which likely contributed to the lower observed frequency.

5.2. Diagnostic Findings at EGD

Histopathological examination of suspicious lesions revealed two male patients with oesophageal cancer (one mass, one stricture) and two female patients with benign and malignant strictures, respectively. This resulted in a high oesophageal cancer incidence of 16.7% with a 2:1 male-to-female ratio. One patient with PUD was H. pylori-positive; while other biopsy results were pending.

This study found a high 88.9% incidence of organic dyspepsia comparable to a local study (Mbiine et al., 2021) with peak incidence in the 30–40-year age group in central Uganda, contrasting with the >40-year age group in Western Uganda (Obayo et al., 2015) but aligning with similar studies in Sub-Saharan Africa (Argaw, Solomon, Geda, Henok, & and Mulugeta, 2023).

Geographic variations in EGD findings were notable. Eastern Uganda reported oesophageal cancer as the most prevalent finding at 34% (Doe et al., 2021), similar to this study's high proportion. In contrast, Western and Northern Uganda studies found gastritis to be most common, with lower oesophageal cancer rates at 7.1% (Obayo et al., 2015) and 5.1% (Okello,

Ogwang, & Pecorella, 2016), respectively. These differences are attributed to regional variations in genetic, environmental, and dietary risk factors.

This study's high incidence aligns with a meta-analysis reporting a rising pooled prevalence of oesophageal cancer in East Africa (Abdu, Assefa, & Abdu, 2025). Given the poor prognosis and increasing trend of oesophageal cancer in Uganda, routine EGD-based screening is critically needed (Collaborators, 2020).

5.3. Barriers and Facilitators to Attending EGD

In this prospective cohort study, Relative Risk (RR) would have been the most intuitive and easily interpretable measure of association between patient-level barriers and attendance of EGD. However, the odds ratio (OR) which was reported is a valid measure and often approximates the RR when the outcome is rare (<10%). This study found a low one-month frequency of EGD at 4.48% so that the OR was a reasonable approximation of the RR, but also the low attendance is a strong indicator of barriers to undergoing EGD despite the doctor's recommendation.

5.3.1. Family History of GI Cancer

In the present study, fewer EGD attendees (22.2%) had a positive family history of GI cancer than non-attendees (40.4%). Similarly, more EGD attendees (72.2%) had a negative family history of GI cancer than non-attendees (54.2%). Furthermore, multivariable analysis showed that a positive family history of GI cancer was a significant barrier to EGD, with 73% lower likelihood of attending endoscopy.

Some studies have found that a positive family history of GI cancer was a significant facilitator of undergoing endoscopy among 2,547 participants aged ≥ 40 years in China (Huang et al., 2023) and among 1,509 participants aged 40 – 70 years in a Korean national survey (Hahm et al., 2008). However, other studies have found that a positive family history of cancer can paradoxically act as a barrier to diagnostic procedures. For instance, individuals may avoid screening and diagnostic procedures because of fear of serious illness, anxiety about procedures, and mistrust of the medical establishment, especially people who have witnessed a relative die from cancer (Griffith, Passmore, Smith, & Wenzel, 2012). Even individuals with known family cancer history may lack an accurate understanding of the benefits of early endoscopy, especially if not accompanied by proper counselling (Ingrand et al., 2016).

5.3.2. Social History of GI Cancer

In the present study, individuals with a friend, colleague, neighbour, or other social contact with a GI cancer diagnosis had 95% lower likelihood of undergoing endoscopy compared to those without such social connection, and the effect was significant. Similarly, descriptive analysis revealed that fewer EGD attendees (27.8%) had a positive social history of GI cancer compared to non-attendees (59.1%), while more EGD attendees (72.2%) had a negative social history of GI cancer than non-attendees (38.8%).

In contrast, a positive social history of GI cancer was a significant positive influence on attending endoscopy in a Korean national survey that applied the extended theory of planned behaviour among 1,509 participants (Hahm et al., 2008) and among 2,547 participants in southeastern china where individuals with a such a social connection had a 30% higher likelihood of undergoing endoscopy (Huang et al., 2023).

However, some qualitative interviews and literature reviews have shown that a positive social history of GI cancer can be a significant barrier to endoscopy. For instance, individuals may avoid endoscopy if they know someone who narrated a painful procedure, while others may harbour anxiety associated with the fear of cancer diagnosis, especially those with social contacts who succumbed to cancer (Kerrison et al., 2022). Other individuals anticipate stigma and avoid diagnostic endoscopy because they know someone with complications of GI cancer (R. Lee & Holmes, 2023). Qualitative interviews with ethnic minority groups living in the United Kingdom found that Black-African participants described GI cancer as a social taboo, were very sensitive to a GI cancer diagnosis, and feared the procedure of endoscopy, and that such negative emotions were more pronounced among individuals with social contacts diagnosed with GI cancer (Kerrison et al., 2023).

5.3.3. Smoking Tobacco

In the present study, both Never-smokers and Former-smokers had significantly higher likelihood of attending endoscopy than Current-smokers. Former-smokers had higher likelihood (9.66 times) than Never-smokers (5.72 times) of attending EGD. Although both effects were statistically significant, the 95% CIs had a wide range, suggesting some variability in the estimates. Notably, the difference in size of proportions between EGD attendees and non-attendees was much larger for Former-smokers than Never-smokers, i.e., Former-smokers were 22.2% among EGD attendees and 3.4% among non-attendees.

Similarly, a Korean survey among 4,593 participants reported that current-smokers experienced more barriers to endoscopy than the other categories of participants' smoking history. However, the effect was not significant after multivariable analysis adjusted for confounders (Kwon et al., 2009). Studies have shown that both Former-smokers and Never-smokers exhibit higher motivation and attendance of cancer diagnostic procedures than Current-smokers. For instance, National Health Interview Surveys (NHIS) in the USA (2010 – 2015) found that current smokers tend to have lower annual family income, are more likely to be uninsured, and achieve lower education levels than Former-smokers or Never-smokers which contributes to their poorer attitude and access to endoscopy (Sanford et al., 2019).

Qualitative studies have shown that Current-smokers are more likely to view cancer as a death sentence and to believe that a diagnosis of cancer would preclude continuation of normal activities (Quaife, McEwen, Janes, & Wardle, 2015). Such observations suggest that Current-smokers' awareness regarding the negative effects of tobacco use may actually discourage them from undergoing cancer diagnosis (Niederdeppe & Levy, 2007).

Other qualitative interviews from NHIS data showed that Former-smokers are more inclined to attend cancer diagnostic procedures than Never-smokers because quitters may feel motivated to take initiatives to optimize their long-term health (Sanford et al., 2019).

5.3.4. Alcohol Consumption

In the present study, more EGD attendees (38.9%) than non-attendees (13.3%) had quit alcohol ≥ 1 year ago. The difference in size of proportions between EGD attendees (5.6%) and non-attendees (6.8%) was negligible for Binge-drinkers. Both quitters and Binge-drinkers had higher likelihood of attending endoscopy than Life-time abstainers. Quitters had 9.12 times higher likelihood of attending EGD than Life-time abstainers, with statistical significance. However, there was no strong evidence that Binge-drinkers had 70% higher likelihood of attending EGD than life-time abstainers. Notably, both effects had a wide range of 95% CIs, suggesting some variability in the estimates.

Previous qualitative studies have yielded mixed findings regarding the influence of binge-drinking on uptake of cancer diagnostic procedures. For instance, a Korean survey among 4,593 participants found that binge-drinkers significantly perceived alcohol as a barrier to endoscopy (Kwon et al., 2009). The USA Behavioural Risk Factor Surveillance System (2002 – 2012) reported that Binge-drinkers were more likely to undergo cancer diagnostic procedures than Life-time abstainers (Mu & Mukamal, 2016). However, other qualitative studies showed

that Binge-drinkers may experience denial of health risks, lower health literacy, and avoidance of medical settings, and thus demonstrate a lower attendance of procedures like endoscopy (Paul, Grubaugh, Frueh, Ellis, & Egede, 2011).

Studies have showed that Quitters may have heightened awareness, proactive health behaviours, and psychological readiness for preventive care, and thus they may be more vigilant about their well-being and more likely to engage in preventive and diagnostic procedures than both Binge-drinkers and Life-time abstainers (Satoh & Sato, 2021). On the other hand, Life-time abstainers may perceive themselves at lower risk for alcohol-related disease leading to decreased perceived necessity for cancer diagnosis and this sense of invulnerability can result in lower participation rates in preventive and diagnostic procedures (Castañeda et al., 2023).

5.3.5. High Price of EGD

In the present study, the majority of respondents, 87.3% (351/402), reported that the price of EGD at Mulago and Kiruddu Hospitals is high. A significant proportion of these participants, 43% (173/402), earned < 150,000 UGX and were low-income earners according to the 2023 Uganda National Household Finscope Survey (Uganda, 2023). The perception that EGD is expensive was associated with an 86% likelihood of avoiding endoscopy, and this effect was statistically significant. A pilot study found that the cost of EGD is currently 350,000 UGX and 300,000 UGX at Mulago and Kiruddu National Referral Hospitals, respectively (unpublished observations), which could explain why the majority of participants in the present study perceived EGD as expensive. In contrast, a 6-month community-based survey among 2,547 participants in China reported that individuals who perceived EGD as expensive overcame the barrier because they were willing to dedicate money to endoscopic screening, given the high incidence of gastric cancer in China (Huang et al., 2023). Therefore, in the present study, the perception that EGD was expensive hindered attendance of EGD at Mulago and Kiruddu Hospitals, while the same perception of high costs was not a barrier in countries with a high incidence of GI cancer.

There is a paucity of data that explicitly defines monthly household income classes in Uganda. Moreover, standard income classes among individuals or households in the Ugandan population are not defined by authorities such as the Ministry of Finance, Planning and Economic Development, the Uganda Bureau of Statistics, or the Bank of Uganda. For instance, the 2023 Finscope Survey defined the low-income class as households earning < 150,000 UGX

monthly, while the middle and floating middle income classes were defined based on households' daily expenditure, and the high income class was not explicitly defined (Uganda, 2023).

Therefore, to maintain consistency in income classification, the present study used fixed multiples of the entire cohort's median income (150,000 UGX) for the purpose of in-depth description. However, this income data was analyzed as a continuous variable (unit increase in UGX) given its skewed distribution. There was a small income difference, i.e., EGD attendees earned a median monthly household income of 125,000 UGX (IQR 100,000; 292,500) less than EGD non-attendees with 150,000 UGX (IQR 60,000; 300,000). Furthermore, multivariable analysis found that increase in participants' monthly household income did not significantly increase attendance of the recommended endoscopy. In contrast, a systematic review of 13 articles in PubMed, Web of Science and Scopus included studies which analyzed income as a continuous variable and reported that increase in participants' income significantly increased uptake of endoscopy (Sare Hatamian et al., 2021). In the context of the present study, these observations show that despite the doctor's recommendation for endoscopy, the perceived high cost of EGD among majority of participants was a strong deterrent to uptake of endoscopy than actual participants' income-levels, similar to previous barrier-studies (Knight et al., 2015; Muthukrishnan, Arnold, & James, 2019).

Having medical insurance was not a significant facilitator to attend endoscopy in Korea (Kwon et al., 2009) and in Sub-Saharan Africa (Mwachiro et al., 2021). Similarly, in the present study none of the 8 medically-insured participants (only 2.1% of the entire cohort) attended endoscopy, and as such the binary logistic regression model had very few cells and did not run to generate values of ORs, CIs, or p-values for this variable. Secondly, Mulago and Kiruddu National Referral Hospitals do not accept medical insurance as a form of payment for medical services and this perhaps contributes to not seeking endoscopy among the few insured patients.

Therefore, in the context of the present study conducted in low resource setting, the perception that EGD was expensive stood out as a significant limiting factor to attending endoscopy among patients with dyspepsia at Mulago and Kiruddu Hospitals despite participants' education-level, income-level, and medical insurance status.

5.3.6. Other Sociodemographic Variables

The proportion of male participants was higher among EGD attendees (44.4%) than among non-attendees (25.5%). Male gender was associated with over twice the likelihood of attending endoscopy, but this was not significant in the present study. Previous studies have yielded mixed findings regarding the role of gender in endoscopy attendance. For instance, a survey in China found that male gender was a significant barrier to endoscopy, and female individuals exhibited better health-seeking behavior, thereby providing doctors with more opportunities to recommend endoscopy (Liu et al., 2019). However, a study at a tertiary center in the Middle East found that male patients were more likely to attend recommended endoscopy compared to female patients because women were more likely to report feelings of embarrassment as a reason for non-attendance (Hadaib, Anglade, & Ibrahim, 2022).

The younger 30–40-year age group had the highest attendance of endoscopy in the present study. Generally, EGD attendees were younger, with a median age of 40.0 years (IQR 39.0; 54.3), than non-attendees, with 50.0 years (IQR 40.8; 58.0). The higher the participants' age, the lower the likelihood of attending endoscopy, although this effect was not significant. However, other studies found age was significantly associated with attending endoscopy, with young age groups, 18–29 and 30–39-years, having 3 times higher likelihood of avoiding endoscopy (Liu et al., 2019) while the older 51–60-years individuals had 1.69 times higher likelihood of undergoing endoscopy in China (Huang et al., 2023). These studies did not examine the role of doctors' recommendations and thus showed that younger individuals have a poor attitude toward undergoing endoscopy. In contrast, the present study found that younger individuals are more likely to attend an endoscopy when the doctor recommends it.

The present study reported mixed findings regarding the role of education in endoscopy attendance, i.e., individuals without formal education and those with university or tertiary education were more likely to attend endoscopy if a doctor recommended it. On the other hand, individuals with basic education (primary or secondary school) were less likely to attend endoscopy despite the doctor's recommendation. These observations are similar to (Huang et al., 2023) in China and (Hahm et al., 2008) in Korea who reported significantly higher EGD attendance with university level education because such individuals had higher knowledge of risk factors and symptoms of GI cancer. In contrast, these studies showed that individuals with no formal education had low knowledge of GI disease risk factors, which contributes to delays in seeking medical care. However, in the context of the present study, individuals without

formal education have a firm reliance on physician authority and are motivated to undergo procedures, especially those recommended by a doctor.

There was a negligible difference in marital status, with 55.6% of EGD attendees and 54.4% of non-attendees being married. Marital status was not significantly associated with undergoing endoscopy in the present study. However, one Korean study (Kwon et al., 2009) found that living with a spouse was a statistically significant facilitator of attending endoscopy, and that advice and recommendations from family members positively influenced individuals to undergo medical procedures.

5.3.7. Other Predictors of EGD Attendance

In this study, nearly half of the participants reported financial constraints as the reason for not undergoing EGD, while others cited medical, logistical, and personal reasons. Similarly, in SSA, a review of responses from digestive health professionals in Kenya, Ethiopia, Zambia, and Malawi reported that patients' financial constraints were not a significant barrier to undergoing endoscopy (Mwachiro et al., 2021). In SSA, financial constraints are not considered a significant barrier in the context of GI endoscopy because other factors play a more prominent role in limiting patient attendance; for instance, the limited availability of functional gastroscopes (Mwachiro et al., 2021) and the high cost of GI endoscopy services (Watermeyer et al., 2023).

The present study showed that individuals who perceived a fear of EGD had 46% lower likelihood of attending endoscopy, while those who perceived a fear of the outcome of EGD had nearly twice the likelihood of attending endoscopy; however, these effects were not statistically significant. Similarly, almost half of the participants were fearful of getting an endoscopy in a prospective study in Eastern Uganda (Mogili et al., 2024). Psychological-barrier studies have demonstrated that patients' concerns like alarming rumours about endoscopy, anxiety over procedure-related unpleasant experiences and side-effects, as well as fear of procedure-related pain, are among the most reported barriers in patients recommended to undergo endoscopy (D. A. Drossman et al., 1996; Gebbensleben & Rohde, 1990; M. P. Jones et al., 2004).

In the present study, individuals who did not know the benefits of EGD had 1.81 times higher likelihood of attending endoscopy than those who knew the benefits of EGD; however, this was not statistically significant, thus highlighting the vital role of patient education to ensure their understanding of the procedure, especially during the informed consent process. In certain

contexts, limited knowledge about endoscopic procedures among patients may paradoxically act as a facilitator for undergoing endoscopy, especially when coupled with a physician's recommendation. Two systematic reviews of literature on barriers to endoscopy showed that a physician's advice significantly impacts a patient's willingness to undergo procedures like endoscopy, regardless of the patient's prior limited knowledge or misconceptions about the procedure (S. Hatamian, S. Etesam, A. Mazidimoradi, Z. Momenimovahed, & H. Salehiniya, 2021; Kerrison et al., 2021).

Lastly, in the present study, individuals who cited a lack of time for EGD had 56% lower likelihood of attending EGD. However, this was not significant. Lack of time for EGD was found to be a statistically significant barrier to endoscopy attendance in China (Huang et al., 2023), and researchers suggested that long-waiting times may lead to reduced patient satisfaction and hinder willingness to seek endoscopy.

5.4. Strengths of The Study

Unlike previous studies that identified a doctor's recommendation as a key facilitator of endoscopy by comparing patients who did and did not receive one, the present study held this variable constant by including only patients who had received an EGD recommendation. This unique design allowed exploration of additional patient-level barriers that persist despite physician endorsement.

This study had a minimal follow-up loss of 4.96%, which enabled precise estimation of the frequency of EGD among patients with dyspepsia. The low (4.48%) attendance of EGD is a strong indicator of barriers to EGD among patients with dyspepsia despite the doctor's recommendation.

5.5. Limitations of The Study

Consecutive sampling may have introduced selection bias. However, strict adherence to eligibility criteria at both national referral hospitals helped mitigate selection bias.

The study's short follow-up interval of one-month may have underestimated the actual frequency of EGD among patients with dyspepsia, especially those who had to postpone getting EGD due to other personal reasons. However, the study tool had an open-ended question poised to non-attendees to capture additional reasons for avoiding or postponing EGD.

The wide 95% CIs for the effects of alcohol use and tobacco smoking on EGD attendance reflect imprecise estimates, likely due to low event counts and sparse data, as only 4.48%

(18/402) of patients underwent EGD. To address this limitation, penalized logistic regression, robust to low cell counts, was employed. Additionally, Expanded Propensity Score Matching was used to evaluate the robustness of the observed associations in the multivariable logistic regression model. Specifically, both one-to-one nearest neighbour matching which matches each treated individual with the closest untreated individual based on the propensity score and kernel matching which uses a weighted average of all individuals in the control group to construct the counterfactual outcome, providing smoother estimates. The resulting ORs and CIs remained similar across the different analytical methods, indicating that despite the inherent uncertainty, the findings remain robust and statistically meaningful. However, since the study was underpowered to precisely detect the effect of barriers on EGD attendance, the ORs should be interpreted as generating hypotheses for future research rather than providing definitive evidence.

As a quantitative study, it offered limited understanding of how barriers such as a positive family and social history of GI cancer, and facilitators like smoking cessation or past alcohol use, affect EGD attendance among patients.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

402 participants were followed up over one month, with a male-to-female ratio of 1:2.8, median age of 50.0 years (IQR 40.0 – 58.0) and mean age of 50.4 years (SD ± 12.7). Only 4.48% of participants underwent EGD despite the doctor's recommendation. The high price of EGD was a significant limiting factor to attending EGD. Furthermore, a positive family and social history of GI cancer was a significant barrier to undergoing EGD. However, abstaining from tobacco smoking, as well as former tobacco smoking and alcohol use, were all significant facilitators to attending EGD. The low one-month frequency of undergoing EGD was a precise estimate given the study's low follow-up loss rate of 4.96%. Oesophageal conditions dominated EGD findings, with oesophageal varices at 22.2% and oesophageal cancer at 16.7%.

6.2. Recommendations

We recommend a policy review to scale down the price of EGD, and this may include a national health insurance scheme, inclusive of public hospitals, as stakeholders to make EGD more affordable at Mulago and Kiruddu Hospitals. Secondly, qualitative mixed-methods studies with more extended follow-up periods are recommended to provide an in-depth understanding of barriers to attending Endoscopy among patients with dyspepsia.

CHAPTER 7: REFERENCES

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CHAPTER 8: APPENDICES

APPENDIX I: INFORMED CONSENT FORM IN ENGLISH

Study Title: **Frequency and Barriers to Upper Gastrointestinal Endoscopy among patients with dyspepsia at Mulago and Kiruddu Hospitals: a prospective cohort study.**

Principal Investigator: AGABA RAYMOND.

Study Summary: Researchers from Department of Surgery, School of Medicine, Makerere University invite you to participate in a study to examine Barriers to Endoscopy among patients with dyspepsia at Mulago and Kiruddu Hospitals. Dyspepsia is any complaint of; fullness after meals, early satiety, upper abdominal pain, and upper abdominal burning. Endoscopy is a flexible fiberoptic tube which is passed to look down your food pipe, stomach and first part of your small intestine.

Background: Uganda has a high rate of uninvestigated dyspepsia, which strongly indicates barriers to timely detection of disease and results in consistency of poor outcomes and lower survival rates related to advanced stage of disease at initial detection. Over 90% of patients with dyspepsia in Uganda have structural abnormality as the cause and studies have proven that Endoscopy is one of the most definitive methods to investigate dyspepsia. However, majority of patients with dyspepsia in Uganda are not getting Endoscopy done due to certain unknown barriers.

Purpose of the study: To increase prevalence of endoscopy in Uganda and contribute to increased early-stage detection of disease for improved treatment and survival of patients.

Duration of Interview: Between 15 and 30 minutes.

Study Participants: 423 eligible patients at the gastroenterology departments of Mulago and Kiruddu Hospitals will participate in this study. You have been invited to participate in this study because you are 30 years old or above, have complaints of dyspepsia and your doctor recommended you to do endoscopy upon your initial visit to the clinic. Dyspepsia is any of the following complaints; fullness after meals, early satiety, upper abdominal pain, and upper abdominal burning. Endoscopy is a procedure where a flexible fiberoptic tube is passed to look down your food pipe, stomach and first part of your small intestine.

Procedure of interview: If you agree to participate in this study, an interviewer will ask you questions using a questionnaire at 2 occasions, both at our initial contact and after 1-month period. Firstly, we shall have a physical interview at the clinic upon our initial contact. After 1-month interval, we shall contact you via telephone call and/or email to ask you further questions. If on our second interview you will have undergone endoscopy, we request that you

share the endoscopic findings with us. Furthermore, we request that you allow us access to your endoscopy report if the procedure is done at Mulago or Kiruddu endoscopy unit.

Risks or discomforts: There are no risks or discomforts from participating in this study. However, if you experience stress or anxiety during your participation in the study you may terminate your participation at any time.

Benefits: Your participation in this study is valuable beyond personal gain because you will contribute to increasing prevalence of endoscopy for increased early-stage detection of disease to enable improved treatment and survival of Ugandan patients with dyspepsia.

Privacy and confidentiality: If you agree to participate in this study, you will be assigned a study number so as to protect your identity while analyzing the data collected. Your name and other identifying information e.g., telephone number and email address will be kept secure and separate from the data collected. The physical records e.g., paper questionnaires of this study will be kept private in a locked cabinet, while electronic records e.g., emails and telephone conversations will be protected by password and encryption; and only the investigator will have access to this data which will only be used for the purpose of this study and nothing else.

Participant's rights: You have the right to withdraw from the study at any time without penalty. If you choose to withdraw, we will delete any data collected from you up to that point. You also have the right to request access to your data and to ask for it to be deleted.

Voluntariness: Your participation in this study is strictly voluntary and your decision not to participate will not affect your treatment at Mulago or Kiruddu Hospital.

Costs to participant: There are no monetary costs to your participation in this study. However, we request for about 15 to 30 minutes of your time to answer questions asked by an interviewer.

Time compensation to participants: The researchers will compensate you ten thousand Ugandan shillings only (UGX 10,000) for your time and commitment to voluntarily listen and answer all questions truthfully as asked by the interviewer after completion of our engagement at the end of the second interview.

Contacts for questions about the study: If you have any questions about this study please contact the principal investigator, AGABA RAYMOND on Telephone number: +256-787542877.

Contacts for questions about participant's rights: If you have any questions about participant's rights in this study, please contact the chairperson of Makerere University School of Medicine Research Ethics Committee, PROF. PONSIANO OCAMA on Telephone: +256-772-421190.

DECLARATION BY PARTICIPANT;

The investigator, ……………………………………., has clearly explained the above consent form to me and I have understood it. Furthermore, I have read the above information, asked questions and received answers. Therefore, I consent to participate in the study.

Name of Participant: ………………………………………………………………………………

Telephone number of Participant: ………………………………………………………………

Email of Participant: ………………………………………………………………………………

Study ID Number of Participant: ………………………………………………………………….

Signature or thumbprint of Participant: ………………………… Date: ………………........

Name of Witness: ………………………………………………………………………………….

Signature of Witness: ……………………………………………………………………………...

Name of Investigator: ……………………………………………………………………………...

Signature of Investigator: ………………………………………… Date: …………………….

APPENDIX II: INFORMED CONSENT FORM TRANSLATED TO LUGANDA

EKIWANDIIKO EKYONGEREZEDDWAKO EKISOOKA

Foomu y'okukiriza okwetaba mu kunoonyereza.

Omutwe gw'okunoonyereza: Okubaawo kw'obulwadde n'emiziyizo eri kamera elingiririza mu mimiro omuyita emmere, mu balwadde abalina okulumwa n'okwokya mu lubuto olwa waggulu, okukkuta amangu, n'olubuto olwa waggulu okujjula mu ddwaaliro e Mulago ne Kiruddu mu Uganda: Okunoonyereza okw'okwetegereza.

Omunoonyereza omukulu: Agaba Raymond.

Ebikwata ku kunoonyereza mu bufunze

Abanonyereza okuva mu kitongole ky'okulongoosa, mu ssomero ly'obusawo ku setendekero ya Makerere yunivasite bakuyita okwetaba mu kunoonyereza ku biziyiza mu kukebeza kamera "endoscopy" mu balwadde abalumwa n'okwokya mu lubuto olwa waggulu, okukkuta amangu, n'olubuto olwa waggulu okujjula "Dyspepsia" mu ddwaliro e Mulago ne Kiruddu. "Dyspepsia" kwe kulumwa n'okwokya mu lubuto olwa waggulu, okukkuta amangu, n'olubuto olwa waggulu okujjula. "Endoscopy" kwe kuyisa oluseke mu luseke awayita emmere okusobola okukeberebwa nga bakozesa kamera okutunula wansi mu mumiro, mulubuto, n'ekyenda ekitandikibwako

Ensibuko y'okunoonyereza

Uganda erina omuwendo omunene ogw'obulwadde bw'okwokya mu lubuto olwa waggulu, okukkuta amangu, n'olubuto olwa waggulu okujjula nga buno tebunanoonyerezebwa ko. Kino kyongera okulaga emiziyizo mu kuzuula obulwadde mu budde ekileeta obutakwatagana mu bivaamu ebitalibilungi, n'okuwangaala okutono nga kuno kwekuusa ku bulwadde okuzuulibwa ku mutendera ogw'okuntikko mu kukeberebwa okusooka. Abalwadde abasoba mu bitundutundu kyenda abalina obuzibu bw'okwokya mu lubuto olwa waggulu, okukkuta amangu, n'olubuto olwa waggulu okujjula mu Uganda nga kino kiba ku buzibu n'ensengeka mu kikula kyabwe era okunoonyereza okwenjawulo kulaga nti enkozesa ya kamera elingiriza mu mimiro y'emu ku ngeri obulwadde buno gyebuyinza okwekenenyezebwamu. Abalwadde abasinga obungi abalina ekilwadde kino mu Uganda tebakebelebwa na kamera elingiliza mu mimiro olw'emiziyizo egitamanyiddwa.

Ekigendererwa ky'okunoonyereza kuno:

Okwongera ku bungi bw'okukebera emimiro, olubuto n'entandika y'ekyenda nga bakozesa kamera wano mu Uganda, n'okuyamba mu kwongera okuzuula ekilwadde nga bukyali okusobola okulongoosa obujjanjabi n'obulamu bw'abalwadde.

Ebbanga ly'okubuuza ebibuuzo: Wakati w'eddakiika kumi na taano ne asaatu.

Abeetabye mu kunoonyereza:

Abalwadde bikumi bina mu abiri mu bisatu abalina ebisanyizo mu bitongole by'eby'omu lubuto mu malwaliro g'e Mulago ne Kiruddu be bagenda okwetaba mu kunoonyereza kuno. Oyitiddwa okwetaba mu kunoonyereza kuno kubanga olina emyaka asaatu n'okudda waggulu, wemulugunya ku kulumwa n'okwokya mu lubuto olwa waggulu, okukkuta amangu, n'olubuto olwa waggulu okujjula era omusawo yakuwadde amagezi okukebelebwa nga bakozesa kamera lw'ewasoka okugenda mu ddwaliro. Okujjula oluvannyuma lw'okulya, okukkuta amangu, okulumwa olubuto olwa waggulu, n'okwokya olubuto olwa waggulu byebimu ku bubonero bw'okwesiba olubuto. Okukeberebwa ne kamera kikolebwa nga bakozesa akapiira akayisibwa mu mimiro okusobola okulaba mulubuto n'ekitundu ekisooka eky'ekyenda kyo ekitono.

Enkola y'okubuuza ebibuuzo

Bw'oba okkiriza okwetaba mu kunoonyereza kuno, ojja kubuuzibwa ebibuuzo emirundi ebbiri, omulundi ogusooka nga okyadde mu ddwaliro n'oluvannyuma lw'omweezi gumu. Mukusooka, ojja kubuuzibwa omulundi ogusookera ddala okukulaba, n'oluvanyuma nga wayise omweezi gumu, Tujja kukutuukilira nga tukozesa essimu oba okukusindikila obubaka okwongela okukubuuza ebibuuzo. Singa ku yiintaviyu yaffe ey'okubbiri onaba okebereddwa ne kamera mundda, Tujja kukusaba otubulire ebinaaba bivudde mu kukebera. Ekirala tusaba otukkirize okufuna alipoota yo ey'okukeberebwa ne kamera singa enkola eno ekolebwa mu Mulago oba e Kiruddu.

Obulabe oba obuzibu

Tewali bulabe oba buzibu bujja kuva mu kwetaba mu kunonyereza kuno naye singa ofuna situleesi oba okweralikirira, oyinza okukomya okwetaba kwo ekiseera kyona.

Emigaso

Okwetaba kwo mu kunoonyereza kuno kwa mugaso era kusukka okuganyulwa kw'omuntu kinoomu kubanga ojja kuyamba okwongera ku mu kuzuula endwadde z'omu lubuto

n’okwongera okuzuula ekilwadde nga bukyaali okusobozesa okulongoosa mu bujjanjabi n’okuwangaala kw’balwadde abalina obuzibu bw’okwokya mu lubuto olwa waggulu, okukkuta amangu, n’olubuto olwa waggulu okujjula mu Uganda.

Okukuuma ebyama oba ebikukwatako:

Bw’oba okkiriza okwetaba mu kunoonyereza kuno, ojja kuweebwa ennamba y’omusomo kikusobozese okukuuma ebikukwatako. Ebirala ebikukwatako nga ennamba yo eyessimu n’ekifo woobera bijja kukuumibwa bulungi. Empapula okujjuzibwa ebikukwatako bijja kusibilwa mu kabineti eriko kufulu era nga ebinaaba biyingiziddwa mu kompyuuta bijja kusibibwa. Omunonyereza yekka y’ajja okukirizibwa oku bitunulamu ne’kigendererwa ky’okunoonyereza kuno kwoka.

Eddembe ly’abetabye mu musomo

Olina eddembe okuva mu musomo mu kiseera kyonna awatali kibonerezo. Bw’osalawo okuggyayo okwetaba kwo mu kunonyereza, tujja kusazaamu ebikukwatako ebinaba bikuŋŋaanyiziddwa okutuuka mu kiseera ekyo. Olina eddembe okusaba bisangulwe oba bisanyizibwewo.

Obwannakyewa

Okwetaba mu kunoonyereza kuno kwa kyeyagalire nnyo era okusalawo kwo obuteetabaamu tekijja kukosa bujjanjabi bwo mu ddwaliro e Mulago oba Kiruddu.

Ebisale eri eyeetabye mu kunoonyereza

Tewali nsaasaanya ya ssente yonna eri mu kwetaba kwo mu kunoonyereza kuno wabula tukusaba eddakiika kuminataano ku asatu ku budde bwo okuddamu ebibuuzo byaffe ebikubuuzibwa.

Okuliyilira olw’obudde bwomaze nga wetaba mumusomo.

Abanoonyereza bajja kukuliyirira omutwalo gumu olw’obudde n’okwewayo kwo okutuwuliriza, n’okukiriza okuddamu ebibuuzo ebinaba bikubuuzidwa mu mazima eri oyo abuuza ebibuuzo nga amaliriza ne ku nkomelero ya yintaviyu ey’okubbiri.

Ab’okutuukirila singa oba oyina ebibuuzo ebikwata ku kunoonyereza

Bw’oba olina ekibuuzo kyonna ku kunoonyereza kuno tuukirira omunoonyereza omukulu, Agaba Raymond ku nnamba y’essimu +256787542877.

Ab’okutuukirira singa oba oyina ebibuuzo ebikwata ku ddembe ly’eyetabye mu kunoonyereza.

Bw’oba olina ekibuuzo kyonna ku ddembe ly’omuntu eyeetabye mu kunoonyereza kuno, tuukirira ssentebe w’akakiiko akakwasisa empisa mu kunoonyereza ku ssomero ly’abasawo mu yunivasite y’e Makerere, Prof. Ponsiano Ocama ku ssimu +256772421190.

Okukkiriza okwetaba mu kunoonyereza

Omunoonyereza …………………………………………… anyonyodde bulungi foomu y’okwetaba mu kunoonyereza era ntegedde bulunji. Nsomye ebigukwatako waggulu era mbuuzizza ebibuuzo era ne nfuna eby’okuddamu. N’olwekyo, nzikiriza okwetaba mu kunoonyereza kuno.

Errinya ly’eyetabye mu musomo

…………………………………………………………………

Ennamba y’essimu y’eyetabye mu musomo

…………………………………………………………

Email ly’eyetabye mu musomo:

…………………………………………………………………

Nnamba y’omusomo: ……………………………………………………………….

Omukono oba ekigalo ekisajja:………………… Ennaku z’omweezi: ……………….......

Erinnya ly’omujulizi:

…………………………………………………………………………….

Omukono gw’omujulizi:

………………………………………………………………………...

Erinnya ly’omunoonyereza: …………………………………………………………...

Omukono gw’omunoonyereza ………………………… Ennaku z’omweezi:……………….

APPENDIX III: QUESTIONNAIRE FOR SURVEY OF EGD IN ENGLISH

QUESTIONNAIRE:

Study Title: Frequency and Barriers to Upper Gastrointestinal Endoscopy among patients with dyspepsia at Mulago and Kiruddu Hospitals: a prospective cohort study.

Study ID Number: ……………… Date: ………………….

SURVEY INSTRUMENT OF ENDOSCOPY AT MULAGO AND KIRUDDU HOSPITALS

We humbly ask your permission to participate in a survey on endoscopy.

Please answer the following questions; **Note that questions with an "asterisk" (*) must be answered.**

PART 1; Participant's sociodemographic characteristics

Instructions: Please read through the following questions from 1-10 and circle the most correct option or answer; except question 2 and 5 where you should fill out the answer in the space provided.

1. *What is your gender?
   a. Female
   b. Male
2. *How old are you in years?
   …………………………………
3. *What is your highest level of education?
   a. Never gone to school
   b. Primary school
   c. Secondary school
   d. University or tertiary institution
4. *What is your marital status?
   a. Single
   b. Married
   c. Separated or Divorced or Widowed

5. *What is your average monthly household income in Ugandan Shillings (UGX)?

   …………………………………………………………………………………………….

6. *Do you have any first-degree relatives (parents, brothers, sisters) diagnosed with oesophageal/stomach/intestinal cancer?
   a. Yes
   b. No
   c. I don't know
7. *Do you know of any friends, neighbours or colleagues diagnosed with oesophageal/stomach/intestinal cancer?
   a. Yes
   b. No
   c. I don't know
8. *Do you smoke tobacco or cigarettes?
   a. Yes
   b. No
   c. Ex-smoker but quit at least 1 month ago
9. *Do you take alcohol?
   a. Yes; I drink daily
   b. Yes; I take 4-5 drinks or more but on occasions
   c. I used to drink but I quit more than 12 months ago
   d. No, I have never
10. *Do you have medical insurance (employer, commercial or other medical insurance)?
    a. Yes
    b. No
    c. I don't know

Part 2: Participant's treatment seeking history.

For question 11 – 14; please read the questions and tick to indicate your answer in the check boxes provided against each response option. Furthermore, please write your response in the space provided for questions 11 and 13 where your specific response is required.

11. *Have you done endoscopy within the last 1 month?
    a. Yes (please state the endoscopic finding as communicated by your doctor)
    ……………………………………………………………………………………………
    b. No

12. *If no to question 11, why didn't you do endoscopy?
    a. I don't know what benefits the endoscopy has
        - ☐ Yes
        - ☐ No
    b. I don't have time to do endoscopy
        - ☐ Yes
        - ☐ No
    c. The price of endoscopy is too high
        - ☐ Yes
        - ☐ No
    d. The procedure of endoscopy is frightening to me
        - ☐ Yes
        - ☐ No
    e. I am afraid doing endoscopy will find out the disease
        - ☐ Yes
        - ☐ No
    f. Other reason (please explain): ………………………………………………………….
13. *If Yes to question 11, could you please let us know where you had your Endoscopy?
    …………………………………………………………………………………………….
14. *If you had endoscopy done at Mulago or Kiruddu Hospitals, would you allow us to follow up your endoscopy report directly with the endoscopy center?
    - ☐ Yes
    - ☐ No

APPENDIX IV: TELEPHONE SCRIPT TO GUIDE FOLLOW-UP WITH RESEARCH PARTICIPANTS (IN ENGLISH)

This script is structured to make participants feel comfortable sharing their responses, especially for sensitive reasons regarding endoscopy avoidance. It is a tool to guide interviewers (investigators) to moderate the interview with research participants via telephone call.

Introduction and Purpose

"Hello, [Participant's Name]. My name is [Your Name], and I'm calling from [Makerere University Department of Surgery]. Is this a convenient time for a brief follow-up conversation?"

Explanation of Purpose

"We appreciate your participation in our study on [Incidence of and Barriers to Endoscopy among Patients with Dyspepsia at Mulago and Kiruddu Hospitals]. We're conducting a follow-up to gather some additional information that will help us understand your experience better. This follow-up should take at most 5 to 10 minutes, and of course, your responses are confidential. Is that okay with you?"

Follow-up Questions

Question 11:

"To start, have you had an endoscopy within the last month?"

If **Yes**: "Could you please share the findings as communicated to you by your doctor?"

[Pause and allow the participant to respond.]

[Write the participant's response in the space provided]

……………………………………………………………………………………………………

If **No**: "Thank you. I have a few more questions to understand your reasons for not having an endoscopy."

Question 12: “If you haven’t had an endoscopy: could you let us know which of the following reasons apply to you?"

"You can say ‘Yes’ or ‘No’ to each reason."

a. "I don’t know what benefits the endoscopy has."

[Wait for response: Yes/No]

b. "I don’t have time to do an endoscopy."

[Wait for response: Yes/No]

c. "The price of endoscopy is too high."

[Wait for response: Yes/No]

d. "The procedure of endoscopy is frightening to me."

[Wait for response: Yes/No]

e. "I’m afraid that doing an endoscopy will reveal a disease."

[Wait for response: Yes/No]

f. "Is there any other reason you haven’t had an endoscopy?"

[If Yes, allow participant to explain: "Please feel free to share what you feel comfortable with."]

[Write the participant’s response in the space provided]

……………………………………………………………………………………

Question 13 (for participants who answered "Yes" to Question 11):

"Thank you for sharing your experience. Could you let us know where you had the endoscopy done?"

[Wait for the participant’s response; if needed, clarify options like hospital name or clinic location.]

[Write participant’s response in the space provided] …………………………………………..

Question 14 (for participants who answered "Yes" to Question 11 and had the procedure at Mulago or Kiruddu Hospitals):

"To ensure we have the most accurate information, would you allow us to follow up on your endoscopy report directly with the endoscopy unit? This would be only if you had your procedure done at Mulago or Kiruddu Hospitals."

- ☐ Yes
- ☐ No

[If Yes, note the participant’s consent; if No, thank them for their response.]

Conclusion and Next Steps

"Thank you very much for your time and openness in answering these questions. If you have any additional questions or need further information, please feel free to reach out to us at [+256-787-542877]."

Final Thank You

"We truly appreciate your contributions to this research, [Participant’s Name]. Have a great day!"

APPENDIX V: QUESTIONNAIRE FOR SURVEY OF EGD TRANSLATED TO LUGANDA

EKIWANDIIKO EKYONGEREZEDDWAKO EKY'OKUSAATU

EBIBUUZO BY'OKUNOONYEREZA KU NKOZESA YA KAMERA ELINGIRIRIZA MU MIMIRO OMUYITA EMMERE.

Omutwe gw'okunoonyereza: Okubaawo kw'obulwadde n'emiziyizo eri kamera elingiririza mu mimiro omuyita emmere, mu balwadde abalina okulumwa n'okwokya mu lubuto olwa waggulu, okukkuta amangu, n'olubuto olwa waggulu okujjula mu ddwaaliro e Mulago ne Kiruddu mu Uganda: Okunoonyereza okw'okwetegereza.

Nnamba y'omusomo**: ………………** Ennaku z'omweezi: **………………….**

EBIBUUZO EBIKWATA KU KUNNONYEREZA KU NKOZESA YA KAMERA MU DDWALIRO E MULAGO NE KIRUDDU

Tusaba olukusa lwo okwetaba mu kunoonyereza kwenkozesa ya kamera elingiliza mu mimiro omuyita emmere. Ddamu ebibuuzo bino wamanga. Ebibuuzo ebiliko akamunyenye **(*)** bya buwaze/olina okubiddamu.

EKITUNDU EKISOOKA; Ebikukwatako

Ebiragiro: Soma mu bibuuzo bino okuva ku kisooka okutuuka ku kye kkumi osaze ku ky'okuddamu ekisinga obutuufu; okuggyako ekibuuzo eky'okubbiri ne'kyokutaano byolina okujjuza mu kifo ekikuweereddwa.

1. *Oli wa Kikula ki?
   a. Mukazi
   b. Musajja
2. *Olina emyaka emeka?
   …………………………………
3. *Oli muyigirize kyenkana ki?
   a. Si soma ngako
   b. Pulayimale
   c. Sekendule
   d. Yunivaste oba ettendekero ly'ebyemikono

4. *Oyimiridde otya mu by'obufumbo?
   a. Ndi Muwuulu
   b. Ndi mufumbo
   c. Twayawukana, nanoba, oba ndi ssemwandu/namwandu

5. *Enyingiza yo ey'omumaka buli mwezi eri etya mu nsimbi za Uganda?

   …………………………………………………………………………………………….

6. *Olina ow'oluganda yenna eyali azuuliddwamu kookolo w'emimiro, olubuto oba ekyenda? (omuzadde, mugandawo omulenzi oba omuwala)
   a. Ye
   b. Nedda
   c. Simanyi
7. *Omanyi mukwano gwo yenna oba muliraanwa oba omuntu yenna nga bamuzuulamu kookolo w'emimiro, olubuto oba ekyenda?
   a. Ye
   b. Nedda
   c. Simanyi
8. *Onywa taaba oba sigala?
   a. Ye
   b. Nedda
   c. Nali munywa naye namuvaako omwezi gumu emabega
9. *Onywa omwenge?
   a. Ye; buli lunnaku
   b. Ye; nnywa eccupa nnya ku taano oba okusingawo oluusi
   c. Nnali nnywa naye nalekera awo emyezi egisoba mu kummina ebbiri egiyise
   d. Nedda, sigunywangako
10. *Olina yinsuwa y'obujjanjabi? (ey'okumulimu, ey'obusuubuzi oba endala yonna)?
   a. Ye
   b. Nedda
   c. Simanyi

EKITUNDU EKY’OKUBBIRI: Ebikwata ku kunoonya obujjanjabi bw’omuntu eyeetabye mu kunoonyereza

Ku kibuuzo eky’ekkumi n’ekkimu okutuuka ku ky’ekkumi nennya, nasaba osome ebibuuzo era osaze ku ky’okuddamu kyo mu kabokisi akakuweereddwa ku buli kibuuzo. Ekirala nsaba owandiike eky’okuddamu kyo mu kifo ekikuweereddwa ku kibuuzo eky’ekkumi n’ekkimu n’ekyekkumi nassatu awetaagisa eky’okuddamu kyo okuwandiikibwa.

11. *Wali okebeddwako mu lubuto ne kamera omwezi gummu oguyise?
    a. Ye (tubuulire omusawo yakugamba ki ku byaava mu kukebera kuno)

       ……………………………………………………………………………………

    b. Nedda
12. *Bwoba osaziza nedda ku kibuuzo “11” waggulu, Lwaki tewakeberebwa mu ngeri eyo?
    a. Simanyi mugaso gwa kukebeeza kamera mu lubuto
       - ☐ Ye
       - ☐ Nedda
    b. Silina budde bwa kunkebeza kamera
       - ☐ Ye
       - ☐ Nedda
    c. Beeyi y’okukebera nga bakozesa kamera eri waggulu
       - ☐ Ye
       - ☐ Nedda
    d. Okunkebeza kamera kuntiisa
       - ☐ Ye
       - ☐ Nedda
    e. Ntya nti okunkebera ne kamera kuyinza okuzuula obulwadde
       - ☐ Ye
       - ☐ Nedda
    f. Ensonga endala (nyonyola): ……………………………………………………….
13. *Bwoba osaziza ‘Ye’ ku kibuuzo kumi nakimu, osobola okututegeeza wa gye wakeberebbwa ne kamera mu lubuto?

    …………………………………………………………………………………….

14. *Bwoba wakeberebwa ne kamera mu lubuto mu ddwaliro e Mulago oba e Kiruddu, osobola okutukkiriza okugoberera alipoota yo mu lyekenenyerezo ly'olubuto elikozesa kamera?

    - ☐ Ye
    - ☐ Nedda

APPENDIX VI: TELEPHONE SCRIPT TRANSLATED TO LUGANDA FOR FOLLOW UP OF RESEARCH PARTICIPANTS

EKIWANDIIKO EKYONGEREZEDDWAKO EKY'OKUNA:

Ekiwandiiko ekinalungamya okugoberera abetabye mu musomo nga bayita ku ssimu.

Ekiwandiiko kino kitegekeddwa mu ngeri eyagazisa abetabye mu kunoonyereza okuwa eby'okuddamu byabwe naddala kunsonga enzibu ezikwata ku kukeberebwa ne kamera elingiriza mu mimiro ezitewalika. Ekiwandiiko kijja kukozesebwa okulungamya abanoonyereza mu yintaviyu n'abetabye mu kunoonyereza ku ssimu.

Enyanjula n'ekigendererwa

"Nkulamusizza, [erinnya ly'eyetabye mu kunoonyereza]. Amannya gange nze [erinnya lyo], era nkukubidde okuva ku [Makerere Yuniversite, dipatimenti y'ebyokulongoosa]. Ekiseera kino kirungi okukubaganya ebirowoozo nawe mu bufunze nga enkola yaffe ey'okukugoberera?"

Ennyinyonnyola y'ekigendererwa

"Tusiima okwetaba kwo mu kunoonyereza kuno okukwata ku [Okubaawo kw'obulwadde n'emiziyizo eri kamera elingiririza mu mimiro omuyita emmere, mu balwadde abalina okulumwa n'okwokya mu lubuto olwa waggulu, okukkuta amangu, n'olubuto olwa waggulu okujjula mu ddwaaliro e Mulago ne Kiruddu]. Tukola okugoberera kuno tusobole okukung'aanya ebikukwatako ebirala kitusobozese okutegeera obulungi by'oyitamu. Kino kiyinza okutwala eddakiika ezitassukka taano ku kkumi era eby'okuddamu byo bijja kukuumibwa nga bya kyama. Ekyo kirungi gy'oli?

Ebibuuzo ebikwata ku kukugobererwa

Ekibuuzo 11:

"Nga ntandika, wali okebereddwako ne kamera mu mimiro mu mwezi oguwedde?"

Oba Ye: "osobola okutubuulira ebyaavamu nga omusawo weyakunyonyola?"

[Siliikiliramu kisobozese eyetabye mu kunoonyereza okuddamu]

[Wandiika eky’okuddamu ky’eyetaabye mu kunoonyereza mu kifo ekikuweereddwa]

…………………………………………………………………………………………………….

Oba Nedda: "Webale nnyo. Ninna ebibuuzo ebirala bitonotono binyambe okutegeera ensonga ekuleetedde obutakeberebwa na kamera elingiriza mu mimiro."

Ekibuuzo 12: “Bwoba tonakeberebwa na kamera elingiriza mu mimiro, osobola okumbuulira ensonga nga olonda ku zino wamanga?"

"Osobola okuddamu‘Ye’ oba ‘Nedda’ ku nsonga zino."

a. "Simanyi migaso gya kukeberebwa na kamera elingiriza mu mimiro."

[Linda okuddibwamu: Ye/Nedda]

b. "Silina budde bwakukeberebwa na kamera elingiriza mu mimiro."

[Linda okuddibwamu: Ye/Nedda]

c. "Ebisale by’okukeberebwa ne kamera elingiriza mu mimiro bili waggulu."

[Linda okuddibwamu: Ye/Nedda]

d. "Emitendera gy’okukeberebwa ne kamera elingiriza mu mimiro gintiisa."

[Linda okuddibwamu: Ye/Nedda]

e. "Ntya nti bwenakeberebwa ne kamera elingiriza mu mimiro bayinza okuzuula obulwadde."

[Linda okuddibwamu: Ye/Nedda]

f. "Wali wo ensonga endala yona lwaki tona keberebwa na kamera elingiriza mu mimiro?"

[Bwekiba nti Ye, kiriza eyetabye mu kunoonyereza okunnyonnyola: "oli wa ddembe okugabanana nange bw’owulira mu ngeri ekweeyagaza."]

[Wandiika eky’okuddamu ky’eyetaabye mu kunoonyereza mu kifo ekikuweereddwa]

………………………………………………………………………………………

Ekibuuzo 13 (Eri abetabye mu kunoonyereza abazeemu "Ye" ku kibuuzo 11):

"Webale kutubuulira by’oyitamu. Osobola okututegeeza ekifo gye wakeberebwa?"

[Linda eky’okuddamu ky’eyetaabye mu kunoonyereza; bwekiba kyeetagisa, nyonyola ku by’okulondako nga erinnya ly’eddwaliro oba ekifo eddwaliro mwelisangibwa]

[Wandiika eky’okuddamu ky’eyetaabye mu kunoonyereza mu kifo ekikuweereddwa]

……………………………………………….…………………………………………..

Ekibuuzo 14 (Eri abetabye mu kunoonyereza abazeemu "Ye" ku kibuuzo 11 era nga bakolebwako mu ddwaliro e Mulago oba Kiruddu):

"Okukakasa nti by’otugambye bituufu, osobola okutukiriza okugoberera alizaati zo ezaava mu kukeberebwa ku lyekenenyerezo. Kino kyandibadde singa wakeberebwa mu malwaliro g’e Mulago oba Kiruddu."

- ☐ Ye
- ☐ Nedda

[Bwekiba nti Ye, wandiika okukiriza kw’eyetabye mu kunoonyereza, Bwekiba nti nedda; webazze okuddamu kwabwe.]

Okumaliriza n’emitendera egiddako

"Webale nnyo olwokutuwa obudde n’okuddamu ebibuuzo byaffe. Bwekiba nti olina ekibuuzo oba nga wetaaze okumanya ebisingawo, tutuukirire ku nnamba y’essimu [+256-787-542877]."

Okwebaza okusembayo

"Tusiima nnyo okwetaba kwo mu kunoonyereza kuno, [Erinnya ly’eyetabye mu kunoonyereza]. Nkwagaliza olunnaku olulungi!"

APPENDIX VII: EXPENDITURE FOR PROSPECTIVE COHORT STUDY OF FREQUENCY AND BARRIERS TO UPPER GASTROINTESTINAL ENDOSCOPY AMONG PATIENTS WITH DYSPEPSIA AT MULAGO AND KIRUDDU HOSPITALS.

ITEM	QUANTITY	UNIT PRICE (UGX)	COST (UGX)
Participant’s time compensation	423	10,000	4,230,000
Subsistence			1,166,950
Stationery			271,000
Research Assistant	5	270,000	1,342,000
Communication			192,500
Transport			653,200
Dissemination Costs			200,000
Miscellaneous			400,000
Sub-Total			**8,455,650**
MAK-SOMREC Approval			100,000
Mulago NRH Approval			50,000
Kiruddu NRH Approval			100,000
Total			**8,705,650**

APPENDIX VIII: COVID-19/ EBOLA RISK MITIGATION PLAN

The COVID-19/ Ebola risk mitigation plan is intended to protect the research staff members from contracting COVID-19 and Ebola while on duty and protect the participants from contracting these infections during the research study.

The researchers and the participants will adhere to the following current standard operation procedures for infection control:

1. Training research staff team members on procedures and instructions for implementing risk mitigation practices.
2. Encourage as many research staff members to get vaccinated.
3. Covid-19 and Ebola screening of the research staff and the research participants which will include;

- Assessing if there are current symptoms of COVID-19 / Ebola.
- Inquiry about the COVID-19 test results if any have been done recently.
- Inquiry about recent exposure to someone with COVID-19 / Ebola in the past 14 days.
- Temperature check.

4. Maintain physical distancing of at least 2 feet from each participant.
5. Ensure face masks / face shields are always correctly worn during the research activities. Masks will be provided to individuals who will not be having one.
6. Ensure frequent hand washing and sanitizing; research staff must wash their hands before interacting with research participants. If hand washing is not possible, hand sanitizer will be used.
7. Clean and disinfect surfaces, touchpoints, equipment, supplies, and materials prior to and between each participant.
8. Plan and prepare for expected and unexpected situations for example a participant or research staff who is found be symptomatic will be referred for proper assessment and testing.
9. Monitor and strictly adhere to all the Ministry of Health COVID-19 / Ebola guidelines.

APPENDIX IX: WORK PLAN FOR PROSPECTIVE COHORT STUDY OF FREQUENCY AND BARRIERS TO UPPER GASTROINTESTINAL ENDOSCOPY AMONG PATIENTS WITH DYSPEPSIA AT MULAGO AND KIRUDDU HOSPITALS.

TIME / ACTIVITY	Feb – Mar 2023	Mar – Apr 2023	Apr – Jun 2023	Jun 2023 – Mar 2024	Mar – Aug 2024	Aug – Nov 2024	Nov – Dec 2024	Dec 2024 – Feb 2025	Feb – Apr 2025	Apr – May 2025	Aug – Sept 2025	Sept 2025, on-wards
Developing the Research Concept												
Writing the 1st draft of Research Proposal												
Developing the research instrument												
Revising proposal based on recommendations and suggestions by supervisor												
Validation & Revision of research instrument												
Research proposal presentation												
Submission to MAK-SOMREC and Response to Comments from IRB												
Approval by MAK-SOMREC, MNRH, KNRH												
Data collection, Analysis & Results Discussion												
Defense of Dissertation												
Publishing Manuscript, and dissemination of results												

APPENDIX X: APPROVAL FROM MAK-SOMREC

20/11/2024

To: RAYMOND AGABA

0787542877

Type: Initial Review

Re: Mak-SOMREC-2024-1035: Incidence of and Barriers to Upper Gastrointestinal Endoscopy among patients with dyspepsia at Mulago and Kiruddu hospitals: a prospective observational study.

I am pleased to inform you that at the **197** convened meeting on **29/10/2024**, the MAK School of Medicine REC (Mak-SOMREC) meeting voted to approve the above referenced application.
Approval of the research is for the period of **20/11/2024** to **20/11/2025.**

As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the REC for re-review and approval **prior** to the activation of the changes.
3. Reports of unanticipated problems involving risks to participants or any new information which could change the risk benefit: ratio must be submitted to the REC.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by participants and/or witnesses should be retained on file. The REC may conduct audits of all study records, and consent documentation may be part of such audits.
5. Continuing review application must be submitted to the REC **eight weeks** prior to the expiration date of **20/11/2025** in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

The following is the list of all documents approved in this application by MAK School of Medicine REC (Mak-SOMREC):

No.	Document Title	Language	Version Number	Version Date
1	translated telephone script	Luganda	pdf	2024-11-14
2	Telephone Script for follow up	English	pdf	2024-11-14
3	translated questionnaire 2	Luganda	pdf	2024-11-14
4	revised questionnaire 2	English	pdf	2024-11-14
5	translated consent form 2	Luganda	pdf	2024-11-14
6	revised consent form 2	English	pdf	2024-11-14
7	Revised Protocol clean copy 2	English	pdf	2024-11-14
8	COVID-19 & EBOLA risk management plan	English	pdf	2024-08-01
9	Work Plan	English	pdf	2024-08-01

Yours Sincerely

Prof. Ponsiano Ocama
For: MAK School of Medicine REC (Mak-SOMREC)

APPENDIX XI: APPROVAL FROM MULAGO NATIONAL REFERRAL HOSPITAL

TELEPHONE: +256-41554008/1
FAX: +256-414-5325591
E-mail: admin@mulago.or.ug
Website: www.mulago.or.ug

IN ANY CORRESPONDENCE ON THIS SUBJECT PLEASE QUOTES NO.................

MULAGO NATIONAL REFERRAL HOSPITAL
P. O. Box 7051
KAMPALA, UGANDA

11 December 2024.

Dr. Agaba Raymond
Principal Investigator
Department of Surgery
Makerere University

Dear Dr. Agaba,

RE: ADMINISTRATIVE CLEARANCE TO CONDUCT A STUDY AT MULAGO NATIONAL REFERRAL HOSPITAL.

The Management of Mulago National Referral Hospital is pleased to inform you that you have been offered clearance to conduct the study titled **MHREC 2847: "Incidence of and Barriers to Upper Gastrointestinal Endoscopy among patients with Dyspepsia at Mulago and Kiruddu Hospitals: A prospective observational study"**

The above clearance is granted to you on the following conditions;

- That you will follow the research ethical processes
- Agreed to comply with all institutional policies and regulations of Mulago National Referral Hospital
- Agreed to provide end of study report and acknowledge Mulago hospital in all publications

Administrative clearance is valid for one (1) year effective from 10 December 2024 to 9 December 2025

By copy of this letter, we reiterate our commitment to support this study.

DR. BYANYIMA ROSEMARY
EXECUTIVE DIRECTOR
MULAGO NATIONAL REFERRAL HOSPITAL.

Copied to;

1. **Incharge – Gastroenterology unit**

Vision: "To be the leading centre of Health Care Services"

APPENDIX XII: APPROVAL FROM KIRUDDU NATIONAL REFERRAL HOSPITAL

TELEPHONE: 0414-672315
: 0414-672308
: 0414-672309
Email : kiruddurh@gmail.com
Website : www.kiruddu.hosp.go.ug

Ref: KRD/ADM/3/101/1

Kiruddu National Referral Hospital
Salaama Road Munyonyo.
P.O BOX 6588, Kampala, Uganda

12th December,2024

Dr. Agaba Raymond
Principal Investigator

Re: Permission to conduct Research at Kiruddu National Referral Hospital.

Reference is made to your letter dated 2nd December, 2024 in which you requested for permission to conduct your study at Kiruddu National Referral Hospital. This study got approval from the Makerere University Research and Ethics Committee with effect from November 20th, 2024 through November 20th, 2025.

Please be informed that your proposal titled ***"Incidence of and barriers to upper gastrointestinal endoscopy among patients with dyspepsia at Mulago and Kiruddu Hospitals: a prospective observational study"*** was reviewed and you were granted permission to conduct your research at this facility. Please take note of the following:

i. Your research team will be governed by the rules that govern the facility.
ii. You are expected to obtain final approval of your study from the National Council for Science and Technology (UNCST).
iii. You are expected to abide by the UNCST regulations for conducting research involving human participants.
iv. You should alert the hospital administration when you start your study.
v. Upon completion of your study, you are expected to provide the hospital with a summary report your findings and to acknowledge the hospital on your publication(s).
vi. Kiruddu National Referral Hospital will be acknowledged in all publications.

By copy of this letter, the Head, Gastroenterology and Head, OPD are informed about your study and are encouraged to co-operate with your team.

Sincerely,

Dr. Akabwai Patrick
Head, Research

Dr. Kabugo Charles
Hospital Director

C.c: Head, Gastroenterology
Head, OPD

"Leading with innovation and serving with compassion in health care delivery"