ASSESSMENT OF NUTRITION AND DIETARY PRACTICES AMONG PATIENTS WITH GASTROINTESTINAL SYMPTOMATOLOGY AT KENYATTA NATIONAL HOSPITAL, KENYA

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DECLARATION

This thesis is my authentic work and has not been presented for a degree or any other award in any other University."

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This work is devoted to my Darling husband, Mr. Alex Maina, as gratitude for fully sponsoring my graduate studies, our dear son Fernandez, parents, Daniel Wahome, Catherine Ndirangu and siblings Judith, Parmenas and Happiness for stepping in when I needed them.

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ABSTRACT

Gastrointestinal Symptoms (GIS) represents a range of disorders with unclear pathophysiology, presenting symptoms such as abdominal pain, ulcers, cramps, constipation, nausea, and vomiting. The disease is linked to multiple factors, including genetics, environment, infections, immune dysfunction, and altered gut microbiota. The rising incidence of GIS globally—affecting over 6.8 million individuals—is attributed to increased urbanization, industrialization, and consumption of processed foods. Sub-Saharan Africa, despite reporting an increase in GIS cases, has limited published studies on the condition, highlighting the need for localized research. The study investigated the dietary habits, nutritional status, and food choices of patients with GIS attending Kenyatta National Hospital (KNH).

This study assessed 200 randomly selected GIS patients diagnosed by 2023. It aimed to determine their socio-demographic characteristics, dietary patterns, the influence of food choices on disease progression, and their nutritional status. Findings indicated that females (57%) were more affected than males, though gender did not show a statistically significant association with GIS ($p=0.76$). The majority (40%) were aged above 34 years, and most patients (72.5%) lived in urban areas. Socio-economic factors such as marital status, education, and income had significant associations with GIS ($p<0.05$). Over 45% of respondents were well-educated and self-employed, and 22.4% reported a history of cigarette smoking.

Dietary analysis revealed that 87% of respondents used sugar in beverages, and 87.9% preferred home-cooked meals, with only 8.1% eating in hotels. The most common foods reported to trigger GIS included beans (76.6%), spicy foods (14.1%), chapatti (13.8%), soft drinks (5.8%), and oranges (4.1%). Similarly, intolerable foods identified were legumes (28.9%), chapatti (10.4%), milk (5.8%), and oranges (5.2%). Foods that brought relief included cabbage (23.3%), potatoes

(10.75%), milk (8.3%), and carrots (6.2%).

Nutrient intake assessment showed excessive consumption of macronutrients compared to recommended daily allowances (RDAs): carbohydrates (154%), protein (193%), energy (127%), and fiber (211%). Consequently, 69% of participants were overweight or obese (BMI ≥26.38 kg/m²), though none were morbidly obese or underweight. Regression analysis showed a significant relationship between BMI and calorie intake (p=0.003), while the relationship between BMI and food frequency was not significant (p=0.680), contrary to most prior research.

The study recommends that GIS patients regularly consult nutritionists to receive updated dietary guidance, control portion sizes to reduce excess macronutrient intake, and engage in at least 30 minutes of exercise daily. Weight reduction and careful food selection, avoiding foods that aggravate symptoms, are essential. Additionally, the Ministry of Health (MOH) should develop dietary prescriptions for GIS patients and integrate GIS management strategies into national health policy guidelines.

Keywords:

Gastrointestinal Disease: GIS refers to a broad range of conditions that cause symptoms related to the digestive system. These symptoms include abdominal pain, cramping, bloating, altered bowel habits (such as diarrhea or constipation), nausea, and vomiting. These diseases can be both acute and chronic and encompass conditions like Irritable Bowel Syndrome (IBS), Crohn's Disease, and Ulcerative Colitis, among others .

Food Pattern: This term refers to the regularities in food consumption, including the types of foods and beverages consumed, meal frequency, and the overall structure of the diet. Food patterns can influence health outcomes, and in this study, it specifically refers to how the dietary patterns

of GIS patients may relate to the severity and management of their symptoms

Dietary Habits: Dietary habits encompass the regular behaviors and practices related to food intake. This includes not only what foods individuals eat but also when, how, and where they consume food. In the context of your study, it involves the eating behaviors observed in GIS patients, such as their food preferences, meal timings, and frequency of consumption **.**

Food Intakes: Food intakes refer to the actual quantity and variety of foods consumed by an individual over a given period. This can include both the nutritional composition (calories, macronutrients, micronutrients) and the specific food items consumed. For your research, it assesses how the intake of specific foods and nutrients correlates with the severity of GIS symptoms.

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ABBREVIATIONS AND ACRONYMS

CD	:	Crohn's Disease
CMPA	:	Cow's milk protein allergy
FODMAPs	:	Fermentable Oligosaccharides, Disaccharides, Monosaccharides, And Polyols
FGID	:	Functional gastrointestinal disorders
GIT	:	Gastrointestinal Tract
GIS	:	Gastrointestinal Symptomatology
IBD	:	Inflammatory Bowel Disease
IBS	:	Irritable Bowel Disease
KNH	:	Kenyatta National Hospital
LgE	:	Immunoglobulin E
OR	:	Odd Ratio
SIBO	:	Small Intestinal bacterial growth
ScRNA-seq	:	Single Cell Ribonucleic Acid Sequencing
TNF	:	Tumor necrosis factor
UC	:	Ulcerative Colitis
WFDC2	:	Whey acidic protein four disulfide core domain 2
WHO	:	World Health Organization

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Gastrointestinal symptomatology (GIS) encompasses the broad spectrum of subjective complaints and abnormal sensations originating from the digestive tract. This includes, but is not limited to, discomfort such as abdominal pain or cramping and altered bowel habits manifesting as diarrhea, constipation, or bloating. Other common symptoms are heartburn, nausea, vomiting, and excessive flatulence. GIS represents the patient-reported experience of digestive dysfunction, serving as the primary clinical clue for underlying disorders ranging from transient indigestion to chronic conditions like Irritable Bowel Syndrome (IBS), Inflammatory Bowel Disease (IBD), or food intolerances. It is the direct manifestation of compromised digestive health and function.

The gastrointestinal (GI) tract is affected by the chronic relapsing ailment known as "inflammatory bowel disease" (IBD). It covers both Crohn's disease (CD) and ulcerative colitis (UC), and the pathogenesis of the disease remains unknown. However, researchers have associated several factors, such as genetic predisposition and environmental factors, pathogen infections, abnormal immune responses, and altered gut microbiota (Bernstein et al., 2016; Fichna, 2016). According to Axelrod and Saps (2020), Bernstein et al. (2016), and Neurath (2017), the increased consumption of processed foods, urbanization, and industrialization, which have led to a shift in dietary choices, have significantly contributed to the high incidence rates of gastrointestinal symptomatology in the western countries. Additionally, other environmental factors such as oral contraceptives, access to over-the-counter medication such as antibiotics, and excessive hygiene may also increase the occurrence of GIS.

Global statistics indicate that GIS affects over 6.8 million people, with more than 0.3% of the total estimated population in North America and Europe. Although this condition has been previously associated with industrialized countries, recent studies show that even the industrializing countries, such as sub-Saharan Africa, are now recording more cases than in the last decade (Gillian Watermeyer et al., 2022). According to Watermeyer et al. (2022), South Africa, one of the most industrialized countries in the sub-Saharan African region, is leading with diagnosed GIS cases. In their study, Khoshdel and Vakhshuury (2019) and Kaplan and Windsor (2021) also record significantly increased GIS cases in developing countries.

Nevertheless, the 2017 Global Burden of Disease survey discovered that the age-standardized prevalence in central and eastern sub-Saharan Africa was 10.2, 9.9, and 11.2, respectively, per 100,000 people. These low prevalence rates contrast with the high prevalence rate of 442 per 100 000 individuals in industrialized North America that was reported for 2017. Sub-Saharan Africa may be less exposed to environmental risk factors or other genetic risk factors for GIS than high-income groups. Although sub-Saharan Africa has fewer published cohort studies on GIS, there is evidence of sizable datasets of individuals who have received a GIS diagnosis in recent years in a number of nations. For instance, one of the largest datasets was confirmed from Nairobi, which reports that among the 92 patients diagnosed with GIS, 87% have ulcerative colitis (Watermeyer et al., 2022).

Additionally, the predominance of UC is recorded in data from Uganda and Zimbabwe. Some people with GIS tend to usually avoid certain foods or food groups due to the fear of aggravating their symptoms. In contrast, others generally do not consume some foods due to preferences. The British Society of Gastroenterology recently included general practical dietary recommendations in the previously agreed guidelines for managing GIS (Lamb et al., 2019). The guidelines include advising patients to consume various foods to meet their caloric and nutrition needs and to limit foods rich in dietary fiber. Also, the guidelines state that GIS patients should be discouraged from self-directed non-evidence-based dietary exclusions, which may affect their overall health and nutrition status.

However, because there aren't any evidence-based dietary recommendations, these patients are more likely to rely on unreliable sources like the internet, which provides guidance, than licensed dietitian-based or medical counseling (Nazarenkov et al., 2019; Lichtenstein et al., 2018). According to Yoon et al. (2018), Nazarenkov et al. (2019), and Schreiner et al. (2020), patients with gastrointestinal symptomatology may follow and are likely to try different unsupported dietary supplements and recommendations, hoping to relieve their symptoms and reduce inflammation. Unfortunately, the majority of these interventions involve avoiding major food groups, which could exacerbate the condition and ineffectively treat the deficiencies of micronutrients that are typical in individuals with GIS who are receiving their first diagnosis (Nazarenkov et al., 2019).

Currently, there are a number of evidence-based nutritional guidelines for active GIS management proposed, which mainly focus on modifying the intake of macronutrients and/or restriction of specific foods and ingredients, including dairy and processed foods, sweeteners, grains, emulsifiers, gluten, and food additives (Akobeng et al., 2018; Nazarenkov et al., 2019; Schreiner et al., 2020). According to Limketkai et al. (2019) the consequences of dietary changes on GIS are still unknown, as firm conclusions about their efficacy are yet to be made. This has left UC and CD patients unsure of what to do regarding their dietary intake.

1.2 Problem Statement

By either changing the gut microbiota and immune response, nutrition has a significant effect on the management of gastrointestinal symptomatology, including inflammatory bowel disease (IBD), by correcting common micronutrient deficiencies among patients or managing the symptoms of the disease. Unfortunately, there are fewer published studies and information on the roles of nutrition in the amelioration of GIS. Lichtenstein et al. (2018) and Nazarenkov et al. (2019) claim that people are more likely to adhere to advice from unreliable sources like the internet, which offers poor guidance in comparison to certified dietitian-based or medical counseling, because there aren't any evidence-based dietary recommendations for the

management of GIS.

Additionally, individuals experiencing gastrointestinal symptomatology frequently engage in the dietary avoidance of various foods or entire food groups. This practice is primarily a self-management strategy to preempt the symptom flare-ups they anticipate these items will provoke. (Marsh et al., 2019). Unfortunately, most foods excluded from their daily intake are highly nutritious and would be important in rectifying micronutrient deficiencies present among GIS patients at diagnosis. The most prevalent micronutrient deficiencies among people with Crohn's disease and ulcerative colitis are iron, calcium, zinc, magnesium, vitamin D, vitamin B12, vitamin A, and folic acid deficits (Scaldaferri et al., 2017). Sub-Saharan Africa continues to experience rapid industrialization and urbanization, contributing to a nutritional transition. This transition is characterized by a low consumption of the traditional African diet that predominantly included plenty of vegetables, lean meats, wild fruits, legumes, and staple starches to a high consumption of processed foods that are commonly high in food preservatives, emulsifiers, trans fats, and sugar (Marshall et al., 2024).

Current eating habits include several dietary variables, which may affect the intestinal flora, disturb the mucous membrane, increase intestinal permeability, and contribute to the etiology of GIS in industrialized regions (Limketkai et al., 2019). This study is critically needed at Kenyatta National Hospital (KNH) precisely because the specific dietary habits and their correlation with GIS in this patient population are currently unknown. As a national referral center, KNH manages a significant and diverse caseload of GIS patients. Generating this foundational, context-specific evidence is the essential first step toward developing effective, localized dietary guidelines that can directly improve patient care and nutritional outcomes at this major healthcare institution.

1.3 Purpose of the study

The purpose of this study is to assess the dietary habits, nutritional status, and food choices of patients with gastrointestinal symptomatology (GIS) at Kenyatta National Hospital (KNH). Despite the high prevalence of GIS, there is a significant lack of data on how specific dietary patterns influence the progression and management of these symptoms in the Kenyan context. This study aims to fill this gap by providing comprehensive insights into the dietary practices of GIS patients, including identifying key nutritional deficiencies and trigger foods that exacerbate symptoms.

The findings will not only help to understand the impact of food choices on GIS but will also inform the development of targeted dietary guidelines and nutritional interventions. These recommendations will guide healthcare professionals in offering personalized dietary counseling, aiming to break the cycle of symptom flare-ups, prevent malnutrition, and enhance overall health. By addressing these dietary and nutritional factors, the study will contribute to improving patient care, ensuring better management of GIS, and ultimately supporting the well-being of patients at KNH and similar healthcare settings in Kenya

1.4 Objectives

1.4.1 Main Objective

This study seeks to thoroughly assess the dietary habits and nutritional status of patients experiencing gastrointestinal symptoms at Kenyatta National Hospital (KNH). It will focus on identifying food avoidance behaviors, meal frequency, and dietary diversity, while also evaluating nutritional status using anthropometric, biochemical, and clinical indicators. The goal is to explore potential correlations between dietary patterns and the severity of gastrointestinal symptoms.

1.4.2 Specific Objectives

I. To determine the socio-demographic characteristics of patients with Gastrointestinal symptomatology at Kenyatta National Hospital.

II. To quantify and characterize the dietary intakes of patients with Gastrointestinal Symptomatology at Kenyatta National Hospital

III. To examine the relationship between specific dietary choices and the severity or progression of gastrointestinal symptoms.

IV. To evaluate the nutritional status of Gastrointestinal Symptomatology patients at Kenyatta National Hospital

1.5 Research Questions

I. What socio-demographic traits are present among Kenyatta National Hospital patients with Gastrointestinal Symptomatology?

II. What is the dietary intake of patients with Gastrointestinal Symptomatology at Kenyatta National Hospital?

III. What is the influence of food choices on the progression of Gastrointestinal Symptomatology among patients with Gastrointestinal Symptomatology in Kenyatta National Hospital?

IV. What is the nutritional status of Gastrointestinal Symptomatology in Kenyatta National Hospital patients?

1.6 Justification of the study

There are no specific dietary exclusion recommendations from the American Gastroenterological Association, the European Society for Clinical Nutrition and Metabolism, or the European

Crohn's and Colitis Organization. As a result, patients are forced to depend on unverified information sources and avoid certain foods that could otherwise help their overall health and reduce the severity of their symptoms. Similarly, the rapid rise in IBD cases in industrializing countries such as Kenya (Wisdom Mudombi) is unpublished. Therefore, investigating the dietary habits of GIS patients will give an overview of current practices and information on the appropriate dietary interventions that can rectify potential nutritional deficiencies.

1.7 **Limitations and Delimitations of the study**

According to Polit and Beck (2009), limitations are challenges or constraints that researchers encounter during their study process. One limitation is the age range of participants, which is 13-59 years. This group includes adolescents and adults, key life stages for GIS management. However, it excludes children and older adults, who may have different dietary habits and health needs.

Another limitation is the exclusion of patients with underlying medical conditions like infections or intestinal strictures. These conditions may affect nutritional status. While this ensures the focus is on GIS, it also means the findings may not apply to individuals with other health issues.

The study also relies on self-reported data, such as Food Frequency Questionnaires and 24-hour dietary recalls. These methods may lead to recall bias, as participants may misreport or forget their dietary habits, which can affect the accuracy of the data.

Lastly, the study uses a census sampling approach at Kenyatta National Hospital (KNH),limiting the findings to this specific hospital. This sampling method may not apply to GIS patients in rural areas or other healthcare settings, where patient demographics and practices could differ.

The study has set specific boundaries or delimitations to focus on particular aspects of GIS and its nutritional impact. One such delimitation is the age range of participants, which is intentionally limited to individuals between 13 and 59 years. This age group was chosen because it encompasses key life stages for GIS management, including adolescents and adults, while excluding children and older adults who may have different nutritional needs and health concerns.

Additionally, the study deliberately excludes patients with other health conditions, such as infections or intestinal strictures, to isolate the effects of GIS on nutrition. While this limits the generalizability of the findings to individuals with other medical conditions, it ensures that the study remains focused on understanding the nutritional impact of GIS in a specific cohort of patients.

The study's data collection methods are another delimitation. By using self-reported data from Food Frequency Questionnaires and 24-hour dietary recalls, the study narrows its scope to rely on these practical tools. While self-reported data may introduce recall bias, it was chosen because of its feasibility and the ability to gather dietary information from a large group of patients in an outpatient setting.

Finally, the study is geographically delimited to Kenyatta National Hospital (KNH) in Nairobi, Kenya. This choice of location was made to gather data from a major urban referral hospital, but it means that the findings may not reflect the dietary habits or health status of GIS patients in rural areas or smaller healthcare settings

1.8 **Significance of the Study**

The study contributes to the information on dietary practices of GIS patients in industrializing countries since its findings can be generalized to other regions with similar settings. This reduces the reliability of uncredited sources of information such as the internet and individual beliefs. Also, the study outcome will be employed used by physicians and clinical Nutritionists/Dieticians for patient-centred interventions that will alleviate not only the GIS symptoms but also correct micronutrient deficiencies and improve overall health.

1.9 **Assumptions of the study**

The assumptions of the study ensured that the researcher continued to undertake the study with reasonable confidence that achieved its overall objective, hence success. One of the assumptions of this study was that the respondents provided accurate and true information about their dietary practices. Due to the self-reporting nature of the study, any deviation from this premise could make the data collected inaccurate. The study also assumed that the sample population employed for data collection was representative of all GIS patients. That ensured that there was no sampling biasness, as this was a census study thus ensuring the reliability of the data collected.

1.10 **Operational Definition of Terms**

Amelioration: the act or process of making a situation better; improvement

Crohn's Disease: is an instance of inflammatory bowel disease (IBD) that can impact any part of the digestive system. It results in inflammation of the digestive system tissues, which can produce severe diarrhea and abdominal pain, abdominal distension, weight loss, and malnutrition.

Dietitian: is a qualified and regulated medical specialist who evaluates, recognizes, and addresses food and nutritional issues on both an individual and broader public health level.

Emulsifiers: are food additives that facilitate the blending of foods that are immiscible with one another, such as oil and water.

Food additives: Food additives are compounds that are added to food to maintain or improve its freshness, safety, flavor, texture, or appearance, according to the WHO

Gastroenterology: is the area of medicine that focuses on problems of the digestive system.

Inflammatory bowel disease: A group of intestinal disorders that cause chronic digestive tract inflammation; Crohn's Disease and ulcerative colitis are the principal types. This causes abdominal pain, cramping, and unexplained weight loss.

Infection: is the infiltration and growth of germs by a disease-causing agent in body tissues.

Macronutrients: These are a group of nutrients required in large amounts. They give your body the necessary nutrients and energy to keep its structure and functions intact. They include carbohydrates, Proteins, and Fats

Micronutrients: In extremely small levels, vitamins and minerals are essential for the organism. However, they have a significant impact on a body's health, and a lack of any one of them can result in serious, even life-threatening, illnesses. Minerals are essential for a few processes, including fluid balance, bone health and growth, fluid balance, and several other processes. The creation of energy, immune defense, blood coagulation, and other processes depend on vitamins.

Pathogens: are organisms or biological agents that can cause disease in another organism or its host. Types of pathogens include Bacteria, viruses, and fungi.

Ulcerative colitis: is a form of IBD that irritates the interior linings of the colon and rectum, both of which are prone to inflammation and ulcers. Symptoms develop over time.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter provides a comprehensive review of existing research and literature on gastrointestinal symptomatology (GIS) with a focus on its epidemiology, nutritional implications, and dietary practices. The review highlights the relationship between nutrition and gastrointestinal disorders, emphasizing how specific food choices and patterns of eating influence disease progression and symptom management. It explores key areas such as the role of diet in the onset and exacerbation of conditions like Crohn's disease and ulcerative colitis, as well as the impact of medications, such as antibiotics, on gut health. Additionally, the chapter delves into theoretical frameworks that examine the interplay between diet, gut microbiota, and gastrointestinal health, laying the foundation for the study's objectives and research design. Through a synthesis of previous studies, this review aims to provide a clearer understanding of how dietary factors affect patients with GIS, thereby guiding the development of evidence-based dietary recommendations for better disease management.

2.1 Epidemiology of gastrointestinal symptoms

The gastrointestinal symptoms (GIS) are complicated, and disease's pathophysiology is yet unknown, however it includes array of diseases that may also include abdominal pains, ulcerative colitis, cramps, constipation, crohns diseases, nausea vomiting among others. The disease is associated with factors, such as genetic predisposition and environmental factors, pathogen infections, abnormal immune responses, and altered gut status. The increased consumption of processed foods, urbanization, and industrialization, which have led to a shift in dietary choices, has significantly contributed to the high incidence rates of GIS in western countries. It affects more

than 6.8 million individuals worldwide, with sub-Saharan Africa reporting an increase in incidence over recent years.

Sub-Saharan Africa has fewer published cohort studies on GIS. Researchers are still unsure of the specific causation of this disorder some of the GIS disorders, despite the fact that several factors have been linked to their pathogenesis. For instance, excessive hygiene, medication exposure, and nutrition are some environmental factors associated with the disease's progression. Over 6.8 million people worldwide have GIS, with the affected population in developed countries like those in North America and Europe having the highest frequency, according to Hassaan et al. (2021) and Ng et al. (2017). However, this condition is not only limited to developed countries as there is evidence of increasing prevalence in less developed or industrializing nations such as sub-Saharan Africa (Kaplan & Windsor, 2021).

The age-standardized frequency in central sub-Saharan Africa was 10.2 per 100,000 persons,9.9 per 100,000 in eastern sub-Saharan Africa, and 11.2 per 100,000 in western sub-Saharan Africa, according to the 2017 Global Burden of Disease publication. The high prevalence rate of 442 per 100 000 people in industrialized North America reported for 2017 contrasts with these low prevalence rates (Sienkiewicz et al., 2021). In contrast to high-income people, sub-Saharan Africa may have less exposure to environmental risk factors or other genetic risk factors for GIS. Although sub-Saharan Africa has less published cohort studies on GIS, there is evidence of sizable datasets of individuals who have received a GIS diagnosis in recent years in several nations. For instance, one of the largest datasets was confirmed from Nairobi, which reports that among the 92 patients diagnosed with GIS, 87% have ulcerative colitis (Watermeyer et al., 2022).

Additionally, the predominance of UC is recorded in data from Uganda and Zimbabwe. While the above statics prove that GIS cases are significantly increasing in developing countries, these

figures are possibly not an accurate depiction of the genuine prevalence rates. According to the few published studies from developing nations, the prevalence of GIS is more common than previously believed in sub-Saharan Africa. The biggest obstacle to diagnosing GIS is the persistently high burden of infectious diseases in Sub-Saharan Africa, according to Gillian Watermeyer et al. (2022). In less developed nations, diarrhea cases are often recorded and are contagious.

Additionally, because of their sudden onset, tendency to present with a self-limiting course, and prompt response to antibiotic therapy, acute gastrointestinal infections brought on by common bacteria and viruses are rarely misdiagnosed with either UC or CD. To diagnose GIS, Gillian Watermeyer et al. (2022) contend that several chronic illnesses common in sub-Saharan Africa must first be ruled out since immunosuppression medications can be started during GIS treatment, which can have negative effects. The absence of adequate equipment has made it very difficult to diagnose IBD in sub-Saharan Africa, which has led to more cases going undiagnosed. For instance, due to poor sanitation, ulcerative colitis is sometimes confused for amoebic colitis caused by Entamoeba histolytica during endoscopy. Therefore, differentiated tests and methodologies are needed, which are frequently lacking.

2.2 Nutrition and Gastrointestinal Disorders

Diet is one of the factors associated with the prognosis of ulcerative colitis and Crohn's Disease. For instance, consuming highly refined foods, a common trend in industrialized countries, alters the gut microbiome. The British Society of Gastroenterology has recently included some general dietary recommendations and guidelines for managing GIS (Lamb et al., 2019). These include telling patients to restrict dietary fiber, especially insoluble fiber, and to eat a variety of meals to meet their caloric and specific micronutrient needs. They should also be dissuaded from starting

non-evidence-based self-directed diet exclusion, which results in micronutrient deficiencies and has an adverse impact on general health.

According to research by Svolos et al. (2019), a particular everyday diet known as the CD- TREAT was effective in treating active Crohn's Disease (CD). This research involved a rat model but was further repeated among human subjects to test the clinical outcomes of using this special diet. A comparison between two sample groups of adult volunteers, one on CD-TREAT diet and the other on exclusive enteral nutrition, showed a variation in the gut microbes. Gargano et al. (2021), on the other hand, assert that nutritional therapy intervention in young CD patients is well-established. However, it is quite challenging among older children due to its routine causing unacceptability due to palatability issues. He also contends that dietary therapy interventions for adult patients' CD, where this strategy is currently redundant, may become common if patients were treated with an exclusive diet rather than an elemental or polymeric feed. This would benefit all patients with gastrointestinal disorders as it promises a decreased use of cortico-steroid treatment (Sigall Boneh et al., 2017). As mentioned earlier, cortico-steroids suppress immunity, putting the patients at a higher risk of contracting an infectious disease-causing relapse.

The use of dietary therapy in GIS patients helps alter the gut bacteria, improve gut health, and thus reduce the symptoms associated with UC and CD. However, the impact of a specific diet recommendation and exclusive enteral nutrition on the human microbiota in the gut mucosa is not investigated. It is difficult to draw the conclusion that dietary changes can enhance the mucosal microbiota. Due to varying oxygen concentrations and the influence of human immunity, the fecal microbiome only partially duplicates the population of mucosal bacteria. Although the diet has the ability to alter fecal microorganisms, this usually takes place over a few days, its impact and the extent of the mucosal level are unknown. Therefore, since the dietary effect of the mucosal

microbiome is believed to be much slower, it takes much longer to induce GIS remission compared to patients treated with either oral or intravenous corticosteroids.

According to Zhang et al. (2024), the clinical response of GIS patients treated with diet therapy is encouraging, but its use must be cautiously used, factoring in the individual nutritional requirements. When the dietary approaches are jointly used with medical therapy, the induction of disease remission is achieved faster than when patients strictly use diet alone. Also, the adverse medication is significantly reduced (Kugathasan et al., 2018). Based on their stool metabolite or microbial profiles at diagnosis, certain GIS patients may benefit more from a specific exclusion diet (Katsidzira et al., 2020). Lastly, there is the potential to improve further diet therapy, including moving to an individualized exclusion diet based on the patient's gut microbiome and metabolite response to corticosteroid therapy. This was a window of opportunity for researchers to come up with ways of how this could be achieved.

2.3 Dietary practices of GIS patients

The lack of clarity in the information publicized in the health facilities due to inconclusive dietary recommendations and over dependence of GIS patients on unverified sources of information has greatly contributed to unnecessary dietary exclusions. Many GIS tends to avoid certain foods or food groups due to the fear of aggravating their symptoms, while generally do not consume some foods due to individual preferences (Lichtenstein et al., 2018; Nazarenkov et al., 2019) According to Schreiner et al., 2020 and Yoon et al. 2018, patients with IBD and other gastrointestinal disorders are likely to test different unsupported dietary supplements and recommendations, hoping to relieve their symptoms and reduce inflammation. Unfortunately, the majority of these involve avoiding major food groups which could exacerbate the condition and ineffectively cure the

micronutrient deficiencies that are common in people with GIS who are just getting their first diagnosis (Nazarenkov et al., 2019).

A cross-sectional study involving 73 IBD patients and 103 healthy controls in Poland concluded that most people avoided consuming fruits, vegetables, and fish while actively consuming refined food products, foods heavy in fats and oils, and added sugar (Michał et al., 2021). Some studies also report that most GIS patients avoid consuming fresh milk and other dairy products as they associate them with the onset of symptoms. However, milk and other dairy products did not cause any significant effects on the control population (Yoon et al. 2018). GIS patients commonly avoid cereals, legumes, nuts, carbonated beverages, and spiced foods. According to the study, most patients practiced self-mediated dietary exclusions while others relied on the internet to make dietary adjustments. According to Wojtyniak and Goryński (2020), the dietary exclusions and consumption of specific foods by GIS patients are associated with personal preferences and experiences. Therefore, physicians and nutritionists must consider this when developing dietary intervention plans for GIS patients.

Currently, there are several evidence-based nutritional guidelines for active GIS management proposed, which mainly focus on modifying the intake of macronutrients and/or restriction of specific foods and ingredients, including dairy and processed foods, sweeteners, grains, emulsifiers, gluten, and food additives (Schreiner et al., 2020; Akobeng et al., 2018; Nazarenkov et al., 2019). GIS patients first exhibit micronutrient deficits at the time of diagnosis, including vitamin D, vitamin B12, vitamin A, iron, calcium, zinc, magnesium, and folic acid (Scaldaferri et al., 2017; Spooren et al., 2019). Thus, avoiding certain meals makes these already-present nutritional problems worse and influences the length of healing or remission. The impact of dietary therapies on GIS is still unknown because it has not yet been possible to draw definitive

conclusions about their effectiveness, claim Limketkai et al. (2019). This has left UC and CD patients unsure of what to do regarding their dietary intake. Therefore, interventions must focus on identifying gaps in nutritional status and providing reliable and efficient nutritional support that promotes better nutritional status and overall health.

2.4 Gut Health and Nutrition

UC and CD are characterized by a decline in the number, diversity, and richness of gut microorganisms and microbial signature that varies among healthy individuals. According to research, gut microbiota and aberrant immune responses can both sustain and initiate the inflammatory response, and the microbiome may play a crucial role in the pathophysiology of gastrointestinal symptoms (GIS) (Watermeyer et al., 2022). According to Chang (2020), most of the NOD2 genetic mutations are involved in abnormal immune system microbiome interactions. Additionally, it's possible that factors like nutrition, helminth infection, smoking, and improved cleanliness enhance the risk of environmental exposure because of how they affect the gut microbiome.

There is less microbial variety among urban dwellers, according to a South African study that contrasted the fecal microbiomes of African people living in urban areas with those in rural ones. Geographical and industrial influences were highlighted as the cause of variance in the gut microbiota (Philipp et al., 2019). Children from a rural hamlet in sub-Saharan Africa exhibited a higher level of diversity and richness of the microbiota when their feces were compared to those of European children residing in an Italian city (Philipp et al., 2019).

Dietary limitation, particularly the consumption of meat or gluten, is linked to a change in the microbiota's makeup. The gut microbiota of vegetarians has been demonstrated to have higher bacterial diversity, reduced counts of pathobionts Enterobacteriaceae, and increased Prevotella

populations, according to Philipp et al. (2019). The Western diet, on the other hand, has been connected to higher levels of Bacteroides and lower levels of Firmicutes (David et al., 2014). Additionally, general food distribution in healthy individuals can alter the gut microbiota to have fewer strains of bacteria that are thought to be healthy, such as Lactobacillus and Bifidobacteria, while having fewer strains of bacteria that are thought to be unhealthy, such as Escherichia coli and Enterobacteriaceae. The gut microbiota diversity of IBD patients, however, has been found to be decreased Philipp et al. (2019), with higher levels of invasive E. coli and Enterobacteriaceae and lower proportions of Firmicutes. In addition, Philipp et al. (2019) discovered that individuals with GIS who consumed meat had significantly different gut microbiota compositions from those who had vegetarian or standard diets.

2.5 Food intake recommendations

The Inflammatory Bowel Disease–Anti-Inflammatory Diet (IBD-AID) is a therapeutic nutritional approach aimed at reducing intestinal inflammation and restoring a balanced gut microbiota through the elimination of pro-inflammatory foods (Olendzki et al., 2014). The diet emphasizes the avoidance of specific carbohydrates—particularly lactose, refined sugars such as sucrose, wheat, and corn—which are known to disrupt the gut's microbial composition and exacerbate gastrointestinal symptoms (Navaneethan et al., 2020). Limiting these fermentable carbohydrates deprives pathogenic gut bacteria of growth substrates, thereby fostering mucosal healing and improved intestinal health (Khalili et al., 2021).

A central component of the IBD-AID involves the exclusion of trans fats, which are commonly found in commercially baked products, processed snacks, and fast foods containing "partially hydrogenated oils." High intake of trans fats has been linked to elevated inflammatory markers and impaired intestinal barrier function (Calder, 2017). Accordingly, processed and fast foods are

discouraged due to their role in promoting oxidative stress and inflammation (Bischoff et al., 2020). Instead, the diet promotes consumption of fruits and vegetables that are rich in vitamins, minerals, and phytonutrients, which enhance immune function and provide antioxidant protection (Calder, 2022). These foods may be consumed in blended, pureed, or well-cooked forms to enhance digestibility and tolerance, particularly in patients with sensitive gastrointestinal tracts.

The IBD-AID also advocates for lean protein and healthy fat sources, such as legumes, nuts, olive oil, avocado, ground flaxseed, fish, eggs, probiotic yogurt, and kefir. These foods provide essential fatty acids and amino acids that support tissue repair and modulate inflammatory responses (Loftus & Sandborn, 2021). The intake of saturated fats from red meat and dairy products should be limited to less than 5 grams per serving, while greater emphasis should be placed on unsaturated fats from plant-based sources to promote anti-inflammatory activity (Calder, 2017).

Furthermore, the diet discourages the consumption of emulsifiers and food additives such as carrageenan, maltodextrin, polysorbate 80, and carboxymethylcellulose, which have been shown to disrupt intestinal mucus layers and alter microbial diversity (Chassaing et al., 2015). Similarly, refined sugars, processed grains, and most dairy products—particularly milk and fresh cheeses—are restricted, though aged cheeses may be permitted due to their lower lactose content and probiotic potential (Halmos & Gibson, 2019).

In terms of beverage intake, alcohol consumption should be moderate—limited to one drink daily for women and up to two for men—with wine preferred due to its polyphenol content and lower grain-based irritants (Camarena & Wang, 2020). Beer is discouraged because of its gluten and fermentable carbohydrate content. Coffee and tea are acceptable in moderation, provided that non-dairy milk alternatives and natural sweeteners such as raw honey are used (Sikalidis et al., 2020).

For individuals with gastrointestinal sensitivity, soft-cooked or pureed foods—including smoothies, well-cooked oats, ground flaxseed or chia seeds, pureed soups, vegetables, yogurt, miso, and lean meats—are recommended to ease digestion and improve nutrient uptake (Cömert & Gökmen 2022). Collectively, adherence to the IBD-AID dietary principles has been associated with reduced bowel inflammation, enhanced gut healing, and improved immune homeostasis among individuals with gastrointestinal symptomatology (Khalili et al., 2021; Olendzki et al., 2014).

2.6 Medication and GIS

2.6.1 Antibiotics and development of GIS

The vital relationship between the human gut's bacteria and the research of gastrointestinal symptomatology (GIS) has come to light, particularly with the development of molecular models of the disorder such the IL-10 knockout mice (Mayberry & Rhodes,1981). These simulations categorically show that GIS does not grow in a germ-free environment. The significance of gut bacteria has been further emphasized by recent genetic discoveries that result in anomalies in the recognition and processing of bacteria in CD. Numerous case-control studies in IBD, Afzal, et al., (2000) have examined the impact of antibiotics on and disruption of this association.

Additionally, several experts have noted the correlation between the widespread use of antibiotics during World War II and the dramatic rise in IBD incidence found in the latter half of the 20th century. Afzal, et al. (2000) remark that there is few research that discusses the part played by antibiotics in the pathophysiology of inflammatory bowel disease (IBD). Recalling bias and the possibility for reverse causality were major confounding factors in two early, small investigations. They found a significant link between CD and antibiotic use. Given the potential lead-in period between the onset of symptoms and the actual diagnosis of CD, it is probably not surprising that

there may be a rise in the number of antibiotic prescriptions made for CD patients in the 1-2 years prior to diagnosis. Card et al. pulled prospectively collected data on CD patients and controls from the General Practice Research database (GPRD) in the UK.

In addition to addressing the lead-in time issue mentioned above, this study evaluated antibiotic consumption, other medicine use, smoking, and other factors by assessing data 2–5 years before to diagnosis. In contrast to 58% of the 1460 control subjects, the researchers discovered that 71% of the 587 CD patients had had an antibiotic prescription two to five years before diagnosis (Adjusted OR 1.32 [1.05-1.65], P 0.001). Despite the absence of obvious confounding by gender, age, or smoking status, a lack of precision about the type of antibiotic administered and the detection of connections with other drug categories, such as those for neurological illnesses and oral contraceptives, were apparent. This suggested that the link to antibiotic use might not be causal. Although surprising, the high correlation between instances and tetracycline usage, especially in people without a history of gastrointestinal problems or medication—may offer some direction for further research in this area.

2.6.2 Childhood vaccinations and gastrointestinal symptomatology

Childhood vaccines, according to Thompson et al. (1995), have been linked to GIS because they have the potential to change how the intestine and systemic immune systems develop. Thompson et al. 's study was the first to hypothesize a link between measles vaccination and GIS. Those who had had the measles vaccination in the past had a 3-fold and 2.5 greater risk of getting CD and UC, respectively, in contrast to unvaccinated controls, according to a cohort analysis of 3545 individuals in the UK. The power of their findings, however, was diminished by methodological problems such as selection participants from different populations, comparing loss to follow-up

between the two cohorts, and evaluating outcome in various ways depending on the exposure group.

Subsequent studies did not provide more support for these initial findings. Koletzko and others (1989). Wakefield et al. and Klement E et al. both found that 8 out of 12 kids with non-specific colitis had symptoms that parents attributed to the measles, mumps, and rubella (MMR) vaccination . The validity of these statements was questioned due to several selection and recollection bias difficulties, the absence of a control group, and the hazy nature of the case definition. Klement E et al. state that in response to public concern, a case control study from the Vaccine Safety Datalink Project was conducted to investigate the relationship between MMR and risk of IBD (2004). 142 patients with chart-confirmed IBD who were born between 1958 and 1989 made up the cases, and 432 controls who were matched for birth year, gender, and health maintenance organization made up the controls. There was no proof that the MMR vaccine in combination or the monovalent measles vaccine increased the risk of IBD.

Research by Koletzko et al. (1989) indicated that the risk of CD increased dramatically with age, but only in three children who had had their vaccinations by the age of two . Ecological studies have typically been unable to establish a connection between the prevalence of measles vaccination and IBD. Twenty years prior to the measles vaccine's release, in the 1940s, there have been reports of an increase in CD incidence. Even though this is a controversial area of research, well-designed studies' findings do not indicate a link between measles vaccinations and the eventual development of IBD.

2.7 Pathophysiology of Gastrointestinal symptomatology

Ulcerative colitis (UC) and Crohn's disease (CD) are two types of chronic relapsing gastrointestinal disorders called "inflammatory bowel disease" (IBD). Ulcerative colitis only affects the large

intestine, causing superficial mucus membrane inflammation that extends contiguously (Bai et al., 2024). Inflammation of the mucosa causes ulcers, bleeding, toxic megacolon, and fulminant colitis to form. Contrarily, Crohn's disease has an uncontiguous effect on any portion of the gastrointestinal tract. Transmural inflammation, which causes fistulas, fibrotic strictures, and abscesses, distinguishes CD from UC. Differentially enriched immune-cell subpopulations have revealed the potentially significant distinctions between UC and CD (Mitsialis et al., 2020) and genetic variants such as PTPN22 and NOD that increase the risk of Crohn's Disease but may be protective against ulcerative colitis (Jostins et al., 2012). However, a thorough understanding of the main patho-physiological processes that give rise to the diverse clinical manifestations of UC and CD is required.

The treatment of IBD includes untargeted therapies, such as immuno-modulators and gluco-corticoids, and targeted biologic therapies that work in various mechanisms. For example, they block signal transduction cascades pathways (e.g., Janus kinase [JAK] inhibitors), neutralize cause inflammation (e.g., anti-tumor necrosis factor [TNF] antibodies), modulate lymphocyte trafficking (e.g., anti-47 integrin antibodies), and promote the function and differentiation of immune subsets (e.g., anti-interleukin-12 and anti- (Chang, 2020). Although many patients benefit from biologic therapy, 30% of patients do not respond to the initial course of treatment, and 50% of patients lose the response over time.

Complex genetic, environmental, epithelial, microbial, and immunological variables contribute to the patho-physiology of GIS (Bai et al., 2024). The high incidence of gastrointestinal symptomalogy cases is more closely linked to environmental variables than genetic susceptibility, claim Watermeyer et al. (2022). More than 240 risk loci, including 17 in CD, were found in multiple investigations on the genetic variables associated with GIS. The risk alleles in the NOD2

gene were the most replicated and oldest sites, according to the study. Despite the dearth of genetic information available in sub-Saharan Africa, inferences taken from African American communities imply that the NOD2 gene attributable risk is significantly lower compared to White American groups.

A further indication that the mixing of European populations with African American populations is to blame for this genetic risk is the absence of NOD2 risk alleles in West African groups. According to Adeyanju et al., the common NOD2 mutations G908R, R702W, and 1007fs are present at low rates and do not raise the risk of developing Crohn's disease (2012). SLC11A polymorphisms, interleukin gene cluster mutations, and NOD2 A725G polymorphic are some other IBD-related mutations that have been discovered in South Africa. The genetic susceptibility of IBD to the African populations only confers a low risk to the population.

Chang (2020) reports that the intestinal epithelium, which contains the goblet cells responsible for secreting mucus and antimicrobial peptides such as the trefoil factor, is greatly affected in IBD patients. For instance, the mucus layer is stripped in CD due to a reduction in goblet cells, while the most recent single-cell RNA sequencing (scRNA-seq) research found that down-regulating the whey acidic protein four-disulfide core domain 2 (WFDC2), a protein secreted by colonic goblet cells, in active UC may lead to abnormalities in the formation of the mucus layer, increased colonization and invasion of microbiota (Chang, 2020).

2.8 Theoretical Framework

There have been many different hypotheses on the causes of Crohn's disease and ulcerative colitis throughout the past century, many of which have treatment ramifications. Additional investigation showed that the bulk of these ideas and treatments lacked strong theoretical underpinnings or effective therapeutic approaches. Others are still being investigated or have not yet been tested. This part has a critical examination of the theories that are pertinent to the research challenge and how they help to resolve it. These theories list the precise theoretical presumptions that aid in resolving the issue.

2.8.1 Diet and allergy

As a digestive disorder, GIS has drawn attention to the importance of nutrition as a primary etiological component. Early in the 20th century, dietary deficits were proposed as causes of GIS, in part because undernourishment was visible in GIS patients (Gerrard, 1997). According to Thompson NP2000, the prevalence of GIS in developed nations and the apparent emergence, or at least growth, of GIS in the 20th century have further focused attention on nutrition as the primary cause of GIS. Regarding newborn feeding patterns, a number of dietary risk factors have been proposed, including breastfeeding and length of breastfeeding as being protective against the emergence of Crohn's and UC. The 1980s saw an increase in the consumption of carbohydrates, particularly simple carbs and fast food, which raised the risk of CD, according to Rigas A. et. al, Koletzko. et. al. (1989) and Bergstrand and Hellers (1983). According to anecdotal evidence that low-fat diets work and pathologic evidence of fat, higher fats and bacterial antigens are the main triggers for the immune system's activation and the development of Crohn's disease.

It was suggested that IBD's primary cause was allergy. Although elimination diets and food challenges were not proved to be helpful, this idea remained. Particularly in relation to UC, an

allergy to cow's milk has been put out as a potential cause. It has been proposed that breastfeeding offers protection by delaying an infant's exposure to cow's milk. There was a high frequency of milk intolerance in newborns who went on to develop UC. Increased anti-cow milk antibodies have been linked to an earlier development of UC. Adults with UC have been reported to have specific antibodies to milk proteins that are correlated with disease activity, albeit these results are inconsistent and may represent greater intestinal permeability rather than a basic allergic phenomenon.

2.8.2 Microparticles and Toothpaste

In the theory that toothpaste consumption leads to GIS in general and Crohn's disease in particular, diet has been suggested as a probable etiology of Crohn's disease (Sullivan, 1990). In animal experiments, a number of toothpaste ingredients have been shown to be detrimental. In particular, some of the particle abrasives, such tricalcium phosphate and quartz, have been shown to have the ability to penetrate the epithelium and cause intestinal lesions resembling Crohn's disease. When talc was administered into animal intestinal lymphatics, similar results were observed. Other ingredients in some toothpastes, like carrageenan, which has been used to create a colitis-like condition in animals, and other abrasives like silicates and calcium pyrophosphate, may also contribute to the development of Crohn's disease. The theory argues that additional recognized risk factors are connected to toothpaste usage by pointing out that children brush less frequently, smokers brush more frequently, and even greater sugar intake has been found to be related to toothpaste use (increased need to brush teeth). This concept has not undergone thorough investigation and has little evidence to back it up, but it continues to be peculiar given that such a seemingly harmless habit could endanger some people's health (Sullivan, 1990).

The concept outlined in the toothpaste hypothesis has lately been expanded to include a wide variety of micro-particles that have progressively been consumed as part of diet during the past century. According to Powell et al. (1996) the main source of billions of micro-particles—mostly titanium, aluminum, and silicon oxides—that are consumed is food additives. These micro-particles are picked up by the specialized M cells, however according to Powell, et al. (2007) they are not degraded and build up in lymphoid tissues. They are believed to act as adjuvants, allowing the absorption of other antigens and hindering their proper disposition by the immune system, affecting the normal intestinal immunological tolerance, and inducing an immune response, but not themselves causing inflammation. Additionally, these micro-particles, in particular calcium conjugates (calcium phosphate), trigger macrophage death and the release of interleukin-1. According to this idea, the method by which an antigen interacts with the immune system and causes the inflammatory response seen in Crohn's disease rather than a specific antigen doing so (Sullivan, 1990).

2.8.3 Hygiene hypothesis

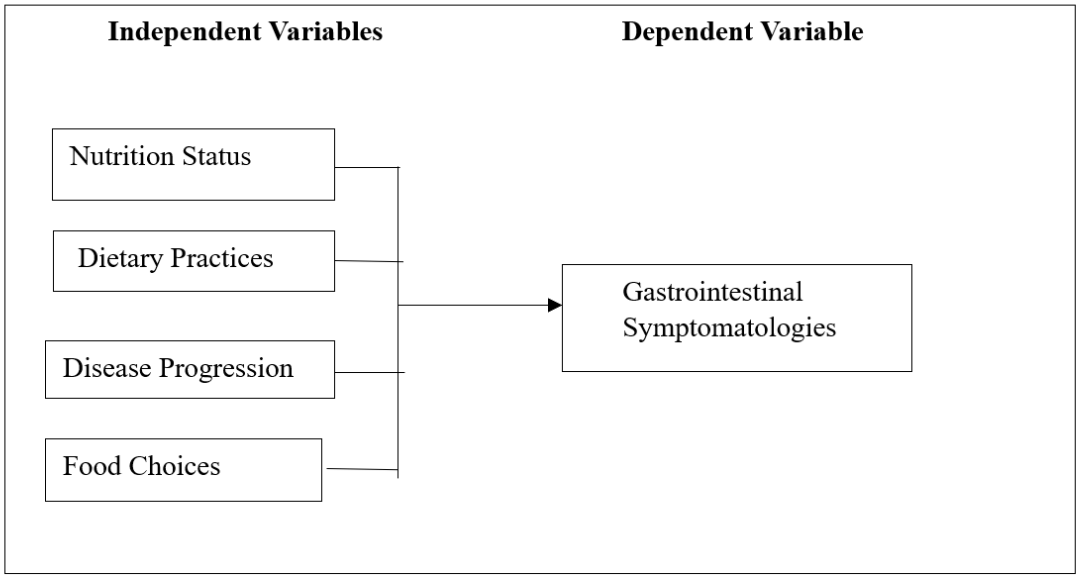
The hygiene theory in inflammatory bowel disease has been thought to be the primary cause of the diseases' increased occurrence globally, despite conflicting facts regarding its precise causes. This hypothesis for GIS is supported by data that the rise in IBD incidence over the 20th century coincided with advancements in cleanliness in both developed and developing nations (Askling. et al. 1999; Yao. et al., 2000). Some of these developments in hygiene include having access to clean water, a hot water tap, fewer families and less crowding, uncontaminated food, and hygiene products like toothpaste (Feeney et. al. 2002; Sullivan,1990). There are, however, counterarguments that suggest the increase in autoimmune and allergic problems during the past century, particularly in developing countries, may not be true.

The World Health Organization's data clearly show that even fundamental demographic data, such the vital registration of deaths, is not effectively covered (Mathers et.al., 2005). Furthermore, so-called Third World economies are unable to provide the public infrastructure necessary for the diagnosis and reporting of these types of diseases, which calls into question the applicability of the hygiene hypothesis under these conditions. The hygiene concept and the increase in allergy diseases in 1989, however, were first linked by Strachan in 1989. He claimed that the expansion of atopic diseases and family size are incompatible. The hygiene hypothesis is based on the idea that due to increased cleanliness, a kid may be overprotected from exposure to common infectious agents in the environment (Bloomfield et.al., 2006). Inappropriate immunologic responses are activated if the child subsequently comes into touch with a pathogenic infectious agent (delayed exposure), which may result in the development of an aberrant or inefficient inflammatory process and maybe even IBD.

2.9 Conceptual Framework

Fig 2.1

Conceptual Framework



In this study, gastrointestinal symptomatology (GIS) functions as both a dependent and independent variable, depending on its role in the research. As a dependent variable, GIS symptoms, such as bloating, abdominal pain, and constipation, are influenced by factors like dietary intake and food choices. For instance, consuming certain foods, such as high-FODMAP meals, can trigger or exacerbate GIS symptoms, making GIS the outcome or effect of these dietary practices. On the other hand, GIS also acts as an independent variable because the experience of these symptoms can influence future food choices and dietary practices. Patients who experience discomfort from specific foods may avoid them in the future, thereby altering their dietary habits. In this way, GIS influences future food choices, creating a feedback loop where dietary restrictions further affect the nutritional status and management of GIS. Therefore, GIS is both a consequence of dietary practices (dependent) and a factor that shapes those practices (independent).

Table 2.1

Operationalization of Variables

Variable	Category	Operational Definition
Nutritional Status	Dependent Variable	Assessed using Body Mass Index (BMI), calculated from objectively measured weight and height (kg/m^2). Participants will be classified as underweight (<18.5), normal weight (18.5–24.9), overweight (25.0–29.9), or obese (≥30.0).
Socio-demographic Factors	Independent Variable	Measured via a structured questionnaire capturing age (in years), gender (male/female), education level (primary, secondary, tertiary), occupation, and monthly income (in Kenyan Shillings).
Dietary Practices	Independent Variable	Assessed using a quantitative Food Frequency Questionnaire (FFQ) to record the frequency (daily, weekly, monthly) and portion sizes of commonly consumed food groups over the past month.

Food Choices	Independent Variable	Defined by a list of specific food items commonly identified as GIS triggers (e.g., spicy foods, dairy, high-FODMAP foods, caffeine). Measured by the frequency of their consumption and/or intentional avoidance (Yes/No).
Disease Progression	Independent Variable	Measured using a validated GIS symptom severity scale (e.g., the Gastrointestinal Symptom Rating Scale, GSRS). Participants rate the frequency and intensity of specific symptoms (e.g., abdominal pain, bloating, diarrhea) over the preceding two weeks, generating a composite severity score.

CHAPTER THREE: RESEARCH METHOD

3.1 Introduction

Information about the researcher's precise methods for carrying out the study is provided in this chapter. It gave details about the study's participants, including who they were, how many there were, and the requirements for inclusion in the study. The researcher also explained the research design employed for this study and the rationale behind it. Additionally, the chapter explains the instruments that were used for data collection, why they were the best option for the study, and the steps that were taken to gather the data. The chapter also covers the techniques for data analysis and the moral considerations involved in data collection. The subheadings below provide in-depth discussion of each of these components.

3.2 Research design

The overall approach, the researcher logically and coherently combines numerous research components that are referred to as study design. The research issue is properly addressed and serves as the guideline for gathering, measuring, and analyzing data. The fundamental goal of the research design is to make sure that the evidence acquired addresses the phenomenon under the study. According to Baker et al. (2016), the researcher clarifies the type of evidence needed to test a specific hypothesis, analyze a program, or appropriately assess and characterize the meaning associated in order to acquire information pertinent to the study problem. The researcher used a descriptive cross-sectional study design. This method was appropriate for the study as it described the research subject and would help the researcher obtain accurate information from the participants. Additionally, this research design was the best for studies that measure the cause and outcome at the same time (Baker et al., 2016).

3.3 Target Population

The study population also referred to as the target population is the group of people or research subjects possessing specific characteristics being studied. These characteristics vary from one population to another depending on the research subject. According to Baker et al. (2016), a researcher should be able to single out a reliable target population capable of providing the required information about the research subject. The study population were all the approximate 200 patients with gastrointestinal symptomatology including those with IBD (ulcerative colitis and Crohn's syndrome) and other gastrointestinal symptomatology patients who were visiting Kenyatta National Hospital during the period of the study.

3.4 Inclusion criteria

This study focused on patients who regularly attend Kenyatta National Hospital (KNH) presenting with gastrointestinal symptomatology (GIS). The age range of 13 to 59 years was selected as it includes individuals who are typically capable of self-reporting their dietary intake accurately using tools such as 24-hour recalls and Food Frequency Questionnaires (FFQs). Adolescents aged 13-17 years are developing important dietary patterns that may affect their GIS symptoms, and including this group provides valuable insights into dietary habits across different age groups.

To ensure that the inclusion of younger participants is ethical and the data remains valid, written assent was obtained from participants aged 13-17 years, while informed consent was also secured from their parents or guardians. The use of standardized and validated tools minimizes recall bias and ensures that data collected from adolescents are reliable and comparable to those from adults.

3.5 Exclusion criteria

The exclusion criteria included traits that excluded some members of the study's target demographic. Once included in the study, these characteristics might affect the outcome, hindering them from achieving the main objective.

Although the research focused on GIS patients, presence of underlying conditions may interfere with one's nutrition and dietary choices, thus making it difficult to establish the role of nutrition in managing the condition.

IBD patients with infectious diseases, symptomatic intestinal stricture or colostomy, intestinal obstruction, and other intestinal diseases, serious co-morbidities were kept out of the study. Additionally, GIS patients who abuse alcohol and other psychoactive substances were excluded from the study due to the possibility of unreliable feedback.

Patients who did not meet the specified age criteria were excluded from the study. Moreover, chronic alcohol use is associated with malnutrition and micronutrient deficiencies. Therefore, involving such patients in the study would make it difficult to establish their dietary practices. Also, patients with severe and uncontrolled mental illness were excluded from the study as the probability that they can make altered judgments and provide unreliable information. Lastly, this study was voluntary, and those unwilling to participate were not compelled.

3.6 Study Area

Kenya's, Nairobi County's Kenyatta National Hospital (KNH) was the site of the study. IBD and other GIS are becoming more common in developing nations at an alarming rate, particularly in sub-Saharan Africa. This has primarily been connected to the excessive consumption of processed meals brought on by ongoing industrialization. Watermeyer et al. (2022) and a change in the gut

microbiome David et al. (2014), an effect on nutrition. KNH is strategic within Nairobi, the capital city and industrialization center, was thus a perfect area representing the sub-Saharan context.

Kenyatta National Hospital (KNH) was purposefully chosen as the study site since it is a national referral hospital with a high volume of patients from both urban and rural areas. Also, its location is in the city will allowed the researcher to various dietary practices among IBD patients exposed to different dietary habits.

3.7 Sampling procedure

A sample is a sub-group of the population with desirable characteristics being studied. This sub-group must be representative to avoid sample biasness and increase the collected data's reliability. According to Baker et al. (2016), research requires using a representative sample to generalize the results to a population with similar characteristics and environmental exposure. For instance, the research findings of these studies may be used to predict cause-and-effect relationships in a similar study conducted in a different area with similar characteristics, such as those surrounding the patients in the Kenyatta National Hospital. The study chooses 200 patients by using Mugenda and Mugenda (2003) research method report which states that for a population less than 10,000 a sample size between 10% to 30% of the total is sufficient for study.

3.8 Sample size

This study employed a census approach, enrolling all 200 eligible patients who presented with gastrointestinal symptomatology during the designated data collection period. This constituted 100% of the accessible population. A census was strategically chosen to eliminate sampling bias and to capture a complete, representative profile of the dietary habits and nutritional status within this specific clinical cohort. This comprehensive enumeration ensures the findings are robust and directly applicable to the patient population at the Kenyatta National Hospital clinic.

3.9 Instrumentation

This study used a simple structured questionnaire for data collection for the respondents. The questionnaires had different sections with questions covering the social-demographic characteristics of the patients, dietary practices, and environmental factors. Every section contained a minimum of seven questions. Both open-ended and close-ended questions were included in the questionnaire to ensure that the respondents provided detailed data. Since the respondents filled in the questionnaires independently, the simplicity of language and precision of the questions was maintained to avoid difficulties when answering. Additionally, participants with difficulties in reading were assisted by their caregivers. Nutrition status was assessed by weight for Height Machine by UNICEF (Seca Version)

3.10 Methods of data collection

This section explains the practice of data collection in the field, administration of the research instruments, criteria for seeking permission to collect data, and how the researcher ensured a high response rate. As mentioned above, the main research instrument for this study was a questionnaire that was directly administered to the respondents. After identifying the correct sample size, the researcher administered the questionnaires to the respondents. Each respondent received one copy of a printed questionnaire. The researcher first confirmed that all questions are well printed. However, an extra questionnaire would have been issued in case of a gross mistake when answering the questions. In such a case, the respondent was required to submit both questionnaires, and the researcher would sort them out. The assistance provided was necessary accommodation to ensure inclusivity and ethical conduct, particularly for participants with low literacy. However, to safeguard data accuracy and reliability, the research team implemented a strict, standardized protocol for all data collectors. This involved structured training on the questionnaires to minimize

inter-interviewer bias, employing close-ended questions with clear response options to reduce interpretation errors, and pilot-testing the tools to ensure they were easily understood. Furthermore, the primary role of the assistants was strictly to read the questions verbatim and transcribe the respondents' answers without interpretation, influence, or prompting, thereby preserving the authenticity of the participant's own responses.

3.11 Methods of data analysis

Only fully completed questionnaires were considered for data processing. The data was then cleaned and coded using Microsoft Excel and then analyzed utilizing SPSS, (a statistical package for social sciences) version 27. Results were presented using tables, pie charts, and graphs. Null hypothesis testing was also done using SPSS Pearson correlation moment and Chi-square was used to analyze the correlation between categorical variables.

3.12 Ethical consideration

Ethical Approval was sought from KEMU, NACOSTI and KNH-UoN Ethics and Research Committee and Kenyatta National Hospital. Ethical considerations during data collection played a vital role in ensuring that the entire process is smooth and not invasive to the respondents' private details. To ensure this was achieved, all respondents were required to sign an informed consent before participating. Also, sensitive information such as name and address remained anonymous throughout the study. Ethical clearance was sought from the institution’s research department (KNH-UoN Ethics and Research Committee) and NACOSTI. The researcher engaged the respondents in a one-on-one conversation to help create a rapport and explain research expectations. Respondents were permitted to seek clarification whenever necessary to ensure accurate understanding of the study procedures. Data were collected from a total of 200 patients within the hospital setting. Anthropometric measurements were obtained last, using a calibrated

weight-for-height machine. Height was measured to the nearest 1 cm, while weight was measured to the nearest 1 gram. The Body Mass Index (BMI) was computed as weight in kilograms divided by height in meters squared (kg/m^2). The participants were asked to sign the informed consent forms before participating in the study. After signing, they were instructed to submit only the consent forms, while keeping the information sheets for their reference. This process ensured that participants had a copy of the study's details for their records while only submitting the signed consent forms to confirm their participation. The signed consent forms were then stored securely for ethical documentation purposes. The researcher's contact details were provided on the subject information sheets to allow the respondents to make contact in case they require any clarifications.

Additionally, the participants were informed that the study findings were to be submitted to the learning institution and that no names were used in the event of publication. Also, other scholars might read the research, but their names will remain anonymous. Access to all collected data was strictly limited to the principal researcher and the supervising academic team to ensure confidentiality. All electronic data were secured on a password-protected and encrypted computer, with any physical document stored in a locked filing cabinet in a controlled-access facility. This multi-layered security protocol was implemented to safeguard participant anonymity and uphold the highest standards of data integrity throughout the study.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.0 Introduction

This chapter presents and discusses the results of the study in relation to the stated objectives. The data collected were analyzed, summarized, and interpreted to address each research objective systematically. Out of the 200 questionnaires distributed, 149 were successfully completed and returned, representing a response rate of 75%. This rate is considered adequate for analysis and acceptable in social science research, as supported by Mugenda and Mugenda (2008).

During the data collection process, several challenges were encountered, including participant non-compliance, inaccurate or non-functional contact information, and unresponsiveness. These limitations prevented the inclusion of some participants in the final sample. Despite these challenges, the data obtained were sufficient and reliable for analysis. The findings in this chapter are presented according to the study objectives and are supported by relevant descriptive and inferential statistical analyses.

4.0 Demographic characteristics results

The characteristics assessed were such age, gender, marital status, and socio-economic status. The findings are summarized below.

4.1.1Gender of the respondents.

The respondents were all Kenyans composed of 57% females and 43% males as reflected in the table below in table 4.1. Patients with gastrointestinal symptomatology was, more prevalent among the female gender than the male gender which was recorded at 57 % of the total population assessed in KNH. Several studies support these findings, indicating that gastrointestinal symptomatology (GIS) is more prevalent among females than males. Three studies that were done

in Minnesota, Scandinavian and northern California showed a ratio of 1.2 to 1.4 indicating that the female gender had a higher prevalence of GIS than the male gender (Brant & Nguyen, 2008). Some studies have further shown that the main bowel disease affecting the female gender is ulcerative colitis.

Another study added that the menstrual circle is a major cause for high prevalence of GIS in female gender than in the male gender (Kane et al., 1998). Recent studies have also added that Immune-mediated diseases often show a female preponderance (Greuter et al., 2020b). In 2023 a study done in IBD indicated that also women show a genetic predisposition to develop inflammatory bowel disease related to their X chromosome. Female hormone fluctuation also led to worse gastrointestinal symptoms and pain perception among the female with IBD in similar studies (Lungaro et al., 2023). However, the gender ratios for Crohn's disease (CD) varied with the age and geographical region that were done on CD in Northern California, Olmsted County, Minnesota and the Province of Manitoba showed a consistent greater female incidence of the disease than the male (Greuter et al., 2020a). Long term use of oral contraceptives was also found to be a predisposing factor to the female gender to suffer from ulcerative colitis increasing the odds of a female individual having GIS to a male counterpart.

Table 4.1

Social demographic

	Gender		**Marital status**		**Age distribution**			
	Male	Female	Married	Single	<26yrs	26-35	36-45	>45
Frequency	64	85	113	36	9	35	50	46
Percent	43	57	75.8	24.2	6.4	25	35.7	32.9

4.1.2 Marital status

Majority of the respondents were married (75.8%) and only 24.2% were single. The Kenya Demographic and Health Survey 2022 states that 55.4% of women and 45.8% of men between the age of 20-49 were married. The results are not supported by any other study even though in Kenya, the married and unmarried ratio is 48:32=1.5:1as in KDHS.

4.1.3 Age of the respondents with GIS

Participants ranged in age from 13 to 55 years, with a mean age of 38.7 years. The age distribution was skewed towards middle-aged adults, with the 36-45 year cohort being the most represented (35.7%). Subsequent groups included >45years (32.9%), 26-35 years (25%), and finally, <24years (6.4%). A good number of the respondents at KNH were born in the year range of 1981 to 1990 (age 35-44 years) and 1991-2010 (15-34 years) making 40.3% and 30.2% respectively. Gastrointestinal symptoms in KNH were more prevalent among people aged 34 years and above with a percentage of 40.3%. According to the distribution of the patient ages, the youth who were aged <18 years were the list recorded being only 3.0% and the youth who were 18-25 years were 9.3% of the total patients in the study. However, findings indicate that the most affected group and GIS onset mostly happens among the young populations with a 25 % incidence while among the

older adults who are 60 years and above the incidence of disease occurrence is 10 to 15 % (del Val, 2011; Ruel et al., 2014; Turner & Muise, 2017). A high incidence of GIS has been depicted among young adults who are between the age brackets 15-25 years. This has been shown to be the main peak of GIS across the age groups (Johnston & Logan, 2008). An assessment across the life stages in other research works showed a smaller peak of GIS onset at the age of 50-70 years which was related to immune changes and cumulative environmental exposures among the elderly. Other studies found out that, although, it is less common, It could also strike someone over 70 years for the first time due to existence of additional age-related health conditions (Gisbert & Chaparro, 2014).

4.1.5 Ethnicity of the respondents

As shown on the table 4.3 below,Most of the respondents were kikuyu ethnic community (45.7%), followed by Luos (17.3%) Kambas (15,4%) then Luhyas at (6.0%). The tribes recorded were eleven only but Kenya has 43 tribes. This was also supported by the counties of origin where the counties that showed reasonable numbers in the study were Kiambu 14%, Kisumu,8.8%. Nairobi 8.8% , Nyeri 8.7%, Muranga7.4%, and Kitui 6.1% had more cases than others. According to the demographic data, patients whose origin was Urban Kiambu county were many compared to those that came from other counties in Kenya. It had the highest number of patients with 14% of the total population. The results also indicated that majority of the patients came from urban areas with the highest percentage of 72.5% studies done on the association of GIS with the environment have agreed with this results that GIS is more prevalent in urban arrears than in rural areas. In other research works, a positive association between urban environment and GIS was found for both ulcerative colitis and Crohn’s disease.

Another study among children in both urban and rural areas identified that the living conditions are directly related with the subsequent development of GIS and the study concluded that urban

living environment was more common among those that had the disease (Dau et al. 2025). A study in the rural arrears also agreed with the results of this study that there is low occurrence of the disease among the rural population. In this research only 19% of the patients came from the rural areas. People living in rural households have been found to have a lower risk of developing GIS than those living in the urban areas. This relationship has been found being strongest among the young children, adolescents, and children that have been exposed to the rural environment early in life.

Table 4.2

Ethnicity of respondents

County in Kenya	Frequency	Percent
Embu	2	1.3
Kalenjin	3	2.0
Kamba	23	15.4
Kikuyu	68	45.7
Kisii	7	4.7
Luhya	11	6.0
Luo	27	17.3
Meru	4	2.7
Taita	2	1.4
Total	149	100.0

4.1.7 Type of settlements

As explained in the table 4.3 below,the respondents were mostly from formal urban setting 72.5% (108) and 14.8% slum settlers and 19% from rural settlement. This still confirmed the fact that the disease is prevalent in the urban areas and more or so on those who are can afford processed foods

like those in the formal estates.

Table 4.3

Types of settlements

	Frequency	Percent
Formal Urban setting	108	72.5
Informal Urban setting	22	14.8
Rural	19	12.8
Total	149	100.0

4.1.8 How long have the respondents settled in the cities

Some number did not report when they first came to the city 13.4% but others reported 5years,10.1%, those of 8 years were 9.4% and 7 years 6.7% others years of stay in the cities scored below 5%. Among the long time dwellers in the city who had stayed for 33. 34 and 35years were respectively reported at 0.7% each. Looking at the long staying in the city, it seemed like 10 years and 23years of stay in the city were the highest score at 5.4% and 4.7% respectively. This is displayed in the table below.

Table 4.4

The year when settled in Nairobi

Year of settle in city	Frequency	Percent
1989	1	.7
1990	1	.7
1991	1	.7
1992	1	.7
1994	2	1.3
1996	1	.7
1998	5	3.4
1999	5	3.4
2000	6	4.0
2001	1	.7
2002	3	2.0
2003	1	.7
2007	3	2.0
2008	6	4.0
2009	1	.7
2010	5	3.4
2011	1	.7
2012	2	1.3

2013	12	8.1
2014	6	4.0
2015	11	7.4
2016	10	6.7
2017	9	6.0
2018	15	10.1
2019	5	3.4
2020	4	2.7
2021	3	2.0
2022	1	.710.1
2023	1	.7
2024	1	.7
Between 1992-2007	1	.7
N/A	21	14.1
Total	149	100.0

4.1.10 Education level of respondents

Most of the respondents were well learned with Bachelor degree being 23.5% and certificate/diploma being 22.8% as shown in the table below. KDHS (2022) reported that more than 80% of Kenyans are literate and at least 21% of Kenyans have learnt beyond secondary education. The table 4.5 below shows the summary.

Table 4.5

Education level of the Patients

	Frequency	Percent
University	37	24.8
College/Tertiary	45	30.3
Primary	16	10.7
Secondary	51	34.2
Total	149	100.0

Most of the respondents were business men and women 40.3% but only 28.2% were formally employed as displayed in the table 4.6 below.

Table 4.6

Employment status

	Frequency	Percent
Self employed	69	46.3
Formal employment	42	28.2
Casual Labourer	22	14.8
Not employed	7	4.8
Total	149	100.0

4.2 Income of the respondents

4.7

Income table

INCOME in KSH

	Frequency	Percent
Below Ksh.10,000	21	14.1
Ksh 10,000 - Ksh 30,000	68	45.6
Ksh 30,000 - Ksh 60,000	44	29.5
Ksh 60,000 - Ksh 100,000	8	5.4
Total	149	100.0

As shown on the table below most of the respondents were earning between 10,000-30000 Kenya shillings per month and only 5.4% were earning more than 60,000/- per month. has traditionally been observed that individuals with GIS tend to have a higher socioeconomic status and education level compared to the general population. The findings of this study align with this observation, as the majority of respondents were well-educated and of relatively high socioeconomic status. Specifically, 80% had attained formal education, with 23.5% holding a Bachelor's degree or higher, 22.8% possessing a diploma, and 34.2% having completed secondary education. Most of this respondents also had financial stability where 83.3 % of the patients studied had either self-employment, formal employment or non-formal employment at 40.3%, 28.2% and 14.8% respectively. A high number of the individuals assessed in the study earned more than 10,000

Kenyan shillings. The relationship between high education level and GIS are not clear since other research also show that the educational level and occupation have a minor effect on the population's likelihood of CD and UC (Li et al., 2009). One research done in 2001 countered this and found that IBD patients are not of a higher socioeconomic status as previously reported in other research works. More research needs to be done on this topic for a clear view. What was clear in these research studies is that higher level of education, occupation, and upper socioeconomic status were negatively associated with adherence to GIS medication making in treatment for long periods than others.

4.3 Smoking status

In this research we found out that 22.4% of the patients had a history of smoking or were currently smoking at the point of interview. Among this,7% were actively smoking at the point of research and 15.4 had recently quitted smoking as shown on table 4.8. Studies have shown that smoking is one of the environmental factors leading to GIS, with a differing effect in UC and CD (Mahid et al., 2006). While Crohn's disease has been related to is associated with active smoking while ulcerative colitis has been largely linked to being a disease of nonsmokers and former smokers.

Cigarette smoking particularly has been identified due to its nicotine content. Studies have depicted detrimental damages caused by nicotine in the body that lead to susceptibility of getting GIS. These damages include changes in humeral and cellular immunity, cytokine and eicosanoid levels, gut motility, permeability, and blood flow, colonic mucus, and oxygen free radicals. (Birrenbach & Böcker, 2004). Other studies have found out that Cigarette smoking endorses intestinal inflammation by affecting the function and dealings among intestinal epithelium, immune system and the microbiome (Papoutsopoulou et al., 2020).

Smoking also results into a condition referred as periodontitis which is a chronic inflammation of the periodontal tissues. Periodontitis has been proven to be a precursor for the effect of the

development of inflammatory bowel disease. Periodontitis has been pointedly linked to the risk of developing UC but not CD in active smokers particularly those that are above the age of 65years (Kang et al., 2020). Apart from smoking being one of the causes of GIS it has also been established that active smoking during the disease treatment worsens the condition further leading to an increased risk of developing osteoporosis and colorectal neoplasia which complicates the treatment of smoking GIS patients. (Ratajczak et al., 2021; van der Sloot et al., 2022). Smoking cessation has been proved to ameliorate the symptoms and leading to better outcomes in patients with active smoking.

The respondents smoking status revealed that 82% of them never smoked and 15.4% had quit smoking.

Figure 4.1

Smoking habits of the patients

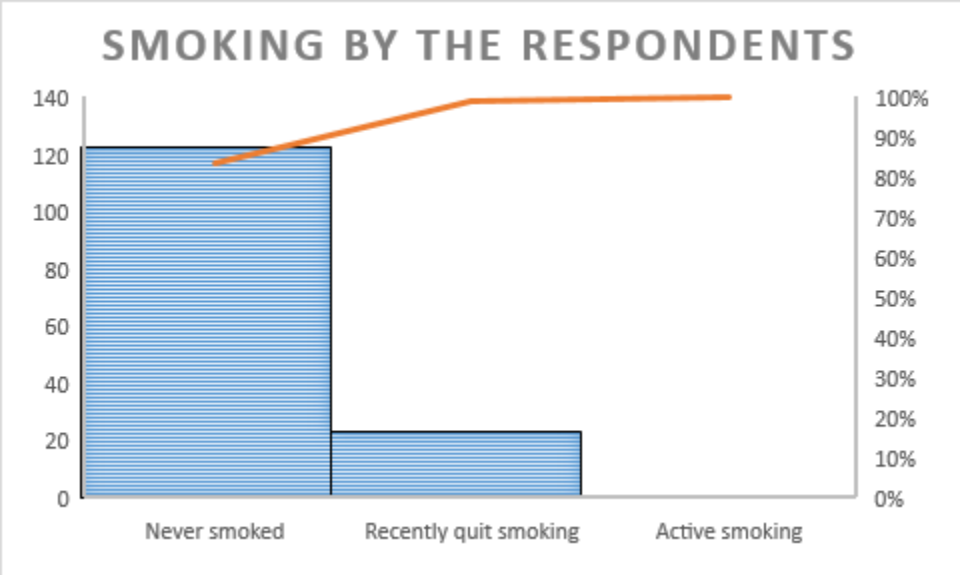


Table 4.8

Smoking status of the patients

	Frequency	Percent
Active smoking	1	.7
Never smoked	123	82.6
Recently quit smoking	23	15.4
Total	149	100.0

4.3 DIETARY PRACRICES

When asked whether they have ever received nutrition services, majority (53.7%) reported having been given nutrition advice by nutritionist and 45.6% had not received the services putting the group at risk of not having proper nutrition information for the disease. The reason for having not been given any information by nutritionist among the 45.6% patients was that nutrition services have never been recommended to them (33%) and 27.5% did not respond to the question. Some respondents 2.1% did not see nutrition services as necessary to them. Many respondents (39%) were unable to give a proper response as to when they last received nutrition services even though 30.5% had sought the nutrition services over different years as summarized in Table below.

Table 4.9

Access to nutrition services and compliance to nutrition advice

	Access to Nutrition Services		Compliance to nutrition advice		
	Yes	No	Yes	No	Sometimes
Frequency	80	68	45	27	36
Percent	53.7	45.6	30.2	18.1	24.2

Those who had received nutrition services and had adhered to the nutrition advices were 30.2% and adherence only sometimes were 24.2% and respondents who were non complaint to nutrition advice were 18.1%. The table below shows compliance with nutrition advice.

Most of the patients sought nutrition services according to this study having 53.7 % of the total studied. These group reported to have received nutrition counselling from the KNH nutritionists. However, a large percentage (45.6%) of the patients had never received any nutrition advice before. Among those who received the nutrition counselling, only 30.2 % adhered to the nutrition advice given while 18% were found to be non-compliant to the prescription given. Studies have found that individuals with GIS usually have a desire to get dietary information and this prompts them to look for nutritional advice (Miglioretto et al., 2025).

These patients have been shown to naturally turn toward various sources of information of dietary nature especially after diagnosis. The main dietary information that is sought by these patients has been found to be, the advice on foods to avoid and how to manage the symptoms of GIS this has been associated with the information being very important and to be mainly influenced by the disease course. The main sources of dietary information was found to be from non-dietetic professionals at 84.7% and from internet (Miglioretto et al., 2025). This is in line with our literature review where we found that most clients with GIS do not seek nutrition advice from professionals. Although some sought nutrition advice even in other studies with most studies recording 36%. However adherence rates of the nutrition advice by GIS patients seeing gastroenterologists has been persistently low according to the research studies that have been conducted (Vrdoljak et al., 2020). Better adherence to nutrition advice has significantly lowered the risk of late onset of Crohn's disease in various studies. Patients need to be encouraged to adhere more to dietary advice and also medications to ensure short duration of disease and relief from the symptoms.

4.3.3. Dietary Pattern of the respondents

Most respondents were eating three times a day >80% but other frequencies were below 10% as shown on the figure below. Snacking in between meals was done by nearly half the patients. These findings still confirm that the GIS patients are mostly well off and people of good food purchasing power as stated by Wouters et al. (2018) and Mielmann and Brunner (2018). This find as further seen in the analysis of dietary intake by RDA also showed that the typical meal pattern of the patients had nutrient values that were higher than required RDA as seen in table 20. The nutrients that exceeded the recommended daily allowances (RDAs) included energy by 27%, protein by 93%, carbohydrates by 54%, fiber by 100%, and phosphorus by 160%.

Figure 4.2

Frequency of food intake among patients with GIS

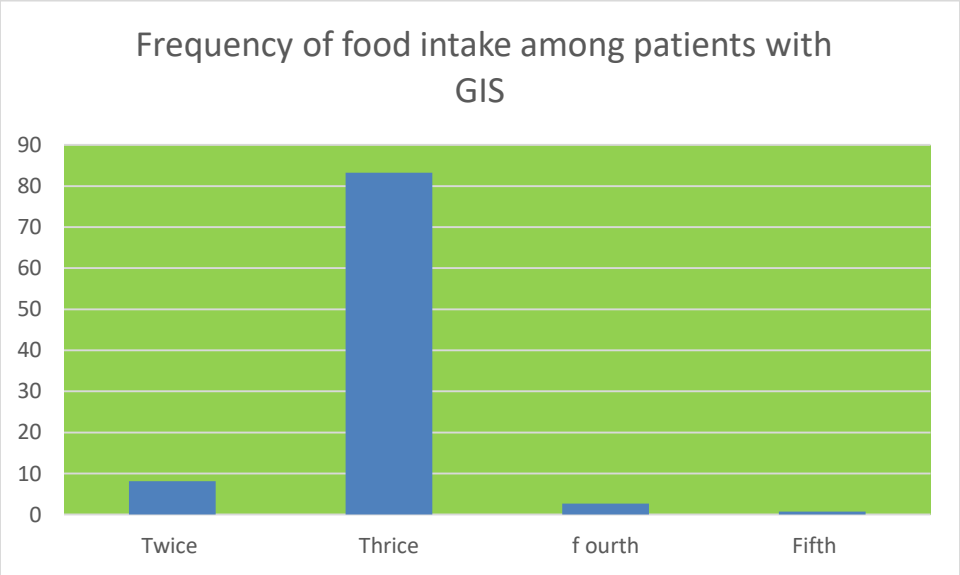


Table 4:10

If the respondents have snacks in between meals

	Frequency	Percent
No	79	53.0
Yes	68	45.6
Total	149	100.0

There were 73.8% who had not lost some weight in the three months prior to the study even though 24.8% had indicated a form of weight loss over that period as shown below. Among those who had lost weight reported to have lost from one kilogram to three kilograms in that period. Water intake was good enough among the patients, majority were taking one liters of water to two liters per day

Table 4.11

Have you lost weight in the last 3 months?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1.3	1.3	1.3
Maybe	12	8.1	8.1	9.4
No	110	73.8	73.8	83.2
Yes	25	16.8	16.8	100.0
Total	149	100.0	100.0	

4.3.4

The most frequently consumed foods among the patients before diagnosis with GIS

The patients frequently ate Githeri 68%, ugali74% rice, 48%chapatti 20%, mukimo 34%, irish potatoes 17%, bread 21% and chips 12% among carbohydrates and beef 69%, eggs 2% and beans 72% in the protein category. Vegetables were also consumed by nearly 97.7% of the patients. Many respondents (42.4%) took about 15 minutes to finish their meals, and a good number, 38.1% were taking 10 minutes to finish eating a meal.

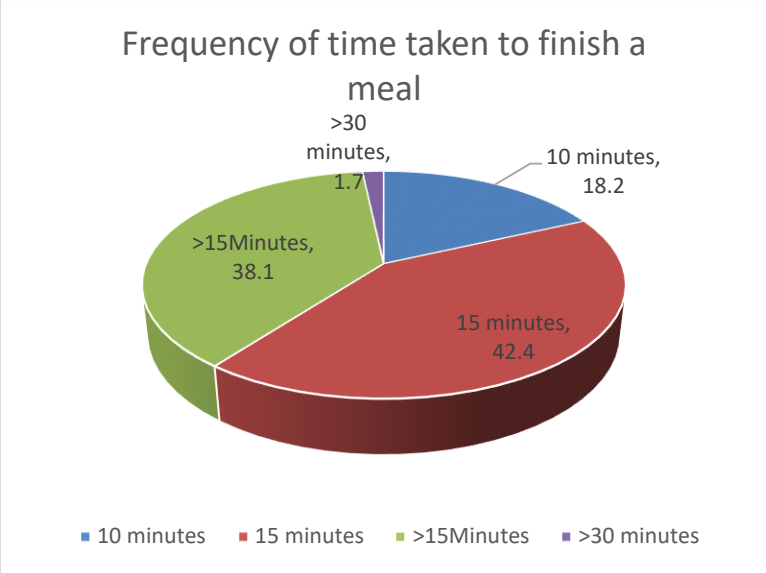
Before diagnosis the most consumed foods were, Githeri 68%, chapatti 20% mukimo34, ugali 74%, rice 48%, irish potato 17%, bread 21% and chips 12%, beef 69%, eggs 2%, beans 72 % and 97.7% vegetables. In other studies food and wheat intake has been linked to higher risk of UC at with egg consumption having (95% CI) The modern dietary pattern, characterized by high intake of animal-origin foods and fruits, was attributed with higher risk of UC in the populations especially in the city.

In this research most patients consumed Githeri before diagnosis which is a combination of beans and maize, also the consumption of beans was also high. Dark kidney beans have demonstrated protective effects against colonic mucosal injury and inflammation, attributed to their elevated levels of dextran sodium sulfate, which may exert anti-inflammatory properties in the gastrointestinal tract.Navy, cranberry and black beans have also been tested in other studies and have been found to reduce colonic inflammation due to their ability to alter the microbiota. Consumption of vegetables was also highly recorded and according to most of the research and fruits have been found to have an inversely proportional relationship with the risk of IBD (Halmos & Gibson, 2019). In one of the studies a high intake of fruits and vegetables and an imbalance of this foods with consumption of fatty acids among Canadian children increased the risk of CD.

A high intake of fish has shown to protect children from incidence of gastrointestinal bowel symptoms. In this study, fish consumption was notably low, with only 19.4% of GIS patients reporting its intake, while just 13.4% consumed indigenous vegetables. Other studies have recorded that among patients with Crohn's disease in remission, fish oil was effective in reducing the rate of disease relapse. Moreover, other studies have added that Protein hydrolyses derived from fish side streams have anti-inflammatory properties and are useful to reduce inflammations in the gastrointestinal truck and especially inflammation of the colon.

Figure 4.3

Frequency Distribution of Meal Completion Duration



In the findings of this research, it was also depicted that many patients 42.4 % took 15 minutes to finish their meals and a good number of them which was 38.1 % took 10 minutes to finish eating a meal. Other studies have shown a relationship between eating rate and ulcerative colitis. In one research, the eating rate was found to be independently inversely associated with mucosal healing, but it did not affect the clinical remission of the disease. In most research, eating quickly has been independently inversely associated with patients having ulcerative colitis. In another study among Japanese patients with ulcerative colitis on the eating habits and clinical symptoms of UC, the rate of eating food and eating until full were inversely associated with mucosal healing in ulcerative colitis and positively associated with Gastro Esophageal Reflux Disease (GERD).

5.2.3 Transition of diets from indigenous foods to foods in the city

In this research study our finding on transition of diets from indigenous foods to foods found in the city showed that a large percentage 75.8% shifted or changed their diets with most of them

adapting to the city diet and foregoing eating indigenous foods. Most research finding have shown that food in the urban areas has an adverse effect of the gut microbiota due to pollution, and early life microbial exposure. On phenolic compounds found in indigenous vegetables such as pumpkin have been asserted to prevent and treat GIS. Also indigenous fruits such as pineapple and passion fruits have been found to have the same effect .

As shown in Table 4.12, the majority of patients (75.5%) reported a change in their diet following migration to the city. Several respondents noted that city living had influenced their dietary patterns, resulting in reduced consumption of certain traditional foods. Notably, 19.4% missed fish, 34% missed indigenous vegetables, and 5.4% missed sweet potatoes, whereas 31.2% reported that they had not missed any food since relocating

Table 4.12

Whether diets shifted

		Frequency	Percent
	No	35	23.5
	Yes	112	75.2
	Total	149	100.0

4.3.5 Frequency of Consumption of specific foods

Fresh fruits were daily consumed by 47.7% of the respondents, 36.9% of them ate fruits 2-3 times per week and once a week by 2%. Cooked vegetables **c**onsumption once per day was 34.2% and 31.5% consumed it 2-3 times per week and once a week by 1.3%. Cooked root vegetables were eaten daily by 19.5% and 22.8% eaten 2-4 times a week and less than a week the consumption was 4.7%. Raw vegetables in form of salad were being consumed daily by only 1.3%, once a week 2-

4 time a week were 27.5% and once per week is 16.1%. Potatoes, pasta and rice were mostly consumed 53.7% at 5-6 times a week followed by 2-4 times a week by 23% and once a day by 10.1%. Meat was eaten mostly at 54.4% per week, 5-6 times a week was 13.4% and once a day at 4.7% indicating that consumption was a bit poor compared to the recommended daily servings in the food pyramid of 2-3 once per week. Meat product was eaten mostly 2-4 times a week by 37.6% of the respondents and once a week by 30.2% and only 0.7%consumption per day. White fish was not very well consumed many respondents 59.7% ate it less than once per month. Oily fish was also not well done because majority 57% ate it only once a month. Linear regression analysis food frequency and nutrition status revealed that there was not significant relationship between the two because p=0.680. This is summarized in table 4.13 below.

Table 4.13

Frequency of Consumption of Specific Foods among Respondents (n = 149)

Food Item	Daily (%)	2–4 times/week (%)	Once/week (%)	Less than once/week (%)	Less than once/month (%)
Fresh fruits	47.7	36.9	2.0		
Cooked vegetables	34.2	31.5	1.3		
Cooked root vegetables	19.5	22.8		4.7	
Raw vegetables (salads)	1.3	27.5	16.1		
Potatoes, pasta, and rice	10.1	23.0			
Meat	4.7	13.4	54.4		
Meat products	0.7	37.6	30.2		
White fish					59.7
Oily fish					57.0

4.3.10 Meal in the day according to RDA

As shown in table 4.14 below The nutrient intake by 24hour recall was analyzed by use of Nutri-survey 2007 and the results according to RDA were as follows in Table 4.14: A typical one days meal from the 56% of the respondents was analyzed for nutrients. The report revealed that

breakfast was given the least kilocalories (825kcal) and lunch meal had the most kilocalories (1360) and supper time had 880kcal. This was contrary to the nutritional recommendations that requires breakfast to take the highest portion of the days kilocalories and supper to take the least. The respondents' daily intake pattern is similar to what is seen in many Kenyan homes where breakfast is never take to be very important and thus less food is eaten at that time

Table 4.14

Typical Meal in the day according to the RDA for GIS patients at KNH by Nutri-survey soft-ware

Meal	Food Item	Amount
Breakfast	Millet whole grain	250 g
Breakfast	White bread for toasting	90 g
Breakfast	Margarine for cooking	5 g
Lunch	Rice hulled cooked	360 g
Lunch	Spring cabbage fresh cooked	150 g
Lunch	Beef medium fat fresh cooked	150 g
Lunch	Tea black with milk and sugar (beverage)	125 g
Snack	Banana fresh	100 g
Supper	Flour/meal	180 g
Supper	Spinach leaves cooked	150 g
Supper	Kidney beans tinned	150 g
Supper	Tea black with milk and sugar (beverage)	125 g

Table 4.15

Nutrient analysed

Nutrient	Analyzed	Recommended	Percentage
Energy	2586.4 kcal	2036.3 kcal	127 %
Water	1153.5 g	2700.0 g	43 %
Protein	116.2 g (18%)	60.1 g (12 %)	193 %
Fat	32.6 g (11%)	69.1 g (< 30 %)	47 %
Carbohydrates	447.5 g (71%)	290.7 g (> 55 %)	154 %
Dietary Fiber	63.4 g	30.0 g	211 %
Alcohol	0.0 g	-	-
PUFA	8.3 g	10.0 g	83 %
Cholesterol	94.8 mg	-	-
Vit. A	2427.4 µg	800.0 µg	303 %
Carotene	14.3 mg	-	-
Vit. E (eq.)	8.8 mg	12.0 mg	73 %
Vit. B1	1.3 mg	1.0 mg	129 %
Vit. B2	1.5 mg	1.2 mg	123 %
Vit. B6	3.4 mg	1.2 mg	287 %
Tot. Fol. Acid	329.3 µg	400.0 µg	82 %
Vit. C	118.7 mg	100.0 mg	119 %
Sodium	910.8 mg	2000.0 mg	46 %
Potassium	3613.6 mg	3500.0 mg	103 %
Calcium	690.9 mg	1000.0 mg	69 %
Magnesium	768.0 mg	310.0 mg	248 %
Phosphorus	1826.9 mg	700.0 mg	261 %

Iron	42.4 mg	15.0 mg	283 %
Zinc	23.7 mg	7.0 mg	338 %

There was a significant relationship between total kilocalories consumed from the foods consumed and the nutrition status as p=0.003.

4.3 To determine the influence of food choices on progression of GI diseases among patients with gastrointestinal symptomatology in KNH

4.3.1 Type of bread consumed

Bread consumption by the respondents indicated that 62.4% were eating white bread compared to 24.2% who were eating brown whole meal bread. It was interesting to note that 11.4% were not eating bread at all. Brown bread has been established by most researchers to be a protective factor for CD, in a similar research whole bread reduced the odds of CD at OR of 95% (Morton et al., 2020). However, refined bread (white bread) and other refined wheat products have been found to be deleterious to gastrointestinal symptom patients, especially those with a high gluten content (Sienkiewicz et al., 2021).

The bread that the respondents consumed were normally spread by either margarine or Butter (50.1%) but a good number of patients were not using the spreads on their bread (45%). The most common type of milk used by the patients in tea, coffee and cereals was whole cows milk among 89.3%. The study reported that 85% of the patients were using sugar on their tea and coffee.

Table 4.16

Types of bread consumed

	Frequency (%)	Percent
Brown bread	36 (24.2)	24.2
Does not consume bread	17	11.4
White bread	93	62.4
Whole meal bread	3	2.0
Total	149	100.0

The highest number of respondents represented by 62.4% took white bread, 24.2% of them taking brown whole meal bread while 11.4% did not consume bread at all and a 2% consuming a whole meal bread. This is shown on the above table 4.16

Other studies have established that bread has a potential capacity of being used as a probiotic, specifically if it is made from sour dough which is fermented flour mixed with water. This type of bread has been found to have amazing benefits to GIS patients especially improving their gut microbiota. It contains lactic acid bacteria species and Saccharomyces cerevisiae yiest. In this studies The analysis of in vitro fecal incubations from patients who had taken fermented bread revealed an increase in most bacterial groups analyzed and short-chain fatty acid production, both in Crohn's disease and ulcerative colitis samples this led to the increase of Roseburia species

The intake of bread has been seconded by other researcher to be beneficial especially bread that has been traditionally baked. The intake of traditional bread decreased the Firmicutes Bacteroidetes ratio in GIS patients and it seemed to be linked to improving Irritable bowel like symptoms in ulcerative colitis patients. These findings seems to be in agreement that whole meal

bread was more popular and patients may have been educated about the issue that the bread has a potential of improving gut health.

Majority of the clients (68.5%) were using breakfast cereals of high fibre in the morning and a good number 28.2% were not using cereals for breakfast. The most preferred method of cooking by the respondents was slight steaming by 83.9% as shown in the figure below. They also preferred cooking food at home (87.9%) as opposed to eating at hotels (8.1%) and majority of them cooked food by themselves (67.9%)

In this study also 85% of the respondents used sugar in their tea, coffee and chocolate. In other research studies sugar intake has been associated with an increased risk of inflammatory bowel disease. Some research studies found out that intake of Total Carbohydrates, Sugar and Sugar-Sweetened Beverages was directly proportionate with the risk of risk of GIS (Khademi et al., 2021). Most of the assessed patients steamed and slightly fried their food This was 83.9% , only 6.7 % of them taking deep fried foods. This shows that the patients had good knowledge on how their food should be cooked. Steamed foods rarely irritate the bowels and slight frying is also mild enough to be tolerated by those with gut issues. Soft-cooked or pureed food using a blender are the best depending on tolerance (IBD-AID., 2024). Table 4.17 summarizes the findings.

Table 4.17

Methods of cooking

	Frequency	Percent
Boiled	13	8.7
Deep fried foods	10	6.7
Steamed and slightly fried	125	83.9
Total	149	100.0

Table 4.18

Types of places to access food

	Frequency	Percent
Both	5	3.4
Homemade	131	87.9
Hotel foods	12	8.1
Total	149	100.0

The patients were mostly (88%) cooking food at home as they prepared for themselves (68%) and this was one of the recommended best practices for GIS patients. They have to eat from home in order to eat healthy meals and choose food ingredients carefully as recommended for their diet as shown on table 4.18 above.

Table 4.19

Table on who prepared food

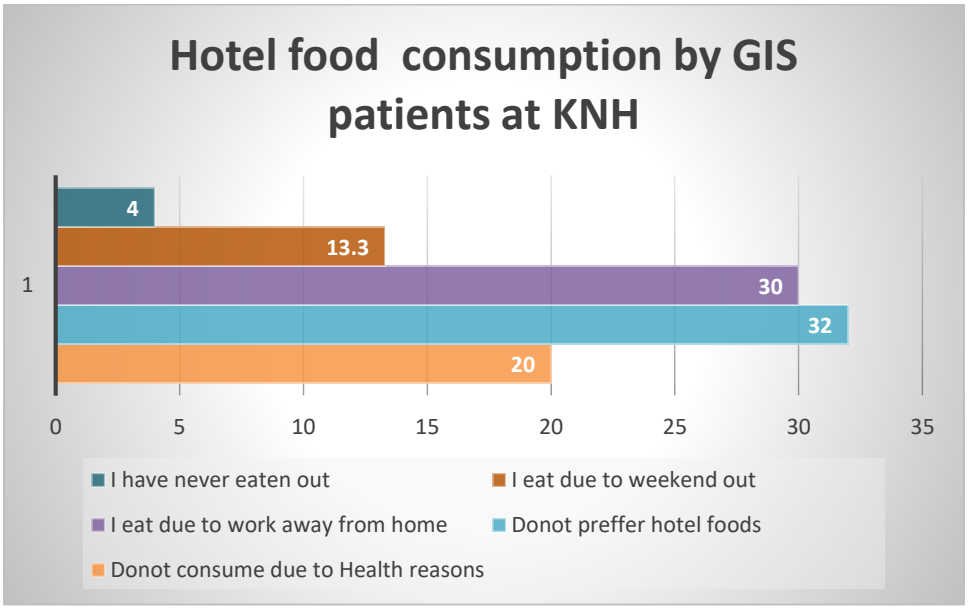
	Frequency	Percent
Parent	11	7.5
Self	93	67.9
Spouse	46	35.7
Total	149	100.0

More than half the number of respondents 54.4% have never been given advice on how to prepare food by the nutritionists.

Figure 4.4

Hotel food consumption by IBD patients in KNH

Descriptive	**TEA**			**COFEE**		
Measures	NO	YES	TOTAL	NO	YES	TOTAL
Frequency	21	128	149	21	127	149
Percent	14.1	85.9	100	14.1	85.2	100



There was insignificant evidence on relationship of GIS to the place the patient takes his or her meals from, either hotel or from home from other research works. A research on this topic can be done to verify if there is any association of GIS with eating from home or from a hotel. Most of the patients ate homemade food at 87.9% and 8.1% who ate from the hotel.

Table 4.20

No. of patients who received counselling on meal preparation

	Frequency	Percent
No	81	54.4
Yes	68	45.6
Total	149	100.0

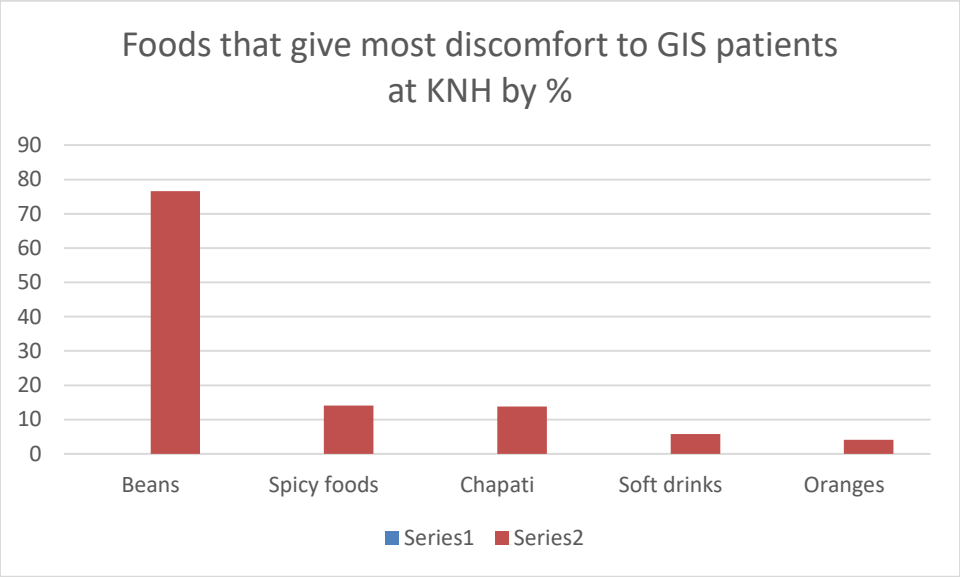
Among all the patients that were interviewed, 54.4% were found to have never been given advice on how to prepare food by a certified nutritionist. These patients are supposed to seek nutrition advice regularly since nutrition management is part of their treatment regime. Might be that nutritionists are not consulted to counsel the patients as shown in the table 4.20 above.

4.3.6 Allergies to food

More than half of the respondents 51% did not have allergies with food and those who had were allergic to mostly beans, nuts, milk, and meat which were reported by a few respondents. Beans were reported to cause the most discomfort by 76.6%, spicy food 14.1%, chapatti 13.8%, soft drinks 5.8% and oranges 4.1%.

Figure 4.5

Foods that gave most discomfort



The results of this research showed that there were foods which led to the severity of gastrointestinal symptoms. The patients reported of the foods that were not tolerable to them and also some had allergies with certain foods.76.6% of the respondents in this research suffered from discomfort when they took beans.14.1% of then when they took spicy food, 13.8 percent when they took chapatti, 5.8% when they took soft drinks and only 4.1 % felt discomfort when they took oranges. More than half of the respondents did not have any allergies. These findings agree with other studies that have been done on the same area in other places. The term "food discomfort" or “food allergy” was referred to transient, moderate post-meal discomfort like gas, bloating, or mild indigestion, which could happen even with normally well-tolerated foods. This was also referred to having an allergic reaction to a certain food . The cause of these allergies has mostly been linked to increased epithelial barrier permeability which is a common feature in IBD pathophysiology (Capobianco et al., 2024). Mucosal histamine has also been highlighted as a course for allergies

among IBD patients and also it contributed to immune-inflammatory reactions of the gastrointestinal tract in Crohn's disease and ulcerative colitis . The prevalence of food allergies has shown to be higher among children in other studies with most of them being diagnosed with lgE mediated food allergies, which also led to a high food avoidance in this cohort .

Most of the respondents, 76.6% were allergic to beans in this study, Other studies agree with this finding however they have shown that beans have a potential positive and negative impact on the gut health depending on the type of beans the patient takes. Kidney beans have been found to cause serious allergic reactions due to their lectins content which causes immunoglobulin E (IgE), non-Immunoglobulin E, and mixed allergic reactions.In an experiment that was done among mice on colitis, diets high in beans had both positive and negative effects. They increased colonic mucosal damage while they decreased inflammatory indicators and improved biomarkers .

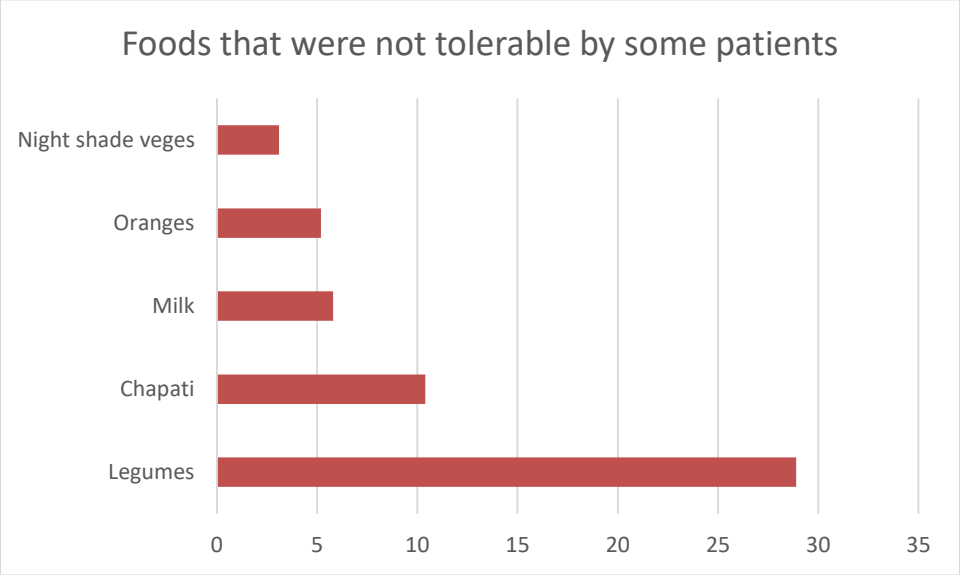
In this research study the findings showed that 14.1% of the respondents had allergies to spicy foods. In a research that was done in China, the same result was observed and spicy foods which are part of the Chinese cuisine were confirmed to be a major risk factor for ulcerative colitis, other studies from the same country showed that spicy foods increased the progression of ulcerative colitis (Y.-F. Wang et al., 2013). In Asia, spicy foods, particularly those with a lot of chili were found to aggravate abdominal pain and burning symptoms in Functional Gastrointestinal Disorders (FGID) .

The study also showed that 13.8% of the respondents had allergies towards chapatti. Studies depicted that wheat products could cause irritation among patients with IBS due to the content of gluten. Limiting wheat and several foods that were high in fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAPs) were recommended in this studies to ease the symptoms of irritable bowel syndrome (IBS).

Allergy towards soft drinks was also seen in this study at 5.8% Studies discovered that artificial sweeteners like sucralose and saccharin had a significant causal effect in the development of gastrointestinal symptomatology during its stages of pathogenesis. Another research done among Arab populations on soft drinks and Chrohn's disease showed that the excessive sugar in soft drinks led to development or exacerbated the Chrohn's disease. Those foods that were not tolerable at all by some patients were Legumes 28.9%, Chapatti 10.4%, Milk 5.8%, Oranges 5.2% and Managu (black night shade) 3.1%. as indicated in Table below.

Figure 4.6

Foods that were not tolerable



Foods that were not tolerable among the population studied include; legumes at 28.9%, chapatti at 10.4%, milk 5.8%and oranges at 5.2% and night shade vegetables at. Most IBD patients in other studies have shown sensitivity to lactose, fructose, nickel, and gluten. These findings were coherent with other studies that showed that despite the nutritional value of legumes, tolerating them was difficult for people with gastrointestinal symptomatology because of the complex

carbohydrates and fiber they contained, which could make symptoms like gas, bloating, and stomach pain worse. Legumes were one of the foods that patients typically avoided since their fermentation in the stomach caused discomfort for those who were sensitive to it (Capobianco et al., 2024; Gubatan et al., 2023). Legumes did not directly raise GIS activity, according to research, but their fermentable fibers (FODMAPs) exacerbated gastrointestinal symptoms in people especially during flare-ups. Low-FODMAP diets, which frequently advocate cutting back on or avoiding legumes, were advocated as an intervention for GIS as a result of this. Although, dietary therapies alone lacked the robustness to address the underlying inflammation of the bowel, therefore while these diets were meant to reduce symptoms, they were not considered a substitute for gastrointestinal symptomatology treatment (Cappello et al., 2021).

Other research studies also agreed on the intolerance related to consumption of chapatti, a product made from wheat. In their findings, gluten and carbohydrate content in chapatti, caused intolerance symptoms in certain people, which worsened inflammation and digestive pain. The studies showed that wheat and gluten was problematic for patients with gastrointestinal challenges, particularly if they had gluten sensitivity. In addition to being poorly digested, carbohydrates like those in wheat products also caused fermentation in the gut, which resulted in symptoms like gas, bloating, and diarrhea. This was particularly true for people who were susceptible to fructose malabsorption or Small Intestinal Bacterial Overgrowth (SIBO), both of which were common in patients with GIS). Amylase trypsin inhibitors, found in gluten-containing cereals, have the capacity to activate toll-like receptors, thus stimulating the release of inflammatory cytokines and inducing a T-cell immune response in both celiac and non-celiac patients .Amylase trypsin inhibitors, which were present in gluten-containing cereals, had the ability to activate toll-like receptors, which led to the production of inflammatory cytokines and triggered a T-cell immunological response in

individuals with gastrointestinal symptomatology, this worsened the condition of inflammation in the gut.

The findings of these research on GIS patients having intolerance with milk agrees with other studies where individuals with ulcerative colitis had an increased symptoms of IBD when they took milk. Other research findings also showed the same result where, a sizable fraction of individuals with gastrointestinal symptomatology, especially those with Crohn's disease and ulcerative colitis, were found to have lactose intolerance. Inflammation in GIS conditions especially CD and UC have also been associated with impaired production of lactase, an enzyme that breaks down lactose, or the sugar in milk hence leading to lactose intolerance in IBD patients. In addition to lactose, some individuals with GIS had sensitivity to the milk protein casein, which occasionally caused gastrointestinal distress. While A2 casein, which was present in other dairy products like goat's milk, was better tolerated, A1 casein, which was frequently found in cow's milk, was more difficult to digest.

Oranges in this research also showed an increased sensitivity among patients with gastrointestinal symptomatology who were assessed, 5.2% could not tolerate oranges. Other research works have shown similar results on sensitivity to citrus foods. These fruits such as oranges and other high-fiber, acidic fruits such as pineapple, lemon and unripe mangoes, caused discomfort or made symptoms worse for people with gastrointestinal symptomatology. Another study depicted that citrus fruits and raw vegetables were among the foods which avoided by individuals with GIS

Another food that was not tolerable to the respondents was the black night shade vegetables at 3.1% which was not a significant percentage. Most research studies revealed the existence of a positive impact of these vegetable (African night shade) in treating and reducing symptoms of inflammation rather than causing intolerance, however some patients had intolerance from the

same vegetable. Over the years in research studies, “Managu” was prized for its antioxidant and anti-inflammatory qualities, which could help control inflammation. Vitamins A, C, calcium, and fiber are among its components that promoted immunological and digestive health, which were critical for people with long-term digestive disorders like IBD. However, the research showed that “Managu” contained bitter, potentially irritating molecules because of its glycoalkaloid concentration, which could cause digestive issues, particularly during flare-ups of gastrointestinal symptoms. The researcher suggested that before eating, the leaves were to be frequently boiled or soaked to lessen the bitterness, which could help to make the vegetable more palatable to those with digestive related diseases like IBD.

4.3.8 Foods that bring relief while in pain were;

Among the foods that brought relief and were tolerable in included potatoes at 10.75 %, milk at 8,3 % cabbages and cabbage at 6.2%. Some patients used milk to relief symptoms of pain but it caused belatedness and more pain afterwards 16% said milk helped them sooth the pain. In other studies foods that are well tolerated included water, rice, plain pasta or noodles, baked or broiled potatoes, white breads, plain fish, chicken, turkey, or ham; eggs, dry cereals, soy and rice based products, peas, applesauce, cantaloupe, watermelon, fruit cocktail, margarine, jams, jellies, and peanut butter. Over the years whole foods have been used in treatment of gastrointestinal symptomatology such whole foods include whole maize flour, whole wheat flour and whole rice. Cabbages in this research showed a potential of relieving the symptoms related to GIS among 23.3 % of the respondents. Other research works have shown similar results on cabbage and other cruciferous vegetables. Most of the cruciferous vegetables like cauliflower, broccoli, and cabbage when cooked aided people with GIS because the cooking process lowered the fiber content, which made them easily digestible. Although these veggies were high in phytochemicals and antioxidants

that could help reduce inflammation, some patients found them difficult to consume during flare-ups of IBD due to their fiber and possible lectin concentration.

Potatoes brought relief to 10.75% of the respondents in this research, the findings agree also with research that was performed on mice, the mice showed improved intestinal barrier integrity and they were relieved from symptoms of IBD. Glycoalkaloids found in potatoes and also on potato skins were responsible for these effects (Patel et al., 2002). Researchers have showed an interest in the use of potatoes as a gut modulator due to its anti-inflammatory contents. Some of these anti-inflammatory elements includes, resistant starch, anthocyanin and fiber (Reddivari et al., 2019). Purple fleshed potatoes were found to be more potent in relieving and even carrying out anti colitic activities than any other colored potato since they contained more anthocyanin. (Reddivari et al., 2020). A mixture of taking carrots and cabbage brought relief to the respondents in KNH at 6.2%, carrots have been used over the years in traditional drug therapies especially in the western countries. A research on mice showed that fermented carrots had better results than the raw or cooked carrots on relieving mice with ulcerative colitis. The fermented carrots had an effect in ameliorating the pathological damage of the colon tissue of the UC mice. Several experiments have been done on mice and they have consistently shown the same result, in these studies purple carrots showed to have more effect on relieving symptoms of ileum and colon irritation. Carrots also helped in reducing inflammation of the colon and ileum with a P value of ($P < 0.0001$) in both the colon and ileum.

Some of the respondents used milk to relieve themselves from gastrointestinal symptoms, however some said that they experienced pain after taking milk. These findings were not consistent with other research, other research found out that milk caused more harm and increased the severity of the symptoms than relieving them Most of these studies recommended that milk and dairy products

should be eliminated from the diets of patients with gastrointestinal symptomatology. One of these research found out that almost 70% of the patients studied had symptom relief after they were restricted from taking milk and dairy products . Because dairy products contained lactose sugar some patients had trouble digesting and could lead to worse symptoms such as watery diarrhea.

4.3.9 Use of supplements

Supplement use showed that 11% used them and they used mostly iron only, Iron /folic acid , vitamin C and calcium but 88% were not on any supplements. Use of herbal concoctions for pain was reported among only 14.8%.

Table 4.21

Have you ever used any traditional herbs for pain relief ever since you knew your diagnosis

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		3	2.0	2.0	2.0
	No	124	83.2	83.2	85.2
	Yes	22	14.8	14.8	100.0
	Total	149	100.0	100.0	

4.4 BMI of the respondents (nutrition status)

When BMI data were analyzed, the results showed that the mean BMI for 144 records found was 26.38 kg/m^2 showing general over weight status among the respondents. The lowest BMI was 18.65kg/m^2 and maximum BMI was 38.62 kg/m^2 and a standard deviation of 3.393 as shown in Table 4.22 below. There was a significant difference between the Means of BMI as $P<0.001$.

Table 4.22

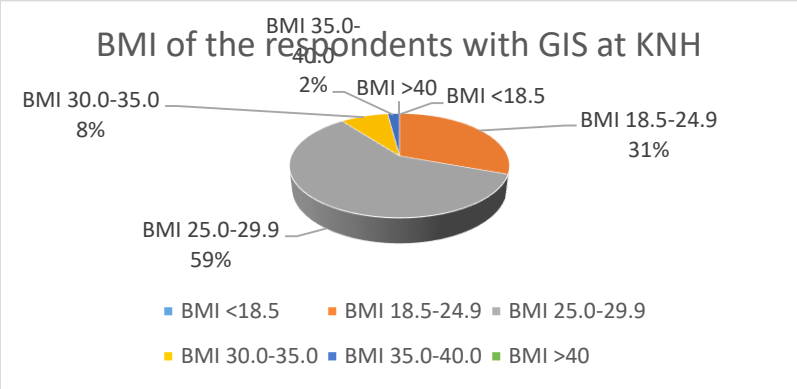
BMI Index

	N	Minimum	Maximum	Mean	Std. Deviation
Body Mass Index	144	18.65	38.62	26.3832	3.39328

When BMI values were graded, 59% (85) were overweight, 31% (44) were of normal BMI, 8% (12) were Class 1 Obesity and 2% (3) were Class 11 obesity and none were underweight nor morbidly obese as shown in figure 4.7 below.

Figure 4.7

BMI of the respondents with GIS at KNH



The nutrition status of the respondents showed that most of the patients were overweight and obese. From the data collected, 69% of the patients were either overweight or obese. These patients had a BMI of 26.38 Kg/$m^2$and with the highest BMI being 38.62 Kg/m^2. Only 3% of the assessed respondents had a BMI of 18.65 Kg/m^2 which indicates a normal nutrition status. This BMI was the least recorded, no one was underweight among the respondents.

These results show that overweight and obese patients were most associated with GIS. A study of the nutrition status of outpatient Crohn's disease patients agreed with this findings, it revealed that a high number of patients with Crohn's disease were obese and overweight and they appeared to reflect current wellness, older age and sedentary lifestyles. Obesity was highly prevalent in a study done in the US among GIS patients in Dallas where 32.7 % of the studied population were found to be obese having a BMI greater than 30 Kg/m^2.It was also found that obesity status might worsen the condition and gastrointestinal symptoms . 20 % to 40% of gastrointestinal symptomatology patients in Western countries have proved to be obese, this studies have suggested that using weight loss as a rationale for GIS can be of great help. Over the years, high fat in the body has been directly related to GIS incidence and difficulty in treatment.

Obesity has been highlighted as affecting some of the treatment procedures for GIS such as colorectal surgery and a potential increase in the risk of perioperative complications has been noted. However, most studies have linked obesity to Crohn's Disease and few ulcerative colitis especially in women. In a study among women who were obese measures of adiposity were associated with an increased risk of Crohns disease but not ulcerative Colitis. (Khalili et al., 2015). The adipose tissue in human beings represents a metabolically and hormonally active organ, producing adipokins in obese patients which exert a pro-inflammatory effect that drives disease activity in patients with immune-mediated diseases, including gastrointestinal symptomatology eg

IBD.. Obesity has also been linked to causing a lot of autoimmune diseases worldwide and causing alterations in the intestinal microbiome leading to such illnesses (Harper & Zisman, 2016).

However other studies have depicted undernourishment among the GIS patients. Despite of these patients looking overly well because of their nutrition status, most suffer from micronutrient deficiencies due to malabsorption that is secondary to gastrointestinal insufficiency, chronic diarrhea, and the therapy given to the patient. The main deficiencies identified were mainly micronutrients and vitamins, this include; iron, magnesium, zinc, selenium, vitamin D, folic acid and vitamin B12. Patients with Crohn's disease presented a higher vulnerability of getting folate and B12 deficiency due to ileocecal location and sulfasalazine administration compared to UC patients. In this study 73.8 % of the patients had not lost weight in the past 3 months prior to study and need to be guided by KNH nutritionists to do weight loss for good prognosis of the disease. This is because weight loss has been associated with decreased incidence of GIS especially ulcerative colitis and also improved treatment.

Table: 4.23

Testing the relationship between demographic and socioeconomic variables with Nutrition status

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
category of BMI * Marital status	145	97.3%	4	2.7%	149	100.0%
category of BMI * Gender	145	97.3%	4	2.7%	149	100.0%

category of BMI * Highest level of education		145	97.3%	4	2.7%	149	100.0%
category of BMI * Monthly income		145	97.3%	4	2.7%	149	100.0%

Table 4.24

*Category of BMI * Marital status*

		BMI			
		Normal	Overweight	Obese	Chi-Square (P-Value)
Marital status	Single	38	62	7	7.52 (0.023)
	Married	10	24	9	
Gender	Male	16	39	7	0.78 (0.676)
	Female	27	47	9	

Table 4.25

Chi-Square Tests for BMI and Marital status

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.521[a]	2	.023
Likelihood Ratio	7.847	2	.020
N of Valid Cases	145		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 3.97. The was significant relationship between BMI and marital status since P=0.023.

Table 4.26

*Category of BMI * Gender*

Count

		Gender		
		Female	Male	Total
category of BMI	Normal	27	16	43
	overweight	47	39	86
	Obese	9	7	16
Total		83	62	145

Table 4.27

Chi-Square Tests for Gender and BMI

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.783[a]	2	.676
Likelihood Ratio	.789	2	.674
N of Valid Cases	145		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.84. The relationship between gender and BMI was not significant as P>0.05 (.676).

Table 4.28

Cross-tabulation between highest level of education and BMI

Count

		Highest level of education			
		Bachelors	Cert/Dip	Masters/PHD	Post cou
category of BMI	Normal	19	9	1	
	Overweight	12	18	1	
	Obese	3	5	0	
Total		34	32	2	

Table 4.29

*Category of BMI * Highest level of education*

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	19.920[a]	10	.030
Likelihood Ratio	20.707	10	.023
N of Valid Cases	145		

a. 9 cells (50.0%) have expected count less than 5. The minimum expected count is .22. The relationship between BMI and highest level of education and the relationship was significant at $p<0.030$.

Table 4.30

*Category of BMI * Monthly income*

		Monthly income				
		< Ksh.10,000	Ksh 10,000 - Ksh 30,000	Ksh 30,000 - Ksh 60,000	Ksh 60,000 - Ksh 100,000	Total
category of BMI	Normal	0	3	13	23	4	43
	Overweight	6	14	45	18	3	86
	Obese	2	4	9	1	0	16
Total		8	21	67	42	7	145

Table 4.31

Chi-Square Tests for monthly income and BMI

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	27.196[a]	8	.001
Likelihood Ratio	29.798	8	.000
N of Valid Cases	145		

a. 8 cells (53.3%) have expected count less than 5. The minimum expected count is .77. The relationship between Nutrition status and Level of income was significant because P=0.001

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The gastrointestinal (GI) tract is affected by the chronic relapsing ailment known as "inflammatory bowel disease" (IBD). The disease's pathophysiology is yet unknown, however it includes both Crohn's Disease (CD) and ulcerative colitis (UC). The disease is associated with factors, such as genetic predisposition and environmental factors, pathogen infections, abnormal immune responses, and altered gut status. The increased consumption of processed foods, urbanization, and industrialization, which have led to a shift in dietary choices, have significantly contributed to the high incidence rates of gastrointestinal symptomatology (GIS) in western countries. This affects more than 6.8 million individuals worldwide, with sub-Saharan Africa reporting an increase in incidence over the recent years. Sub-Saharan Africa has fewer published cohort studies on GIS. Among the 92 patients diagnosed with IBD in Nairobi by 2023, 87% had ulcerative colitis. Some of the patients tend to usually avoid certain foods or food groups due to the fear of aggravating their symptoms. Nutrition management of the gastrointestinal symptomatology is important but unfortunately, there are scanty nutrition studies on the disease, leaving both health care providers and patients with inadequate nutrition information. This study sought to assess the dietary habits and nutrition of the respondents at KNH: determine their socio-demographic characteristics, to assess their dietary patterns, to determine the influence of food choices on progression of the disease and to assess the nutritional status. The study randomly selected 200 patients with gastrointestinal symptomatology who routinely visited KNH.The research reported that there were more female GIS (57%) than male, the age bracket among the respondents which were above 34 years were 40%. The highest percentage of respondents

originated from the urban areas at 72.5%. The marital status, education level and the monthly income status of the individuals studied had a significant association with gastrointestinal symptomatology at $p<0.05$. Gender did have an association with GIS as Chi-square gave $p=0.76$. Most of the respondents were well educated and self-employed >45%, The analysis revealed significant patterns in substance use, dietary intake, and food intolerances among respondents. A substantial majority (87.9%) reported consuming primarily homemade foods, with only 8.1% regularly eating from hotels. Regarding consumables, 87% regularly consumed sugar or sweetened beverages. Furthermore, 22.4% of respondents had a history of or were current cigarette smokers. Investigation into food intolerances identified beans and other legumes as the most common allergenic and non-tolerable items, cited by 76.6% as an allergen and by 28.9% as a food they could not tolerate. Other significant triggers included spicy foods (14.1%), chapatti (13.8% as an allergen, 10.4% as non-tolerable), and various items like soft drinks, oranges, and milk. This data highlights a high prevalence of specific dietary triggers and lifestyle factors within the studied population. Foods that brought relief to the patients included cabbage at 23.3%, potatoes at 10.75%, milk 8.3% and carrot at 6.2%. The dietary intake assessment revealed the respondents were overconsuming carbohydrates 154%, Protein 193%, Energy 127% and Fiber 211% that required moderation. The nutrition status assessment revealed that most of the respondents 69% were either overweight or obese with a BMI of 26.38kg/m2 and above. There were no patients who were underweight and none of them was morbid obesity of BMI>40. Linear regression analysis between BMI and calorie intake was significant at $p=0.003$ as reported by many nutrition studies. Food frequency and BMI relationship was not significant by regression as $p=0.680$ but this was not expected as it contradicts many studies. The study recommends that the patients link up with nutritionists for continuous updates on nutrition education and best practices. The patients also have to reduce their food intake through moderating what they eat because they had cases

where their intakes were more than RDAs especially for macronutrients. The patients should be put on weight reduction diets and frequent exercises of at least 30minutes per day. The patients also need to select their foods properly with restriction of foods that caused the most discomfort. The MOH can come up with food prescriptions/recommendations for the patients with gastrointestinal symptomatology and also factor management strategies into the MOH diseases management Policy guidelines.

5.2: Conclusion

The research concluded that the female gender had a high predominance of GIS with 57% of the respondents being female, the age bracket among the respondents that had GIS was above 34 years with a percentage of 40.the highest percentage of the respondents originated from the urban areas at 72.5%. The marital status, education level and the socioeconomic status of the individuals studied did not have any significant association with BMI of gastrointestinal symptomatology patients. Most of the respondents were well educated and were either self-employed, formally employed and non-formally employed. Smoking had a significant relationship to incidence of GIS with 22.4% of the respondents having either a history of smoking or were currently smoking at the time of the research. Sugar and sweetened beverages were directly proportionate to gastrointestinal symptomatology risk 87% of the respondents used sugar in their tea or coffee.87.9% of them took homemade foods and only 8.1% took from the hotel this showed that there was insignificant relationship between GIS and taking food at hotels. Allergic foods determined were beans at 76.6 %, spicy food 14.1%, chapatti 13.8%, soft drinks 5.8% and oranges 4.1%. Foods that were not tolerable included legumes at 28.9%, chapatti 10.4%, milk 5.8%, oranges 5.2% and 'managu' 3.1%. Foods that brought relief to the patients included cabbage at 23.3%, potatoes at 10.75, milk 8.3% and carrot at 6.2%. The dietary intake assessment revealed that patients were overconsuming carbohydrates 154%, Protein 193%, Energy 127% and Fibre 211% that required moderation. The

nutrition status assessment revealed that most of the respondents 69% were either overweight or obese with a BMI of 26.38kg/m2 and above. There were no patients who were underweight and none of them was morbidly obese of BMI>40. The gender, urban origin, high BMI of the client, poor dietary patterns and smoking predisposed them to gastrointestinal symptomatology or increased symptoms in one way or another.

5.3 Recommendations

The study recommends that the patients link up with nutritionists for continuous updates on nutrition education and best practices. The patients also have to reduce their food intake through moderating what they eat because they had cases where their intakes were more than RDAs especially for macronutrients. BMI of the participants also showed that many were obese and overweight. This calls for patients to be put on weight reduction diets and frequent exercises of at least 30minutes per day. Simple exercises such as rope skipping, walking and jogging are recommended for these patients. The patients also need to select their foods properly with restriction of foods that caused the most discomfort such as legumes, wheat products and certain vegetables that caused bloatedness and more pain. Nutritionists should be consulted frequently to provide nutrition information and come up with food plans for patients with gastrointestinal symptomatology. This study has successfully fulfilled its core purpose. By definitively characterizing the specific dietary habits, prevalent food intolerances, and nutritional status of GIS patients at KNH, it has generated the crucial, localized evidence necessary to inform actionable recommendations. The findings provide a direct foundation for the MOH to develop targeted food prescriptions and refine policy guidelines. Furthermore, the study has effectively identified critical future research directions, including the need to investigate rural populations and pediatric-specific manifestations of GIS, thereby laying the groundwork for continued scientific and clinical advancement.

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APPENDICES

Appendix 1. Counties of the respondents

	Frequency	Percent
Nakuru	1	.7
Bungoma	4	2.7
Eldoret	1	.7
Embu	2	1.3
Kiambu	21	14.2
Homabay	2	1.3
Kakamega	1	.7
Nandi	1	.7
Nyeri	13	8.8
Kericho	2	1.3
Muranga	11	7.4
Kilifi	1	.7
Kirinyaga	3	2.0
Kisii	3	2.0
Kisumu	13	8.8
Kitale	1	.7
Kitui	8	6.1
Machakos	6	4.1

Makueni	7	4.7
Meru	5	3.5
Migori	6	4.0
Mwea	3	2.0
Mwingi	1	.7
Nairobi	13	8.7
Narok	1	.7
Nyamira	3	2
Nyandarua	3	2.1
Siaya	2	1.4
Taita	2	1.4
Teso	1	.7
Vihiga	4	2.7
West-pokot	1	.7
Total	146	100.0

Appendix 2: Participant Information and Consent Form

Title of Study: Assessment of nutrition and dietary practices among patients with gastrointestinal symptomatology at Kenyatta National Hospital, Kenya

Principal Investigator\and institutional affiliation:

Faith Ndirangu

Kenya Methodist University

Co-Investigators and institutional affiliation:

Dr. Job Mapesa and Rose Juma

Both of Kenya Methodist University

Introduction:

I would like to tell you about a study being conducted by the above listed researchers. The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. Feel free to ask any questions about the purpose of the research, what happens if you participate in the study, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions to your satisfaction, you may decide to be in the study or not. This process is called **'informed consent'**. Once you understand and agree to be in the study, I will request you to sign your name on this form. You should understand the general principles which apply to all participants in a medical research: i)

Your decision to participate is entirely voluntary ii) You may withdraw from the study at any time without necessarily giving a reason for your withdrawal

iii) Refusal to participate in the research will not affect the services you are entitled to in this health facility or other facilities. We will give you a copy of this form for your records.

May I continue? YES / NO

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol No. _____

WHAT IS THIS STUDY ABOUT?

This study will simply assess the nutrition and dietary practices among patients with gastrointestinal symptomatology at Kenyatta National Hospital. The study results will be used by physicians and clinical Nutritionists/Dieticians to develop patient-centered interventions that will alleviate not only the gastrointestinal symptoms but also correct micronutrient deficiencies and improve overall health. The study also opens opportunities for further investigations into the dietary practices of these patients.

A questionnaire will be administered and you are requested to answer to your best of knowledge.

The researchers listed above are interviewing individuals who have GIS. The purpose of the interview is to find out your dietary habits. Participants in this research study will be asked questions about their dietary patterns and a little bit about their socio-economic details.

All patients with GIS are considered as respondents as this is a census kind of study. We are

asking for your consent to consider participating in this study

WHAT WILL HAPPEN IF YOU DECIDE TO BE IN THIS RESEARCH STUDY?

If you agree to participate in this study, the following things will happen:

You will be interviewed by a trained interviewer in a private area where you feel comfortable answering questions. The interview will last approximately 30 minutes. The interview will topics in Nutrition.

After the interview has finished***, (explain in details any procedures that are necessary e.g blood draws, counseling etc.)***

We will ask for a telephone number where we can contact you if necessary. If you agree to provide your contact information, it will be used only by people working for this study and will never be shared with others. The reasons why we may need to contact you includes: a follow-up study in IBD, enroll you for interventions that may be funded in future.

ARE THERE ANY RISKS, HARMS DISCOMFORTS ASSOCIATED WITH THIS STUDY?

Medical research has the potential to introduce psychological, social, emotional and physical risks. Effort should always be put in place to minimize the risks. One potential risk of being in the study is loss of privacy. We will keep everything you tell us as confidential as possible. We will use a code number to identify you in a password-protected computer database and will keep all of our paper records in a locked file cabinet. However, no system

of protecting your confidentiality can be absolutely secure, so it is still possible that someone could find out you were in this study and could find out information about you.

Also, answering questions in the interview may be uncomfortable for you. If there are any questions you do not want to answer, you can skip them. You have the right to refuse the interview or any questions asked during the interview.

We will do everything we can to ensure that this is done in private. Furthermore, all study staff and interviewers are professionals with special training in these examinations/interviews.

ARE THERE ANY BENEFITS BEING IN THIS STUDY?

You may benefit by receiving free nutrition counseling on a later date after participating in this study. We will refer you to the hospital's nutrition department for care and support where necessary. Also, the information you provide will help us better understand the dietary practices of patients with IBD. This information is a contribution to science and information of patients with this condition in Sub- Saharan Africa.

WILL BEING IN THIS STUDY COST YOU ANYTHING?

Participating in this study will cost you 30minutes of your time and no financial expenses.

WHAT IF YOU HAVE QUESTIONS IN FUTURE?

If you have further questions or concerns about participating in this study, please call or send a text message to the study staff at the number provided at the bottom of this page.

For more information about your rights as a research participant you may contact the Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Telephone No. 2726300 Ext. 44102 email uonknh_erc@uonbi.ac.ke.

The study staff will pay you back for your charges to these numbers if the call is for study-related communication.

WHAT ARE YOUR OTHER CHOICES?

Your decision to participate in research is voluntary. You are free to decline participation in the study and you can withdraw from the study at any time without injustice or loss of any benefits.

Participant's statement

I have read this consent form or had the information read to me. I have had the chance to discuss this research study with a study counselor. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study.

I understand that all efforts will be made to keep information regarding my personal identity confidential.

By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study.

I agree to participate in this research study:

I agree to provide contact information for follow-up:

Participant printed name:

……

Participant signature / Thumb stamp

_____

Date

_____

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher's Name:

_____

Date:

_____ **Name……..Signature**

/Thumb stamp: …….. _____

Signature ……..

Contact information

_____Da

te; _____

Role in the

study:

_____

[i.e. study staff who explained informed

consent form.]

For more information

contact

_____

at

_____

from

_____to

_____

Witness Printed Name (*If witness*

is necessary, A witness is a

person mutually acceptable to

both the researcher and

participant)

Appendix 3: Questionnaire

QUESTIONNAIRE DATE……

QUESTIONNAIRE NUMBER……

ASSESSMENT OF NUTRITION AND DIETARY PRACTICES AMONG PATIENTS WITH GASTROINTESTINAL SYMPTOMATOLOGY AT KENYATTA NATIONAL HOSPITAL

SECTION A: Social-demographic Characteristics

Kindly answer all the questions appropriately by ticking the right box.

YOB____ A_____weight ____ Height____

8. Which year did you settle in town/cities?

   _____

9. How many consecutive years have you lived in the urban area? _____

10. Highest level of education

    Primary [ ]

    Secondary [ ]

    Post-seco course [ ]

    Cert/Dip [ ]

    Bachelors [ ]

3. Country of birth _____

4. Race/Tribe

   _____

5. Where did you grow upto 18years

   _____

6. Where do you live?

   _____

7. Area of residence

   Rural [ ]

   Formal Urban setting [ ]

   Informal urban setting [ ]

Masters/PhD [ ]

11. Economic activates

Farming [ ]

Business [ ]

Formal employment [ ]Non-formal employment [ ]

12. Smoking status

Active smoking [ ]

Recently quit smoking [ ]

Never smoked [ ]

13. Monthly income

Below Ksh 10,000 [ ]

Ksh 10,000 – 30,000 [ ]

Ksh 30,000 – 60,000 [ ]

Ksh 60,000 - 100,000 [ ]

Above Ksh 100,000 [ ]

SECTION B: Dietary Practices

Have you ever received counseling from a clinical nutritionist after your diagnosis?

If NO, Why?

When was the last time you saw a nutritionist?

Do you adhere to the advice they gave you?

Yes No Sometimes

Respond to this section's inquiries by ticking the right box.

1. What type of bread do you typically consume?
   - White bread
   - Brown bread
   - Wholemeal bread
   - Other kinds (please specify)
   - Does not consume bread

2. What do you often spread on bread?
   - Butter
   - Margarine
   - Low fat spread
   - Do not spread fat on bread

3. What kind of milk do you usually use for drinks in Coffee, tea and cereals, etc.?
   - Whole milk
   - Semi-skimmed
   - Skimmed
   - Other types (please specify)
   - Do not drink milk

4. Do you usually take sugar in:

	YES	NO
(a) tea		
(b) coffee		
(c) Do not take coffee and tea		

5. Which type of breakfast cereal do you usually eat?

High fiber cereals (e.g., All Bran, Shredded Wheat, Bran flakes, Porridge, Weetabix)	
Other cereals (e.g., Cornflakes, Rice Krispies, Sugar Puffs, Honey Snacks	
Do not eat breakfast cereals	

6. Do you prefer boiled, baked, steamed slightly fried or deep fried foods?

7. Do you prefer to take homemade meals or hotel foods?

   i. Who prepares your meals at home?

   ii. Have they received counseling on how to prepare your meals from the nutritionist?

   iii. How many times do you consume foods from hotels?

   Why?

8. How many meals do you take in a day?

9. Do you have snacks in between the meals?

10. Have you lost weight in the last 3 months?

    If YES, how much weight have you lost in that period?

11. Do you regularly take water?

    How much water do you take per day/24hours?

12. How long do you take to take one large meal before you finish it? _____

13. What foods did you take often before you got diagnosed with GIS?

14. Is there a shift in your diet?
15. If YES, what foods were you taking that you no longer take because of maybe availability or shift from upcountry to towns?

16. And what foods are you now consuming?

17. I want you to write down everything that you consumed yesterday from the time you woke up and the time you consumed it (24hr recall) (**FILL THE 24HOUR FOOD TABLE ATTACHED)**

18. Do you have allergies that you think are caused by your condition which is gastrointestinal symptomatology?Which one are they? State them
19. What foods do you think aggravate stomach discomfort/pain?

20. What foods worsen your symptoms?

21. What foods are you not able to tolerate completely?

22. Can you list the foods that bring relief when you are in pain?

23. Do you think milk is a better option in relieving pain?

Explain

24. Do you have any deficiencies that your doctor has discussed with you?

If YES, which ones are they?

25. Are you on any nutritional supplements? If YES, which ones?

If NO, why?

	4-5 Times Per Day	2-3 times per day	once per day	5-6 times per week	2-4 times per week	once per week	1-3 times per month	Less than once per month
Breakfast cereal								
Fresh fruit								
Cooked green vegetables (fresh or frozen)								
Cooked root vegetables (fresh or frozen)								
Raw vegetables or salad (including tomatoes)								
Chips								
Potatoes, pasta, rice								
Meat								
Meat products								
Poultry								
Whitefish								
Oil-rich fish								

Cheese								
Beans or pulses								
Sweets, chocolates								
Ice cream								
Crisps, savory snacks								
Fruit juice (NOT squash)								
Soft/fizzy drinks								
Cakes, scones, sweet pies or pastries								
Biscuits								

24 HOUR FOOD RECALL

TIME	FOOD OR BEVERAGE ITEMS	PORTION SIZE	HOW WAS IT PREPARED
Breakfast meal			
Morning snack			
Lunchtime meal			

Afternoon snack			
Dinner meal			
Bedtime snack			

7. In summary:

   (a) How frequently do you consume fresh produce and/or fruit juice?

☐☐ Per day OR ☐☐ Per week OR ☐☐ Per month

   (b) How many times do you eat oil-rich fish?

☐☐ Per day OR ☐☐ Per week OR ☐☐ Per month

   (c) How often do you eat treats like cookies, cakes, scones, sweet pies, or chocolates? Per month

☐☐ Per day OR ☐☐ Per week or ☐☐

SECTION C: Medication and treatment

1. What over the counter drugs do you take when the pain is unbearable?

2. Have you ever used any traditional herbs for pain relief ever since you knew your diagnosis?

If YES, state the herbs and a simple narrative why you were told to use them……

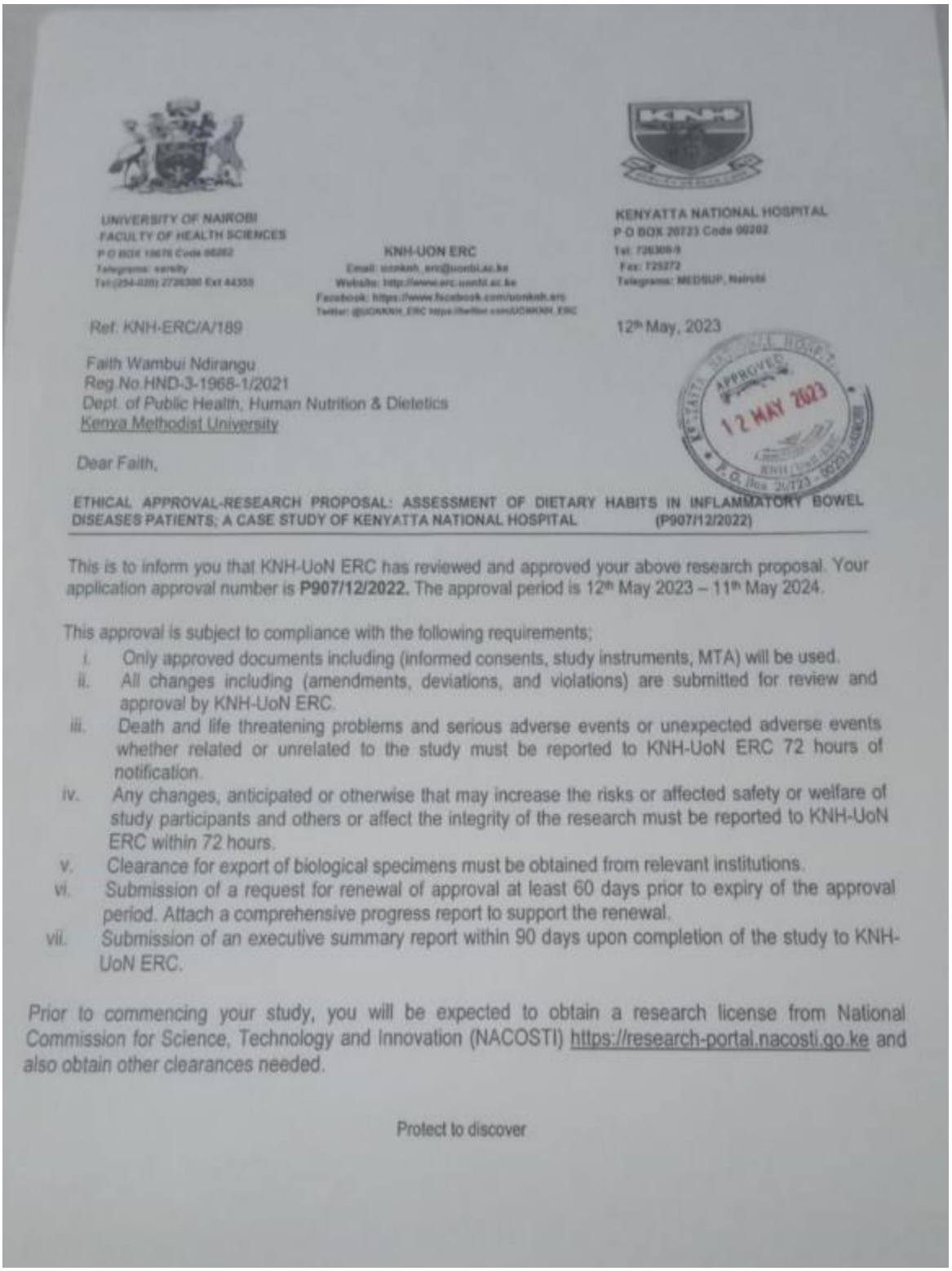
3. Have you been on drugs for a prolonged period prior to your diagnosis that you think could have caused the GIS?

   What condition was it?

   What drugs were you on?

4. Is there anyone in your family who has GIS?
5. Who

Appendix 4: Research Approval Letter



UNIVERSITY OF NAIROBI
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P O BOX 19676 Code 00202
Telegrams: varsity
Tel (254-020) 2726300 Ext 44355

KNH-UON ERC
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Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/189

12th May, 2023

Faith Wambui Ndirangu
Reg.No.HND-3-1968-1/2021
Dept. of Public Health, Human Nutrition & Dietetics
Kenya Methodist University

APPROVED
12 MAY 2023
KNH (UoN-ERC)
P.O. Box 20723 - 00202 NAIROBI

Dear Faith,

ETHICAL APPROVAL-RESEARCH PROPOSAL: ASSESSMENT OF DIETARY HABITS IN INFLAMMATORY BOWEL DISEASES PATIENTS; A CASE STUDY OF KENYATTA NATIONAL HOSPITAL (P907/12/2022)

This is to inform you that KNH-UoN ERC has reviewed and approved your above research proposal. Your application approval number is **P907/12/2022.** The approval period is 12th May 2023 – 11th May 2024.

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by KNH-UoN ERC.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to KNH-UoN ERC 72 hours of notification.
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH-UoN ERC within 72 hours.
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to KNH-UoN ERC.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

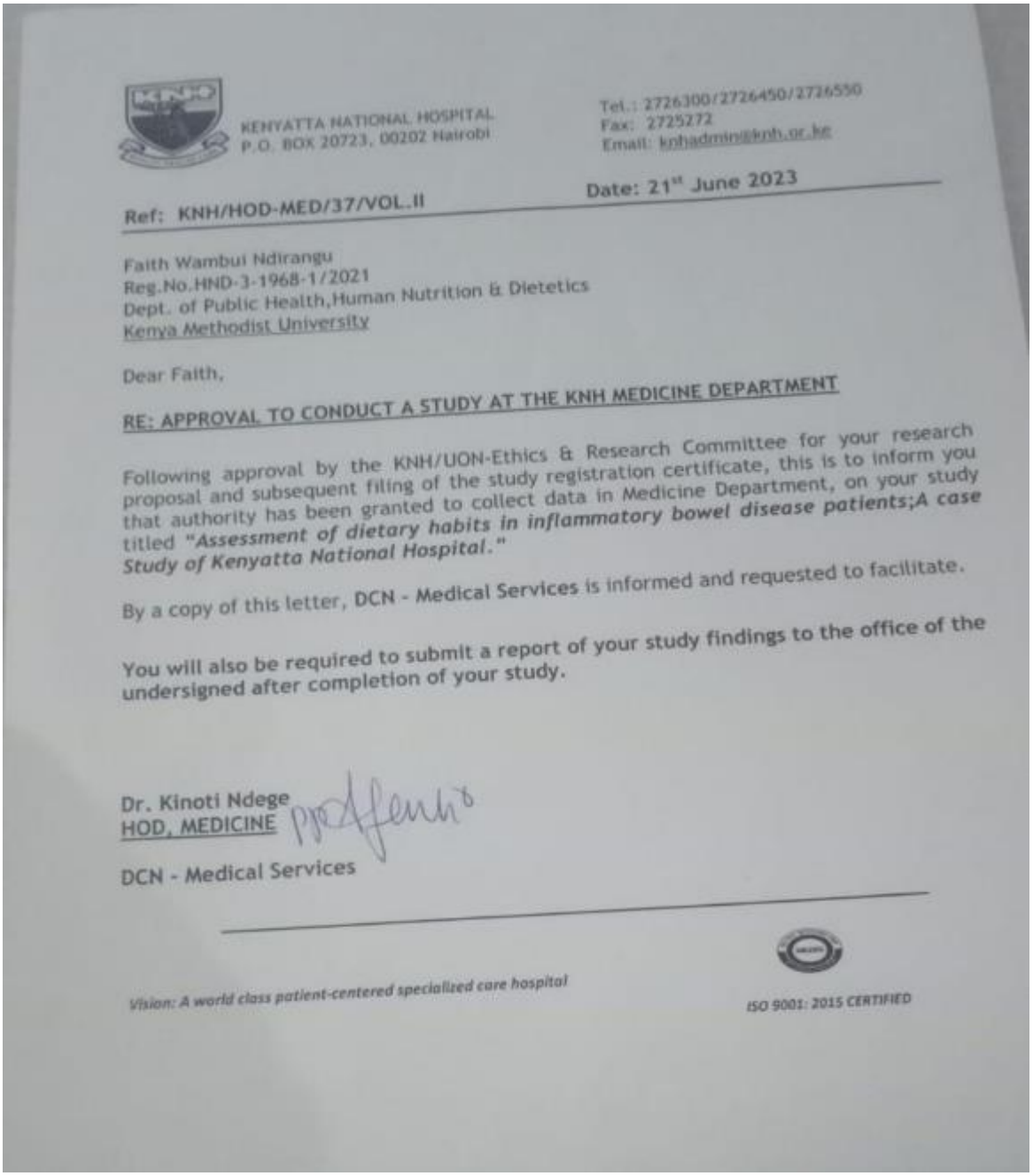
Protect to discover

Yours sincerely,

DR. BEATRICE K.M. AMUGUNE
SECRETARY, KNH- UoN ERC

c.c. The Dean, Faculty of Health Sciences, UoN
The Senior Director, CS, KNH
The Chairperson, KNH- UoN ERC
The Assistant Director, Health Information Dept., KNH
The Chair, Dept. of Public Health, Human Nutrition & Dietetics, Kenya Methodist University
Supervisors: Dr. Job Mapesa, Dept. of Public Health, Human Nutrition & Dietetics, Kenya Methodist University
Ms. Rose Juma, Dept. of Public Health, Human Nutrition & Dietetics, Kenya Methodist University

Appendix 5: KeMU Approval Letter



KENYATTA NATIONAL HOSPITAL
P.O. BOX 20723, 00202 Nairobi

Tel.: 2726300/2726450/2726550
Fax: 2725272
Email: knhadmin@knh.or.ke

Ref: KNH/HOD-MED/37/VOL.II

Date: 21st June 2023

Faith Wambui Ndirangu
Reg.No.HND-3-1968-1/2021
Dept. of Public Health,Human Nutrition & Dietetics
Kenya Methodist University

Dear Faith,

RE: APPROVAL TO CONDUCT A STUDY AT THE KNH MEDICINE DEPARTMENT

Following approval by the KNH/UON-Ethics & Research Committee for your research proposal and subsequent filing of the study registration certificate, this is to inform you that authority has been granted to collect data in Medicine Department, on your study titled *"Assessment of dietary habits in inflammatory bowel disease patients;A case Study of Kenyatta National Hospital."*

By a copy of this letter, DCN - Medical Services is informed and requested to facilitate.

You will also be required to submit a report of your study findings to the office of the undersigned after completion of your study.

Dr. Kinoti Ndege
HOD, MEDICINE

DCN - Medical Services

Vision: A world class patient-centered specialized care hospital

ISO 9001: 2015 CERTIFIED

Appendix 6: NACOSTI Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 215673

Date of Issue: 15/June/2023

RESEARCH LICENSE

This is to Certify that Ms.. Faith Wambui Ndirangu of Kenya Methodist University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: Assessment of dietary habits in inflammatory bowel disease patients: A case study of Kenyatta National Hospital for the period ending : 15/June/2024.

License No: NACOSTI/P/23/26374

215673

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions