EVALUATION OF NUTRITIONAL STATUS, AND ASSOCIATED FACTORS AMONG ADULT GASTROINTESTINAL CANCER PATIENTS AT THE ONCOLOGY DEPARTMENT OF JIMMA UNIVERSITY MEDICAL CENTER JIMMA, ETHIOPIA

INSTITUTE OF HEALTH

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Evaluation of Nutritional Status, and Associated Factors among Adult Gastrointestinal Cancer Patients at the Oncology Department of Jimma University Medical Center Jimma, Ethiopia

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June, 2024

Jimma, Ethiopia

Statement of Declaration

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ABSTRACT

Background:-*Malnutrition is a prevalent issue that significantly contributes to high morbidity and mortality rates among adult patients with gastrointestinal cancer. Increasing evidence shows that alteration of serum biomarkers, nutritional status, and malnutrition associated factors leads to life-threatening complications and influences the clinical prognosis. Yet, there is a lack of adequate empirical data regarding, serum biomarker alteration linked to tonutritional status, and malnutrition associated factors among gastrointestinal cancer patients in Ethiopia.*

Objective:- *This study aimed to evaluate nutritional status, and associated factors among adult gastrointestinal cancer patients at Jimma University Medical Center (JUMC), Ethiopia, in 2024.*

Method:- *A facility-based cross-sectional study design was used among 134 adult gastrointestinal cancer patients at the oncology department of JUMC, Jimma, Ethiopia, from April 1, 2024, to June 25, 2024. The study participants were selected by sing concesus sampling method of all adult gastrointestinal cancer patients who were on treatment during study period. Nutritional status was collected using the subjective global assessment tool. Data entry and statistical analysis were performed using Epi Data Version 3.1 and SPSS version 26, respectively. Descriptive statistics, independent sample t-test, and bivariate and multiple logistic regression were used to determine associations, with a P value ≤ 0.05 considered statistically significant.*

Results:- *Out of 133 participants, 78.9% (95% CI: 71.0-85.5) were malnourished, and the prevalence of electrolyte disorders among adult gastrointestinal cancer patients were 65.4% (95%CI: 56.7 to 73.4). There was a significant decrease in the mean level of Serum Albumin= 3.10±.593 vs. 3.90±.396, P= <.0001; Hemoglobin:11.92±2.083 vs. 13.79±1.410, P= <.0001; Prognostic Nutritional Index: 39.45±7.305 vs. 47.86±5.799, P= <.0001; Geriatric Nutritional Risk Index: 79.73±10.681 vs. 97.83±6.550; P = <.0001, and Nutritional Risk Index: 81.51±10.650 vs. 100.48±6.878, P = <.0001), in malnourished as compared to well-nourished patients respectively.*

Low serum albumin, Stage IV cancer, Poor performance status, and longer duration of illness (25 months or more), increased the risk of malnutrition by 8.29 times(AOR = 8.29, 95% CI: 2.13-32.2, P=.002; 7.59 *times (AOR = 7.59, 95% CI: 1.05-25.3, P=.045; 5.77 times (AOR =* 5.77*, 95% CI:* 1.20-27.6, P=.028), and *had 7.81 times(AOR = 7.81, 95% CI: 1.47- 41.6, P=.016), respectively.*

Conclusion and Recommendation

Malnutrition is highly prevalent among adult gastrointestinal cancer patients. There was a significant decrease in the mean level of serum albumin, hemoglobin, geriatric nutritional risk index, nutritional risk index, and prognostic nutritional index in malnourished as compared to well-nourished patients. These biomarkers are recommended as alternative or supplementary screening tools for early detection of malnutrition in adult gastrointestinal cancer patients.

Keywords: *- Gastrointestinal Cancer, Jimma University Medical Center, Nutritional Status, Serum Biomarkers*

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Abbreviations and Acronyms

ALB	Albumin
BMI	Body Mass Index
CRC	Colo-Rectal Cancer
Hgb	Hemoglobin
GIT	Gastro-Intestinal Tract
GNRI	Geriatric Nutritional Risk Index
GLR	Glucose-to- Lymphocyte ratio
JUIRB	Jimma University Institutional Review Board
JUMC	Jimma University Medical Center
NLR	Neutrophil to Lymphocyte ratio
NRI	Nutritional Risk Index
MNA	Mini Nutritional Assessment
PG SGA	Patient-Generated Subjective Global Assessment
PLR	Platellete to Lymphocyte ratio
PNI	Prognostic Nutritional index
SGA	Subjective Global Assessment
SIADH	Syndrome of Inappropriate Antidiuretic Hormone Secretion
UMS	Universal Malnutrition Scoring tool
TLC	Total lymphocyte count
WHO	World Health Organization

1. INTRODUCTION

1.1. Background

Gastrointestinal cancer refers to malignant conditions of the gastrointestinal tract and accessory organs of digestion(1). Gastrointestinal cancer is a major contributor to global cancer-related morbidity and mortality. In 2018, it accounted for 4.8 million cases and 3.4 million deaths, representing 26% of all cancer cases and 35% of cancer-related deaths worldwide(2,3). The majority of these cases (63%) and deaths (65%) occurred in Asia, while Europe and North America together accounted for 26% of cases and 23% of deaths(4). Colorectal cancer (CRC) is the third most common cancer globally, making up over 10.2% of new cancer cases and 9.2% of cancer-related deaths. Stomach (gastric) cancer follows with 5.7% of new cases and 8.2% of deaths, liver cancer with 4.7% of new cases and 8.2% of deaths, esophageal cancer with 3.2% of new cases and 5.3% of deaths, and pancreatic cancer with 2.5% of new cases and 4.5% of deaths(2,5,6).

In Nigeria, colorectal cancer is the most common gastrointestinal cancer, accounting for 44.5% of cases, followed by liver cancer at 16.5% and gastric cancer at 15.2% (7). In contrast, in Ethiopia, gastric cancer is the leading cause of cancer-related deaths at 13.6%, followed by liver cancer at 10.5%(8,9).

Malnutrition is highly prevalent among adult gastrointestinal cancer patients due to the combined effects of the illness and its treatments, significantly impacting patient outcomes. The prevalence of malnutrition varies worldwide (10). Studies from Germany(11), France(12,13), Spain(14), Turkey(15), Vietnam(16), and Brazil (17) report malnutrition rates between 25% and 85%, with gastrointestinal cancer patients experiencing the highest rates of nutritional intolerance, ranging from 84.3% to 90%(18–21). Study from southern Iran reported that 86.9% of adult gastrointestinal cancer patients were malnourished(22).

A Moroccan study found severe malnutrition in 73% of pancreatic head cancer patients, while 27% had moderate malnutrition(23). In Egypt, 39.6% of patients with liver and gastrointestinal malignancies were malnourished, with the highest rates in gastric cancer patients (49.5%), followed by colorectal cancer patients (39.2%) and liver cancer patients (29.4%) (24).

Research also indicates a high prevalence of muscle wasting in specific cancers: pancreatic cancer (88.9%), gastric cancer (76.5%), and esophageal cancer (25,26). In Ethiopia, the prevalence of malnutrition among cancer patients was high. According to the Patient-Generated Subjective Global Assessment (PG-SGA) score, 63.1% of these patients were malnourished, with 27.5% classified as moderately or severely malnourished (27). Among gastrointestinal cancer types, colorectal cancer patients had the highest prevalence of malnutrition at 56.2%, followed by stomach cancer patients at 46.3%(28). Patients diagnosed with gastrointestinal (GI) cancers face a high risk of malnutrition(22). This is due to various factors, including the accelerated metabolism triggered by tumors, as well as surgical interventions like total or subtotal gastrectomy(29).

Additionally, challenges related to eating and digestion, along with adverse effects of cancer treatments such as early satiety (reported by 69% of patients), alterations in taste (40.3%), nausea or vomiting (31.9%), meat aversion (28.9%), and taste disturbances (16.8%), contribute to malnutrition among these patients (30–33). Malnutrition in patients with gastrointestinal cancer impairs immune function, raises infection rates, and increases the risk of chemotherapy toxicity and postoperative complications (34). This leads to disability, extended hospital stays, reduced quality of life, and lower survival rates(30,35,36).

Nowadays, malnutrition in cancer patients is seen as a potential therapeutic target, with early detection being crucial for risk assessment and timely intervention(37,38). Numerous practical scales exist for early nutritional assessment, including Body Mass Index (BMI), which can lead to misdiagnosis and underestimation of cancer-related malnutrition due to its inability to differentiate between muscle and fat mass, and its susceptibility to factors such as age, sex, edema, height, and measurement errors(39,40). The Subjective Global Assessment (SGA) is currently the most effective and reliable nutritional assessment tool, with high sensitivity (96%) and good specificity (83%)(41–43). However, SGA's complexity and resource requirements make it uncommon in routine clinical practice in developing countries like Ethiopia. As a result, diagnosing malnutrition among cancer patients remains problematic(42), highlighting the need for alternative objective biochemical parameters and improved diagnostic methods. Additionally, there is a lack of studies on malnutrition among adult gastrointestinal cancer patients in Ethiopia

that have been inconsistent and have not adequately addressed routine diagnostic challenges among those populations.

Systemic inflammation is commonly observed in cancer due to pro-inflammatory cytokines released by tumors or immune cells. This inflammation can increase metabolic demands, reduce appetite, and cause accelerated muscle protein breakdown(44). It is closely related to cancer and is often described as a wound that never heals. It plays a role in the onset, growth, spread, aging, and death of malignant cells, contributing to malnutrition among cancer patients(45). It affects key metabolic and neuroendocrine pathways, leading to increased resting energy expenditure, reduced lean body mass, and diminished physical performance(46). Pro-inflammatory cytokines cause hemolysis and disrupt glucose metabolism due to cancer cell accumulation, leading to low hemoglobin (Hgb) levels. This occurs because of the interdependence between heme and glucose metabolism. Additionally, increased hepatic production of IL-6 induces hepcidin, which degrades cellular ferroportin and limits iron availability for heme synthesis(47,48).

In other cases, nutrient deprivation, and high production of cytokines such as TNF-α, IL-2, and IL-6 lead to metabolic disruptions that inhibit albumin gene expression, and synthesis and increase vascular permeability(49,50). Albumin, a protein produced by hepatocytes, is present in serum at 35-50 g/L concentrations. Its production relies on the supply of amino acids, plasma colloid osmolality, cytokine concentrations (mainly IL-6), and the number of active hepatocytes(51). As the most abundant circulating acute-phase protein, albumin is an important antioxidant(52,53). In cancer and cancer-related malnutrition, the overproduction of cytokines such as TNF-α, IL-2, and IL-6 leads to metabolic disorders, inhibiting albumin gene expression and impairing vascular permeability(53). Albumin plays a crucial role in regulating the volume of intravascular spaces. It acts as a nonspecific transporter for various substances, including drugs, hormones, vitamins, calcium, magnesium, bilirubin, fatty acids, and lipids(54–56). Recently, inflammation-based scores and ratios have been recognized as more sensitive markers than conventional ones(57).

Additionally, several factors were significantly associated with hypoalbuminemia in cancer patients. These factors included cancer stage, cancer location, age, gender, anorexia, weight change, malnutrition according to the SGA score, and cancer type. Patients over 64 years old were particularly susceptible to hypoproteinemia. Low hemoglobin (Hgb) levels were also linked to various factors, such as age, gender, weight change, nutritional status, cancer type, cancer stage, and type of cancer treatment(58).

Biochemical markers, often indicative of inflammation, are frequently used to assess malnutrition. As a nutritional marker, Platelet-to-Lymphocyte Ratio (PLR) has been significantly correlated with Prognostic Nutritional index (PNI) and BMI in pancreatic cancer patients, and together with Neutrophil-to-Lymphocyte Ratio (NLR), it has shown significant associations with (PNI) in hepatocellular carcinoma(57). PLR has also been associated with hemoglobin levels and postoperative complications in colorectal cancer patients, influencing morbidity rates(58).

Studies indicate that nutrition interventions based on the (PNI) can help patients maintain their weight, enhance their tolerance to radiotherapy and chemotherapy, and ultimately improve long-term treatment outcomes(59). Additionally, studies indicate that it serves as an independent prognostic factor for patients with various types of cancer and is also used to predict treatment outcomes in these patients(60). Sarcopenia, characterized by loss of skeletal muscle mass, low muscle strength, and reduced physical performance, has been reported to be associated with (NLR) and (PLR) in patients with renal cell carcinoma and gastric cancer(61,62). Therefore, early recognition of systemic inflammation should be a critical part of nutritional assessment in cancer patients to enhance both short-term and long-term outcomes.

In other cases, cancer patients undergoing chemotherapy, taking medications, or experiencing endocrine disorders such as the Syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH) are susceptible to electrolyte disorders (65). These electrolyte imbalances play a crucial role in the prognosis of cancer patients, with disorders such as coagulopathy and renal failure being strong indicators of mortality. They can influence outcomes, increase mortality rates, and affect the length of hospital stays(66). Currently, there is no standard method for assessing, serum biomarker alteration, and its association with nutritional status among gastrointestinal cancer patients. Hence, timely screening of nutritional status in adult gastrointestinal cancer

patients using a comprehensive assessment of all elements is the most reliable strategy to obtain an accurate picture of a patient's nutritional status and to improve their health and quality of life.

Therefore, this study aimed to evaluate nutritional status, and serum biomarkers such as NLR, PLR, Glucose-to- Lymphocyte ratio(GLR), and Nutritional risk assessment tools such as GNRI, PNI, and NRI, previously those considered as malnutrition assessment biomarkers containing serum ALB, TLC, HGB, and Electrolyte status (Na+, K+, CL-) among adult gastrointestinal cancer patients and to provide a basis for nutritional support and individualized care. Also to assess malnutrition-associated factors in gastrointestinal cancer patients.

1.2. Statement of the Problems

Malnutrition is common among adult gastrointestinal cancer patients and negatively impacts clinical outcomes. It accounts for 10% to 20% of cancer-related deaths, rather than the cancer itself (67). There is a high risk of malnutrition among adult gastrointestinal cancer patients(68,69). The risk percentage was found to be (62.0%) up to (84.0%) (70). A study conducted in Brazil stated that the prevalence of malnutrition among gastrointestinal cancer patients was 69.9%, supported by findings of weight loss (73.8%) and a low fat-free mass index (56.8%)(71).

A study involving 154 wards in France revealed that up to 60.2% of patients with esophageal and stomach cancer were malnourished(72). In a Spanish hospital, research on upper gastrointestinal cancer patients showed that more than half experienced weight loss, with 36.8% of those patients losing over 10% of their total body weight(73). Additionally, the nutritional risk for colorectal cancer patients increased from 83.9% to 92.2% after undergoing anti-cancer therapy(74). For pancreatic cancer patients, the incidence of malnutrition was 66.7% (13), indicating a significant association with an increased risk of malnutrition (75).

A study at the Philippine General Hospital found that 76.4% of 292 colorectal cancer patients were malnourished(76). The prevalence or risk of malnutrition increases with the disease's progression, affecting about 60% of patients with advanced cancer(33). For liver cancer patients, malnutrition occurs in 65-90% of cases. It is linked to higher cancer incidence and complications, deterioration of liver function, and early onset of refractory ascites and hepatic encephalopathy(77). A study from the Republic of Korea reported that 86.6% of liver cancer patients and 60.5% of patients with advanced cancer stages (III or IV) were malnourished(78). In Vietnam, research revealed higher malnutrition rates in esophageal cancer patients based on albumin (10.7%), prealbumin (55.8%), and total lymphocyte count (27.2%)(79).

In developing countries like those in Africa, malnutrition among gastrointestinal cancer patients is common. A study in Nigeria found that 60.8% of cancer patients were malnourished according to the Universal Malnutrition Scoring (UMS) tool. In comparison, 60% were malnourished based on the Subjective Global Assessment (SGA) (80). In Ethiopia, the overall prevalence of malnutrition in cancer patients was 58.4%, with male patients experiencing a prevalence of 53.7% and female patients 62.8%.

The rates of malnutrition were notably higher in patients with advanced-stage cancer, with 74.7% of stage four and 58.2% of stage three cancer patients being malnourished(28). Malnutrition in cancer patients leads to several adverse health outcomes, including increased treatment-related toxicity, reduced response to cancer treatment, lower quality of life, poorer overall prognosis, postoperative complications, delayed healing of ulcers and wounds, poor survival rates, anastomosis issues, negative disease outcomes, and increased mortality(81–87).

Malnutrition can also influence clinical decisions, such as the removal of tumors, which is a critical and potentially curative step in cancer management(88). Additionally, malnutrition results in prolonged and repeated hospitalizations, increasing the demand for healthcare resources and leading to significant economic impacts. A study conducted in France found that malnutrition among cancer patients significantly increased hospital costs by approximately €3,360 per patient, resulting in an annual impact of €10,159,436(89).

Poor nutritional status significantly impacts the physical, social, emotional, and functional well-being of elderly cancer patients(90). The study reported that 63.6% of patients with high social support from friends experienced weight loss, while 52.6% of those with moderate social support reported weight gain(91). Weight loss associated with chemotherapy contributes to poor physical and social functioning, while weight gain from certain treatment regimens can have adverse effects on emotional and social well-being (92).

Malnutrition in cancer patients also contributes to psychological issues, with anxiety and depression being common problems. A cross-sectional study of hospitalized cancer patients found that up to 54% of patients may experience anxiety, and 45.3% may experience depression. These psychological issues can further complicate the management and outcomes of cancer treatment(93,94). Previous research in Ethiopia has primarily focused on the prevalence and associated factors of among adult cancer patients, but it has not specifically examined the burden of nutrition, changes in serm biomarkers alteration, and hematological parameters like hemoglobin and total lymphocyte count in adult gastrointestinal cancer patients.

There is a notable gap in the evidence concerning the extent and impact of malnutrition in adult gastrointestinal cancer patients, as well as the characteristics that put this population at risk of malnutrition. This research area is often neglected despite the adverse clinical outcomes and the increasing prevalence and complications associated with malnutrition in this group.

Even though the prevalence and consequences of malnutrition are recognized, it remains frequently underdiagnosed and undertreated. This issue may stem from the lack of a universally accepted "gold standard" for defining nutritional status and the absence of a nutritional screening policy. Thus, it is crucial to use validated nutritional screening and assessment tools for the early detection of nutritional status among adult gastrointestinal cancer patients. Various criteria combinations, different cut-offs, and assessment methods have been reported, all contributing to the variability in malnutrition prevalence. However, no universally accepted nutritional assessment method is considered the most accurate and validated for identifying malnutrition. Common nutritional assessment indices and tools, such as BMI, SGA, PG-SGA, and Mini Nutritional Assessment(MNA), have limited evaluation of prognostic validity among cancer patients.

Moreover, few studies have directly compared the accuracy of various nutrition assessment methods within the same sample(46–49). While the importance of diagnosing and treating comorbidities is widely acknowledged, electrolyte disorders in cancer patients often do not receive sufficient attention. In certain diseases, electrolytes are used for diagnosis and monitoring, but the specific issue of electrolyte disorders has not been adequately emphasized among gastrointestinal cancer patients.

To the best of our knowledge, no studies have investigated serum bio-markers, nutritional status, and associated factors among adult gastrointestinal cancer patients. Research assessing nutritional status and blood biomarkers in adult cancer patients is limited, despite the rising incidence of malnutrition and its detrimental impact on quality of life.

Electrolyte disorders in cancer patients are also often overlooked, despite their diagnostic and monitoring significance in other diseases. There is a lack of research on the magnitude of electrolyte disorders among adult gastrointestinal cancer patients, despite the known impact of electrolyte disorders on treatment outcomes and quality of life. Therefore, this study aims to determine the magnitude and correlation of serum bio-markers alteration such as Neutrophil-to-Lymphocyte Ratio (NLR), Platelet-to-Lymphocyte Ratio (PLR), Glucose to Lymphocyte Ratio (GLR), Geriatric Nutritional Risk Index (GNRI), as well as Prognostic Nutritional Index (PNI), Nutritional Risk Index (NRI), Albumin (ALB), Total Lymphocyte Count (TLC), Hemoglobin(HGB), electrolyte(Na+, K+, and Cl-), and nutritional status among adult

gastrointestinal cancer patients. Additionally, it aims to assess factors associated with malnutrition in these patients.

1.3. Significance of the Study

The prevalence and complications of malnutrition among adult cancer were high in Ethiopia, yet studies examining the link between nutritional status at diagnosis and disease progression complications are scarce among adult gastrointestinal cancer patients. Since malnutrition significantly impacts clinical outcomes and patient quality of life. This study aims to provide a foundation for improving nutritional support and personalized care for gastrointestinal cancer patients.

Early evaluation of nutritional status, serum biomarkers, and associated risk factors is crucial for healthcare providers to understand the effects of cancer and its treatments on patients' nutrition. This knowledge is essential for effective cancer management and improving patient survival rates. Identifying high-risk patients early and establishing comprehensive nutritional and clinical standards can improve survival, reduce morbidity and mortality, shorten hospital stays, minimize functional impairments, and lower healthcare costs.

This study serves as a valuable resource for cancer patients by educating them on the critical aspects of nutrition and its role in their treatment, encouraging proactive management of their nutritional health to improve their therapy outcomes and overall well-being. It also highlights the need for diagnosing and managing electrolyte disorders in adult gastrointestinal cancer patients.

Additionally, it aims to enhance healthcare workers' knowledge of early nutrition assessment using standard techniques and biomarkers before starting cancer treatment. For policymakers, program planners, educators, the Ministry of Health, and the JUMC oncology department, the findings will provide a basis for developing evaluation and follow-up tools for health workers, aiding in designing effective strategies to tackle existing challenges.

Overall, this study will deepen our understanding of nutritional status, serum bio-marker changes, electrolyte status, and associated factors among adult gastrointestinal cancer patients providing detailed knowledge, and helping to identify common dietary deficiencies and the impact of cancer on patients' nutritional health. It will inform future research, policy, and

practice to improve gastrointestinal cancer patients' care and outcomes and guide directions, policy formulations, and clinical practices in Ethiopia.

2. LITERATURE REVIEW

Gastrointestinal cancers, which include stomach, liver, esophageal, pancreatic, and colorectal cancer (CRC), collectively account for more than a quarter of all cancers worldwide (95). In 2020, esophageal cancer was estimated to cause over 600,000 new cases and more than 500,000 deaths globally, according to data from the GLOBOCAN database (96). Gastric cancer had approximately 1.1 million new cases and over 700,000 deaths in the same year (98). Similarly, colorectal cancer (CRC) has been on the rise, with an estimated 1.9 million new cases and 900,000 deaths reported globally (97).

Among these gastrointestinal cancers, colon cancer is the most common in terms of new cases (10.0%), followed by stomach cancer (5.6%). In terms of cancer-related deaths, colorectal cancer leads (9.4%), followed by liver cancer (8.3%) and stomach cancer (7.7%) (98). These statistics underscore the significant global burden of gastrointestinal cancers in terms of both incidence and mortality.

In 2022, colorectal cancer (CRC) remains a significant health issue globally, accounting for more than 1.85 million cancer cases, which is 9.8% of all cancer cases, and causing 850,000 deaths annually, representing 9.2% of all cancer-related deaths (99). CRC is the third most commonly diagnosed malignancy and the second leading cause of cancer-related death. Esophageal cancer ranks as the fourth most common type of gastrointestinal cancer, while gastric cancer is the fifth most common but the third most common cause of cancer-related deaths. Liver cancer ranks third in incidence and mortality among GI cancers. Pancreatic cancer is the least common of the five major gastrointestinal cancers, ranking as the 12th most common cancer globally (95).

In Africa, liver and colon cancers are the predominant cancer types, accounting for 48% and 45% of new cases and deaths, respectively, among the five most common gastrointestinal cancers. In 2020, countries such as Egypt, Nigeria, South Africa, Ethiopia, and Morocco reported the highest incidence and mortality rates for gastrointestinal cancers. These countries collectively account for 45% of cancer cases and 44% of cancer deaths in Africa (100).

In Ethiopia, between 2014 and 2019, the most commonly diagnosed cancers were esophageal cancer (9.5%), colorectal cancer (5.2%), and gastric cancer (4.9%) (101). Cancer wasting syndrome, affecting approximately 50-80% of cancer patients, contributes to 20% of cancer-related deaths (103). These statistics highlight the significant burden of gastrointestinal cancers in Africa and the specific challenges faced in Ethiopia, underscoring the need for improved prevention, early detection, and management strategies(102).

Malnutrition is a prevalent issue among cancer patients, particularly those with gastrointestinal cancers. At University Hospital Rio Grande do Sul, Brazil, the prevalence of malnutrition was reported to be 77%, with severe weight loss affecting 40% of patients and reduced food consumption in 41.7%. Gastrointestinal symptoms were associated with 75% of cases, and changes in functional capacity were observed in 78% of patients, necessitating significant nutritional interventions. According to biochemical parameters revealed decreased serum albumin levels in 56% of patients and low total lymphocyte count in 76% associated with malnutrition (103).

Similarly, a study in Spain utilizing the (PG-SGA) found that the greatest weight loss was seen in patients with esophageal tumors (57%) and stomach tumors (50%). About 68% of patients experienced severe eating problems, with anorexia being the primary issue for 42.2% of them. Approximately 52% of patients were moderately or severely malnourished, and 97.6% required some form of nutritional intervention(104). These studies underscore the significant impact of malnutrition on cancer patients, highlighting the need for comprehensive nutritional assessments and interventions to improve outcomes and quality of life in these individuals.

A study in France found that 39% of cancer patients suffered from malnutrition. The prevalence of malnutrition varied among different gastrointestinal cancer sites: stomach cancer (60.2%), colon/rectum cancer (39.3%), and pancreatic cancer (66.7%) (13). In Thailand, a prospective study on elderly cancer patients reported that 47% of adult cancer patients experienced gastrointestinal complications related to chemotherapy. Overall, 83% had some form of toxicity, and 42% had severe outcomes. Chemotherapy modification due to toxicity was necessary in 51.6% of cases (105).

In Korea, a study showed that 61% of cancer patients were malnourished. Malnutrition rates were higher in male patients with longer hospital stays (60.2%) and female patients who were re-hospitalized (66.6%). Patients with liver cancer and those in advanced cancer stages (86.6% and 60.5% respectively, stages III or IV) had a higher prevalence of malnutrition compared to other patients (78).

A prospective study conducted in Australia found that 80% of patients were classified as PG-SGA class-A, indicating good nutritional status, while 20% were classified as PG-SGA-B. None of the patients were classified as PG-SGA-C. Ovarian cancer patients had significantly lower serum albumin levels and higher PG-SGA scores compared to patients with other types of cancer and benign conditions. About 67% of ovarian cancer patients were classified as PG-SGA-B(106).

In the same area, an observational cross-sectional study reported that 49% of cancer patients were malnourished according to PG-SGA, and 46% required advanced symptom control and nutritional intervention. The most common symptoms affecting nutrition were taste changes (31%), loss of appetite (24%), and nausea (24%) (107). These studies underscore the high prevalence of malnutrition among cancer patients and highlight the significant impact of cancer type, stage, and treatment on nutritional status. Effective dietary assessment and intervention are crucial to improve outcomes and quality of life for these patients.

On the other hand, a cross-sectional study conducted by the Uganda Cancer Institute found that gastrointestinal lymphoma and esophageal cancer were the most common gastrointestinal cancers, accounting for 34% and 20.2%, respectively. Among these patients, 11.8% were severely malnourished, 9.4% were moderately malnourished, and 7.3% were mildly malnourished (108). Similarly, a cross-sectional conducted at Libya found that according to the Subjective Global Assessment (SGA), 25% of individuals were severely malnourished, 73.5% were moderately malnourished or suspected of being malnourished, and only 1.5% were well-nourished (109).

A cross-sectional study at Jimma University Medical Center found that the prevalence of malnutrition among cancer patients was 61.4%. Of these patients, 14% had extremely severe malnutrition and 47.4% were moderately malnourished. The study also revealed high rates of hypoalbuminemia (49.4%), hypoproteinemia (34.1%), and low hemoglobin (50%). Malnourished patients had lower average serum albumin, total protein, and hemoglobin levels compared to well-nourished patients. Serum albumin and hemoglobin levels were significantly correlated with the Subjective Global Assessment (SGA) tool(58).

The study identified that stage IV cancer, gastrointestinal (GI) cancers, and malnutrition were significantly associated with hypoalbuminemia. Additionally, age older than 64 years was significantly associated with hypoalbuminemia, while stage IV cancer and malnutrition were primarily associated with low hemoglobin levels(58). These findings underscore the significant impact of malnutrition on biochemical parameters and the association with cancer stage and type, highlighting the importance of nutritional assessment and intervention in cancer care to improve patient outcomes.

Malnutrition affects approximately 70-75% of individuals diagnosed with cancer worldwide and is prevalent in low-income countries like Ethiopia. The incidence varies based on cancer type, location, stage, and social factors, impacting the quality of life in terms of health, social, psychological, and economic aspects.

Most evidence regarding the risk and prevalence of malnutrition comes from studies involving all cancer types, without a specific focus on nutritional and blood biomarker status among adult gastrointestinal cancer patients. Moreover, many high-quality studies have been conducted in hospitals outside Ethiopia, which may limit the generalizability of their results to Ethiopian cancer patients, particularly those with advanced gastrointestinal cancers. Previous studies in Ethiopia on malnutrition among cancer patients have been largely cross-sectional and focused on general cancer types, lacking specific details on nutritional status, serum biomarker changes,the magnitude of electrolyte disorders, and associated factors among adult gastrointestinal cancer patients.

Serum biomarkers are potentially valuable prognostic markers that may inform treatment decisions, yet their utility in older patients with gastrointestinal solid tumors remains unclear. Therefore, this study aims to evaluate the nutritional status of adult gastrointestinal cancer patients, assess the association of serum biomarkers with nutritional status, and describe factors associated with malnutrition during cancer treatment among adult gastrointestinal cancer patients.

2.1. Serum Bio-Markers of Malnutrition

There are several clinical, biochemical, and physiological markers used to assess malnutrition in cancer patients. One commonly used clinical marker is the percentage of weight loss over a specific period(110). A weight loss of more than 5% in the past month or more than 10% over the last 3–6 months is considered significant malnutrition. Other anthropometric measurements such as body mass index (BMI), mid-arm circumference, and mid-upper-arm muscle area provide additional information about nutritional status and body composition(111,112). The American Society for Parenteral and Enteral Nutrition guidelines for diagnosing malnutrition incorporate these clinical indices and more (113).

Albumin is a serum hepatic protein with a half-life of 14–20 days, comprising approximately half of the total protein content (3.5 g/dL to 5 g/dL) of plasma in healthy humans. It is released into the bloodstream at a rate of about 10 to 15 grams per day(114). Due to its relatively long half-life and hepatic synthesis, albumin is considered as non-specific marker of malnutrition. However, its serum levels are down-regulated in response to inflammatory conditions and certain medications, particularly those affecting the liver, despite being a negative acute-phase protein(115). Albumin is widely used as a nutritional and prognostic marker in cancer patients, although it primarily reflects inflammatory responses. Frutenicht et al. identified albumin as a mortality predictor in patients with gastrointestinal tumors(116,117).

Cytokines are a broad category of small proteins that are crucial in cell signaling. They are secreted by certain cells of the immune system and have an effect on other cells. They play a role in immune responses, inflammation, and hematopoiesis (formation of blood cells). They can be pro-inflammatory or anti-inflammatory. Includes interleukins, interferons, tumor necrosis factors (TNFs), growth factors, and chemokines(118,119).

Interleukins are a specific type of cytokine. Initially, they were thought to be expressed only by leukocytes (white blood cells) and act on leukocytes, hence the name "interleukin". They are involved in various immune functions, including cell activation, differentiation, and proliferation. Each IL has a specific role in immune responses. Examples: IL-1, IL-2, IL-6, IL-10, etc. For instance, IL-6 is known for its role in inflammation and its regulation of immune responses(120,121).

Numerous studies have shown that albumin is significantly correlated with Subjective Global Assessment (SGA), indicating that hypoalbuminemia is a marker of malnutrition. Recent findings in 128 colorectal cancer patients demonstrated that serum albumin levels were influenced by the expression of circulating cytokines such as TNF-α and IL-10. Albumin levels are associated with weight loss in cancer patients as well as with BMI (122). Albumin serves as a major carrier for many substances in the body and helps maintain plasma oncotic pressure. It also supports immune activation, aids in DNA synthesis, and acts as an antioxidant(123,124).

Other nutritional assessment tools include questionnaires that incorporate factors such as estimation of nutritional intake, laboratory parameters, and calculation of unintentional weight loss (121). Such instruments that have been utilized in cancer patients include the Prognostic Nutritional Index (PNI), Geriatric nutritional index (GNRI), Controlling Nutritional Status, and Nutritional Risk Index (NRI), (122,123). Additionally, the Neutrophil-to-Lymphocyte Ratio (NLR), Glucose-to-Lymphocyte Ratio (GLR), and Platelet-to-Lymphocyte Ratio (PLR) are used as biomarkers of inflammation and malnutrition in adult cancer patients (123).

Many studies have demonstrated the relationship between NLR and nutritional status, particularly in severely malnourished cancer patients and those experiencing significant weight loss (128). PLR, another hematological ratio and inflammation marker, has been associated with various conditions, including cancers, and elevated PLR is linked to increased all-cause mortality(129). PLR serves as a prognostic marker in different cancers and is also associated with nutritional status (130).

Additionally, PLR has been significantly associated with both BMI and hemoglobin levels in gastric cancer patients(131), and both PLR and NLR are significantly related to Nutritional Risk Score, albumin levels, hemoglobin levels, and cancer stage (132). NLR and PLR have also been reported to be significantly associated with performance status in cancer patients(133).

2.2. Factors related to malnutrition in cancer patients

Research focusing on older adults with cancer identified significant risk factors for malnutrition, including older age, cancer stage, frailty, memory loss, severe depression, and decline in physical function and activity (134). In Spain, a study reported that 55.0% of cancer patients experienced eating problems during treatment, and 64.0% were affected by consequences of previous illness or injury (135). Similarly, a cross-sectional study in Iran found that common factors contributing to nutritional symptoms included depression (38.8%), anorexia (37.8%), dry mouth (32.5%), nausea (25%), and pain (23.1%) (136).

A cross-sectional study conducted at a Cancer Hospital in Baghdad identified breast cancer as the most common type (34%), followed by lung cancer (18%). Among the study sample,one-quarterr (26%) were well-nourished (SGA-A), 59% were moderately malnourished (SGA-B), and 15% were severely malnourished (SGA-C). The study found significant associations between severe malnutrition and factors such as gender, BMI, eating regularity and meal type, changes in appetite, dry mouth, chewing problems, difficulty swallowing, and anorexia. Severe malnutrition was more prevalent in patients with cancers of the nasopharynx, esophagus, and upper gastrointestinal tract (137).

Gastrointestinal cancers carry a high risk of malnutrition, with rates reported up to 90%, largely due to treatment side effects including oral health problems, digestive disorders, intestinal issues, and metabolic changes(138). Weight loss during chemotherapy varies widely (40-91.6%) depending on the cancer site. Common gastrointestinal symptoms associated with chemotherapy and changes in nutritional status include dry mouth, nausea, stomach pain, diarrhea, and constipation(139).

Risk factors for severe postoperative malnutrition among gastrointestinal cancer patients include age, preoperative weight loss, gastric cancer, and open surgery (140). Treatment-related effects decrease slowly during treatment but remain significant. For instance, the prevalence of loss of taste decreased from 55% to 21%, dry mouth from 56% to 42%, difficulty swallowing from 57% to 43%, and dental problems from 33% to 21%(88).

A cross-sectional study conducted at a health facility in Nairobi, Kenya found that the prevalence of malnutrition was 13.4%, with 33.1% at risk of malnutrition (12.5% at average risk and 20.6% at high risk). Age, cancer site, smoking, and male gender were identified as predictors of malnutrition(141). In Ethiopia, risk factors for malnutrition in cancer patients include cancer stage, anorexia, and diarrhea (28).

Similarly, a cross-sectional study conducted at Hawassa University Comprehensive Specialized Hospital on adult cancer patients reported that educational status, wealth index, food security, type of nutrition, cancer stage, chemotherapy cycle, presence of comorbidities, anxiety, overall functional status, nausea, appetite, vomiting, and diarrhea closely correlated with nutritional status. The prevalence of malnutrition and associated risk factors in cancer patients is a significant concern across various study sites(142).

In developing countries like Ethiopia, malnutrition rates and related factors in cancer patients are high. In developing countries like Ethiopia, malnutrition rates and related factors in cancer patients are high. Factors contributing to decreased nutritional status in cancer patients include tumor type and location, length of hospital stay, immune-compromised status, and chemotherapy. Current nutritional screening procedures in Ethiopian hospitals are inadequate, leading to increased morbidity and mortality in advanced gastrointestinal cancer patients.

Therefore, this study aims to evaluate nutritional status, among adult gastrointestinal cancer patients. The study seeks to provide a basis for nutritional support and individualized care, as well as to assess factors associated with malnutrition in gastrointestinal cancer patients.

2.2. Conceptual Framework

This conceptual framework proposes that the stage of cancer, type of treatment, socio-demographic factors, lifestyle-related factors, serum biomarkers, and feeding-related factors that influence nutritional status among adult gastrointestinal cancer patients. Understanding these relationships will guide the development of effective nutritional support strategies and improve patient outcomes figure 1 (58,142,143).

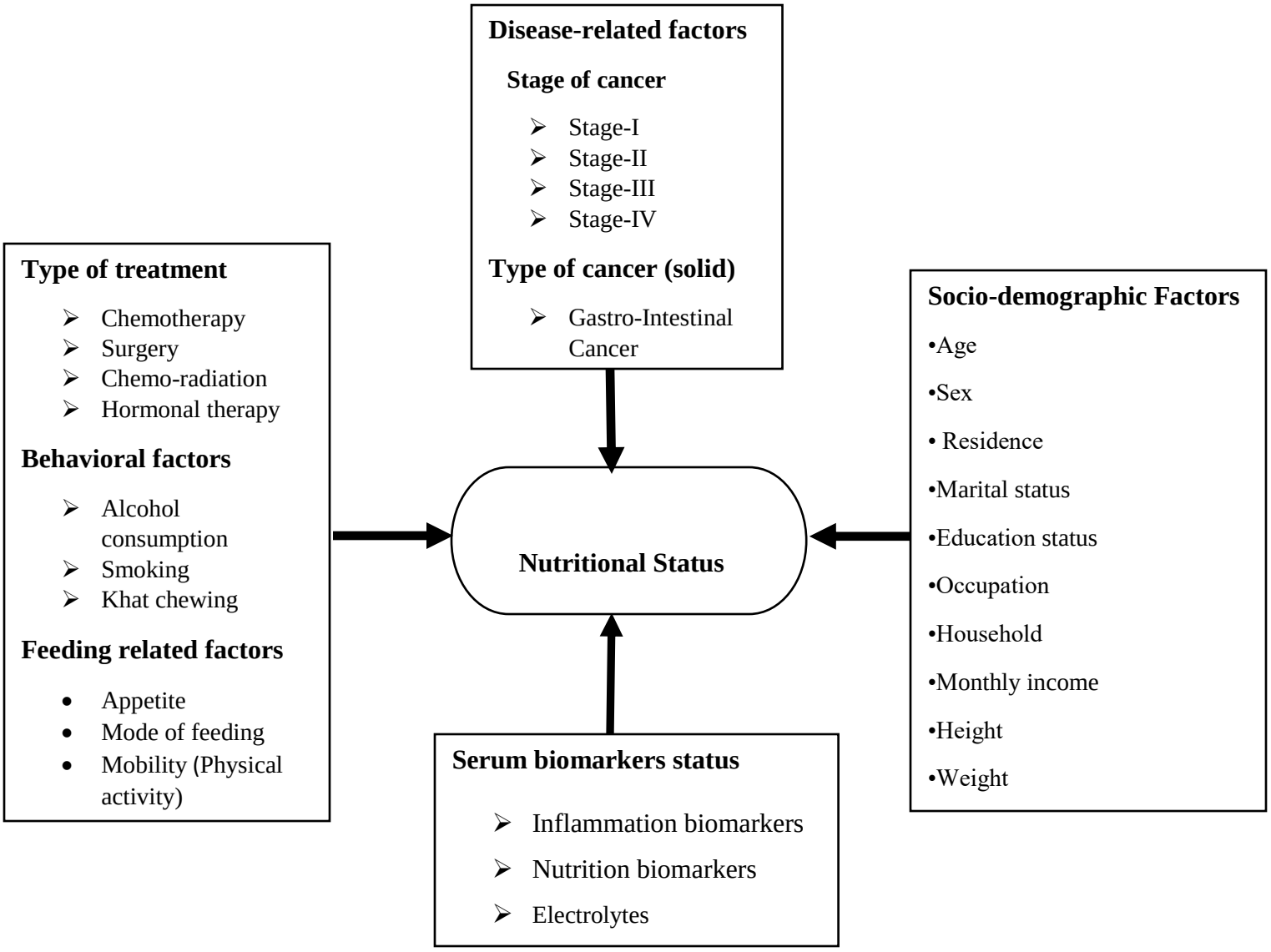

Figure 1. Conceptual framework of Evaluation of Nutritional Status, and Associated Factors among Adult Gastrointestinal Cancer Patients at the Oncology Department of JUMC, 2024.

3. Objectives

3.1. General Objective

To evaluate nutritional status, and associated factors among adult gastrointestinal cancer patients at the oncology department of JUMC, Jimma, Ethiopia from April 1, 2024, to June 25, 2024.

3.2. Specific Objectives

1. To assess nutritional status among adult gastrointestinal cancer patients at the oncology department of JUMC from April 1, 2024, to June 25, 2024.
2. To evaluate the status of serum biomarkers in adult gastrointestinal cancer patients at the oncology department of JUMC from April 1, 2024, to June 25, 2024.
3. To determine electrolyte levels among adult gastrointestinal cancer patients at the oncology department of JUMC from April 1, 2024, to June 25, 2024.
4. To identify associated factors of malnutrition among adult gastrointestinal cancer patients at the oncology department of JUMC from April 1, 2024, to June 25, 2024.

4. Methods and Materials

4.1 Study Area and Period

The study was conducted at the Jimma University Medical Center (JUMC) oncology department from April 1, 2024, to June 25, 2024, GC. JUMC is the largest public and teaching hospital with a capacity of 800 beds. It is located in the town of Jimma, 346 km southwest of Addis Ababa, Ethiopia. Currently, the hospital provides services to 20,000 inpatients and 160,000 outpatients (144). The first comprehensive cancer treatment center was officially opened for service on February 19, 2022, at Jimma University. First the pediatric oncology department was established about five years ago, while the adult oncology department was opened two years ago. The hospital's oncology department provides diagnostic, surgical, chemotherapy, Radiotherapy, and Hormonal treatment services. The cancer treatment center offers treatments twice a month (145).

4.2 Study Design

A facility-based cross-sectional study design was employed

4.3 Population

4.3.1 Source Population

The source population was all diagnosed adult cancer patients at the JUMC oncology department.

4.3.2 Study Population

The study population was gastrointestinal cancer patients aged ≥ 18 years old who were on treatment at the JUMC oncology department during the study period.

4.3.3 Inclusion and Exclusion Criteria

Inclusion criteria

- ≥18 years of age or older
- A competent person who can give written informed consent

Exclusion criteria

- Patients with underlying psychiatric illnesses
- Active medical conditions
- Hearing disorders, or communication disorders

4.4 Sample Size Determination

The sample size was calculated using a single population proportion formula with a 5% margin of error (d) and a 95% confidence interval (alpha = 0.05), based on the dependent variables and associated factors.

$$\frac{Z^2 p(1-p)}{d^2}$$

Where, (P) = prevalence rate, d = the margin of error, Confidence level (CI) = 95%, n= Sample size, Z= Value of standard normal distribution (Z-statistic) at 95% confidence level (Z=1.96), n= (Zα2/ 2) P (1-P) / d2, n = 3.8416 (0.463) (1-0.463) / (0.05)2, n=3.8416(0.463) (0.537)/0.0025, n= 383.0564≈383. Z α/2= critical value at 95% confidence level of certainty (1.96), d = margin error between the sample and the population.

1ST Since there no study conducted on prevalence of malnutrition among adult gastrointestinal cancer patients in Ethiopia we take study conducted at Egyptian Adults with Hepatic and Gastrointestinal Malignancies that revealed prevalence of malnutrition was 39.6%(146).

$$\frac{Z^2 p(1-p)}{d^2} = \frac{1.96^2 0.396(1-0.396)}{0.05^2} = 367.5396 \approx 368$$

2nd For the second out come variable (serum biomarkers), even if its independent variables we considered as out come variable to investigate the association between serum biomarkers alteration, and nutritional status by taking the magnitude of hypoalbuminemia, the low Hgb level was 49.4%, and 50%(58). By taking the highest P-value hypoalbuminemia (49.4%), we calculated as follows:

$$\frac{Z^2 p(1-p)}{d^2} = \frac{1.96^2 0.494(1-0.494)}{0.05^2} = 384.104681 \approx 384$$

Then by Considering the source population of 176 (the total number of adult gastrointestinal cancer patients at JUMC's oncology department over three months)(145), and taking the highest P-value the final sample size (Nf) was adjusted using the following formula:

$$N_f = \frac{n}{1+\frac{n}{N}} = \frac{384}{1+\frac{384}{176}} = \mathbf{122}$$

After accounting for a 10% non-response rate, the final sample size was determined to be **134.**

4.5 Sampling Procedure and Sampling Technique

The study sample was conducted by consequetive sampling technique and all adult gastrointestinal cancer patients who were on treatment and met the sampling criteria during the study period. During data collection, **134** eligible adult gastrointestinal cancer patients receiving treatment were enrolled, of which one patient unable to respond the intervie. The sample was proportionally allocated based on the treatment size for both inpatient and outpatient adult patients with gastrointestinal cancer, using the case flow rate from the previous month.

4.6 Study Variables

4.6.1 Independent Variables

- **Socio-demographic factors**: Age, sex, educational status, marital status, residence, occupation, monthly income.
- **Behavioral Factors:** Alcohol consumption, cigarette smoking, and khat chewing.
- **Clinical Information:** Type of cancer, duration of illness, number of treatment cycles, stage of cancer, performance status, and comorbidities
- **Feeding habits:** Eating within the past 24 hours, route of feeding, feeding habits in the past week, regular breakfast consumption, fasting, fluid intake, and eating methods.
- **Serum Biomarkers:** Nutrition biomarkers, Inflammation biomarkers, and electrolyte status.

4.6.2 Dependent Variables

- Nutritional status

4.7 Data Collection Technique

Data collection was carried out by two nurses from the oncology unit and laboratory technologists. The methods employed included the use of questionnaires, taking anthropometric measurements, reviewing medical records, and conducting laboratory tests on blood samples.

Face-to-face interview: Conducted to collect sociodemographic characteristics and nutritional status using validated questionnaires. This included demographic data (age, gender), health-related behavioral variables (feeding habits, alcohol consumption, cigarette smoking, khat chewing), educational status, and clinical information was collected from a self-reported questionnaire and document review.

Document review: Information about the diagnosis, cancer type and stage, symptoms, chemotherapy regimen, and duration of illness was obtained from the oncologist and patient's medical records using a standardized data collection form.

Laboratory Investigations:- Done by Laboratory Technologist to assess serum biomarkers such Complete blood count, FBS, Serum albumin, and electrolytes such as Na, K, and Cl.

Questionnaires

Data were gathered using the WHO STEPS Questionnaire(147), which was adapted to fit the local context in line with the study objectives. Additionally, the WHO Performance status(148), and the Subjective Global Assessment (SGA)(149), tool were utilized.

Subjective Global Assessment (SGA):

The instrument used to assess the nutritional status of adult cancer patients was the Subjective Global Assessment (SGA) tool, which was adapted by (150), and translated into Amharic for use with Ethiopian cancer patients(28,58). This modified version of the SGA tool was originally adopted from a study conducted in Canada (149), The SGA includes both a medical history and a physical examination, and it classifies patients into three categories: A (well-nourished), B (moderately malnourished), and C (severely malnourished).

In the SGA assessment, a score of "B + C" indicates malnutrition, with scores of SGA < 17 signifying well-nourished patients and SGA ≥ 17 indicating malnourished patients. This was used to assess nutritional status, with a sensitivity of 96% and specificity of 83%.

Anthropometrics measurements

Body Mass Index (BMI) was calculated using the formula

- **BMI=** $\frac{\textbf{Weight (kg)}}{\textbf{Height (m)2}}$

BMI values were categorized according to WHO guidelines as follows:

- <18.5 kg/m²: Underweight
- 18.5 to 24.9 kg/m²: Normal weight
- 25 to 29.9 kg/m²: Overweight
- ≥30 kg/m²: Obesity(151,152)**.**

Height measurement:

- Participants' height was measured using a stadiometer.
- Subjects were asked to remove their shoes, stand erect, and look straight ahead.
- The measuring board ensured that the shoulder blades, buttocks, and heels touched the board.
- Height was recorded to the nearest 0.1 cm.

Weight measurement:

- Weight was measured using a beam balance scale.
- The scale was checked for zero before and after each measurement.
- Participants were asked to remove heavy clothing before measurements.
- Weight was recorded to the nearest 0.1 kg.

These standardized procedures ensured accurate BMI calculations and precise measurements of height and weight for the study participants.

Biochemical tests and analysis

After obtaining informed consent, interviews and detailed reviews of the medical records were conducted. Using aseptic techniques, oncology unit nurses drew five milliliters of venous blood from eligible adult gastrointestinal cancer patients using a sterile syringe. Of this, 2.5 ml was placed in a Serum Separator (SS) tube for serum albumin and electrolyte analysis, while the remaining 2.5 ml was placed in an Ethylene-Diamine-Tetra-Acetic acid (EDTA) tube for complete blood count analysis. The blood in the EDTA tube was gently mixed to prevent hemolysis and clot formation before being sent to the hematology laboratory of JUMC within 30 minutes of collection for CBC determination. CBC was analyzed using a fully automated hematology analyzer, the UniCel DxH 800 (Beckman Coulter, USA), by a qualified laboratory professional with the assistance of the principal investigator (PI).

Simultaneously, the blood sample in the SS tube was allowed to stand for 30 minutes at room temperature to complete clotting and clot retraction. It was then centrifuged at 4000 rpm for 10 minutes to separate the serum from the whole blood and stored at -20 °C until analysis. Serum albumin levels were determined using an automated Cobas® 6000 chemistry analyzer (Roche Diagnostics, Germany), in the clinical chemistry unit at JUMC by a qualified laboratory professional with the assistance of the PI. Serum electrolytes (Na^+, K^+, Ca^{2+}, and Cl^-) were analyzed at Jimma Medical Center's laboratory using the HumaLyte Plus5 ion-selective electrolyte analyzer from Germany, adhering to standard operating procedures.

This analyzer employs direct ISE technology, allowing it to test various ISE parameters with automatic maintenance through washing and rinsing. As a benchtop device, it is suitable for any laboratory, offering a closed system with a sample analysis time of under 60 seconds. It measures Na^+, K^+, Cl^-, Ca^{2+}, and pH, requiring a sample volume of 150 µl and includes an autosampler capable of handling STAT and 20 samples. The results for each participant were documented on a laboratory result registration form.

The study employed rigorous laboratory techniques and equipment to analyze hematological parameters, serum albumin, and serum electrolytes. These procedures ensured accurate and reliable data collection for assessing the nutritional and health status of the study participants. In this study, various serum biomarkers were defined and assessed. Here's an overview of each biomarker and its calculation:

Glucose-to-Lymphocyte Ratio (GLR):

Studies reported that the preoperative glucose-to-lymphocyte ratio predicts inflammation-based survival(153).

- GLR was calculated using the formula: GLR = Glucose (mg/dL) / Lymphocyte count (K/uL)
- GLR > 106.14 was categorized as the high GLR group, and GLR < 106.14 was categorized as the low GLR group(154).

Neutrophil-to-Lymphocyte Ratio (NLR):

Previous research indicates that the high value of Neutrophil-to-Lymphocyte Ratio (NLR) is an effective predictor of poor nutritional status, physical decline, and sarcopenia(155,156). systemic inflammation measured by NLR was associated with nutritional risk(157). Early and accurate screening for nutritional risk is crucial in mitigating complications for these patients.

- NLR was calculated as the ratio of neutrophil count to lymphocyte count.
- The normal range for NLR is typically between 1 to 3.
- NLR > 3 was considered high.
- NLR < 1 was considered low(158,159).

Platelet-to-Lymphocyte Ratio (PLR):

The platelet-to-lymphocyte ratio (PLR) and neutrophil-to-lymphocyte ratio (NLR) are linked to prognosis in various solid tumors(160), and are used as inflammation-based nutritional assessment tools(161).

- PLR was calculated as the ratio of platelet count to lymphocyte count, multiplied by 1000.
- The normal range for PLR varies between 90 to 210.

- PLR < 90 was categorized as low PLR.
- PLR 90-210 was considered normal.
- PLR > 210 was categorized as high PLR(161).

Prognostic Nutritional Index (PNI):

The prognostic nutritional index (PNI) is an index proposed by Japanese researchers to survey dietary status, which is calculated from plasma albumin and peripheral blood lymphocyte count(162). The Prognostic Nutritional Index (PNI) is a simplified biomarker designed to evaluate immune nutrition by calculating serum albumin levels and lymphocyte count using the formula PNI = 10 x serum albumin (g/dL) + (0.005 x total lymphocyte count). This index provides insights into a patient's nutritional status and their immune system(163–165).

Nutritional Risk Index (NRI):

The Nutritional Risk Index (NRI) was developed by the Veterans Affairs Total Parenteral Nutrition Cooperative Study Group(166). Research has demonstrated that the Nutritional Risk Index (NRI) is linked to longer hospital stays. Nutritional depletion, as indicated by the NRI, is also associated with poorer outcomes(167). The Nutritional Risk Index (NRI) has gained popularity because it uses objective measurements, such as serum albumin levels and percent usual body weight, to assess nutritional risk in hospitalized patients(168), rather than relying on subjective assessments, as follows:

- NRI was calculated using the formula: NRI = (1.519 × Serum albumin (g/dL) × 10) + (41.7 × Present weight (kg) / Ideal body weight (kg)).
- NRI > 100 indicated no nutritional risk.
- NRI 97.5 - 100 indicated mild risk.
- NRI 83.5 - 97.5 indicated moderate risk.
- NRI < 83.5 indicated severe risk(169,170).

Geriatric Nutritional Risk Index (GNRI):

Research indicates that the Geriatric Nutritional Risk Index (GNRI) is calculated from serum albumin levels and ideal body and is strongly linked to the incidence of complications in older adult cancer patients. A lower GNRI is correlated with extended hospital stays. This index is a valuable tool for evaluating malnutrition in this patient group and can effectively forecast unfavorable clinical outcomes(171–173).

- GNRI was calculated using the formula: GNRI = [14.89 × Serum albumin (g/dL)] + [41.7 × (Actual body weight / Ideal body weight)].
- Ideal body weight (kg) was calculated as [Height (m)]^2 × 22.
- GNRI ≤ 89.3 indicated high nutritional risk.
- GNRI 89.4 - 98 indicated moderate risk.
- GNRI > 98 indicated low risk (174).

4.8. Operational Definition of Terms

Gastrointestinal Cancer: Gastrointestinal cancer refers to cancers that originate in the gastrointestinal (GI) tract, which includes various parts of the digestive system such as esophageal cancer, gastric or stomach cancer, liver cancer, cholangiocarcinoma, pancreatic cancer, colon cancer, and anal cancer (175,176).

Malnutrition: Malnutrition is defined as a state of inadequate or defective nutrition, marked by insufficient food intake, diminished appetite, muscle wasting, and weight loss(177). This condition can also manifest as acute or chronic nutritional deficiencies resulting from an imbalance of nutrients or decreased energy intake coupled with inflammatory activity, leading to changes in body mass composition, functional impairment, and clinical outcomes(178). It is distinct from malnutrition due to starvation, as it arises from a combination of appetite loss and metabolic disturbances, characterized by inflammation, increased protein breakdown, and significant loss of skeletal muscle mass(179–181).

Solid tumor:- A solid tumor is an abnormal mass of tissue that does not contain any cysts or fluid-filled areas. These tumors can be benign (non-cancerous) or malignant (cancerous). They are named based on the type of cells from which they originate. Here are the main types of solid tumors: Solid tumors are different from leukemia, a type of cancer affecting the blood and bone marrow. Leukemia cells do not form solid masses but instead circulate in the blood and bone marrow, affecting the production of normal blood cells(182).

The definitions and criteria for nutritional status assessment using the **Subjective Global Assessment (SGA) are as follows:**

Well-nourished:

- No reduction in food/nutrient intake.
- Weight loss < 5% in the last six months.
- No/very few intermittent symptoms affecting food intake.
- Full operating capacity.
- No/very little increase in metabolic needs.
- No deficiency in fat or muscle mass.
- Alternatively, an individual with SGA B criteria but with a recent adequate diet; recent and significant improvement in symptoms allowing adequate oral intake; and recent significant improvement in function (150).

Moderately malnourished:

- Meets at least 2 to 3 of the following criteria:
- Loss of fat mass and muscle loss.
- Reduced food/nutrient intake
- 5 − 10% weight loss in the past 6 months without gaining weight.
- Mild to moderate symptoms affecting food intake persisting 2-3 times per day in the past week, with decreasing severity.
- Moderate functional impairment, loss of endurance.
- Mild to moderate reduction of body fat and muscle mass(150,183).

Severely malnourished:

- Meets at least 2-3 of the following criteria:
- Severe deficiency in food/nutrient intake
- ongoing symptoms affecting intake 3 or more times per day in the past week.
- >10% weight loss, fat loss, and/or muscle loss.
- Severe loss of ability to function or bedridden.
- Metabolic demands slightly increased due to moderate stress.
- Alternatively, recent significant signs of fat and muscle loss were observed during the assessment (150,183).

SGA Score Classification:

- SGA A: Good nutrition (well-nourished).
- SGA B: Moderate malnutrition (moderately malnourished).
- SGA C: Severe malnutrition (severely malnourished).
- SGA assessment achieving a score of "B + C" indicates malnutrition.

SGA Score Interpretation:

- SGA score < 17 indicates well-nourished.
- SGA score ≥ 17 indicates malnourished.

These criteria and definitions were used in the study to classify the nutritional status of participants based on the Subjective Global Assessment (SGA) score. They provide a structured approach to assess and categorize the severity of malnutrition among study participants(27,184).

Performance status: The performance status in the study was evaluated using the World Health Organization Performance Status (WHO-PS) scale. Here's an overview of how the scale was used:

1. World Health Organization Performance Status (WHO-PS):

- The WHO-PS scale measures the level of function and capacity for self-care in patients.
  - It ranges from 0 to 5, where:
    - **0**: Fully active, able to carry on all pre-disease performance without restriction.
    - **1**: Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature (e.g., light housework, office work).
    - **2**: Ambulatory and capable of all self-care but unable to carry out any work activities. Up and about more than 50% of waking hours.
    - **3**: Capable of only limited self-care, confined to bed or chair for more than 50% of waking hours.
    - **4**: Completely disabled. Cannot carry on any self-care. Confined to bed or chair.
    - **5**: Dead.
  - A score of 1-2 indicates good performance status (able to perform some or all activities), while a score of 2–5 indicates poor performance status (limited ability to perform activities).

2. **Utilization in the Study**:
   - The WHO-PS scale was used to assess how the patient's condition affected their ability to perform daily activities.
   - This assessment helps in understanding the impact of the disease on the patient's quality of life and functional abilities.

3. **Scoring Interpretation**:
    - Scores were used to categorize patients into different functional statuses based on their ability to carry out activities and self-care.
    - Higher scores (3-5) indicated more severe limitations and poorer performance status.

In summary, the WHO-PS scale provided a standardized way to assess and categorize the performance status of patients in the study, helping to understand the extent to which their condition affected their daily lives and functional abilities (185–187).

Serum Biomarkers

In this study, various serum biomarkers were also defined and assessed. Here's an overview of each of the key markers and their diagnostic criteria:

Serum Albumin (ALB):

- Normal Range: 3.5 to 5.2 g/dL
- Hypoalbuminemia: Serum albumin level < 3.5 g/dL
- Diagnostic criteria: Serum albumin levels below the expected normal range indicate malnutrition in cancer patients.

Hemoglobin (HGB):

- Normal Range: 12 to 16 g/dL in adult men; 13 to 16 g/dL in adult women
- Low Hgb Level: < 13 g/dL in adult men; < 12 g/dL in adult women
- Diagnostic Criteria: Low hemoglobin levels are indicative of malnutrition among cancer patients.

Total Lymphocyte Count (TLC):

- Diagnostic Criteria:
- Levels < 1500/mm3: Correlate with malnutrition
- Levels < 900/mm3: Reflect severe malnutrition

Classification:

- Slightly depleted: 1200 ≤ TLC ≤ 2000 cells/mm3
- Moderate depletion: 800 ≤ TLC < 1200 cells/mm3
- Severe depletion: TLC < 800 cells/mm3

Hypoalbuminemia, low hemoglobin levels, and low total lymphocyte count are indicators of malnutrition and correlate with poor outcomes in cancer patients.

Regular monitoring of these markers is essential to manage and improve the nutritional status in cancer patients undergoing treatment (184,188–191).

Inflammation-Nutrition Biomarkers

In this study, biomarkers associated with inflammation were defined as systemic inflammation biomarkers, including neutrophil-to-lymphocyte ratio (NLR), glucose-to-lymphocyte ratio (GLR), and platelet-to-lymphocyte ratio (PLR) (154,192).

Biomarkers containing albumin or those previously thought to be associated with nutrition were defined as nutrition biomarkers, including the prognostic nutritional index (PNI), nutritional risk index (NRI), and geriatric nutritional risk index (GNRI)(45).

GLR=The GLR was calculated by the formula: GLR = glucose (mg/dL) ÷ lymphocytes count (K/uL). In this study, the median GLR was set as the truncation value (106.14), GLR >106.14 was defined as the high GLR level group, and <106.14 was defined as the low GLR level group(154).

GLR=Glucose/TLCx1000

NLR: NLR proportion was calculated as the total number of neutrophils divided by the total number of lymphocytes. Also, the PLR was characterized as the absolute count of platelets divided by the total count of lymphocytes(193).

- **NLR**: Neutrophil/lymphocyte ratio

The normal range of neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) varies from 1 to 3 and 90 to 210, respectively. PLR level <90 was Low PLR, 90-210 normal, and >210 was high PLR respectively(153).

- **PLR**: Platelet/lymphocyte ratio x1000

PNI:- PNI is a scale used to evaluate the nutritional risk of patients, developed using the patient's blood albumin and lymphocyte count values. The index score is calculated with the formula: PNI = (10× Alb g/dL) + (0.005 × total lymphocyte counts/mm3). A low PNI score (<46.8) indicates high nutritional risk, while a high PNI score (>46.8) indicates low nutritional risk(163,194).

PNI: Albumin (g/L) + 5 × lymphocyte（10^9/L）

GNRI: The Geriatric Nutritional Risk Index (GNRI) was calculated, based on the equation: **=** [14.89 × serum albumin (g/dL)] + [41.7 × (actual body weight/ideal body weight)], where ideal body weight (kg) was calculated as: [height (m)]2 × 22 (kg/m2). The ratio of body weight to ideal body weight was set to 1 when the patient's body weight exceeded the ideal body weight. Patients' GNRI scores were categorized as at high risk (GNRI ≤ 89.3), moderate risk (GNRI 89.4 to 98), low risk (GNRI 95 to ≤ 98), and no risk (GNRI > 98)(195).

NRI: NRI was calculated below: NRI = (1.519 × (serum albumin, g/dL x10)) + {41.7 × present weight (kg)/ideal body weight (kg)}. Nutritional risk was characterized as three grades: 1) no risk(NRI > 100); 2) moderate risk (NRI 83.5 -97.5); 3) mild risk (NRI 97.5 - 100), and 4) <83.5 severe risk group (196).

Electrolyte status:

Electrolyte disorders are defined by test results indicating an altered level of at least one of the electrolytes (sodium, potassium, and chloride level), that is either increasing or decreasing from the normal range(197).

The following ranges were used to determine the imbalance for electrolytes: Na+=135-145mmol/L, K+=3.5-5.5mmol/L, and Cl=98-108mmol/L, respectively. A value less than the lower range of each electrolyte is considered as hypo-electrolytemia, and a value greater than the upper range is considered as hyper-electrolyte-mia (198).

4.9. Data Processing and Analysis

The data were first checked for completeness and then entered into EPI data version 3.1 before being transferred to SPSS version 26.0 for analysis. The model fit was assessed using Hosmer and Lemeshow's goodness-of-fit statistic. An independent sample t-test analysis was conducted to compare the mean levels of serum biomarkers (serum albumin, total lymphocyte count,and hemoglobin, geriatric nutrition risk index, prognostic nutrition index, nutrition risk index, neutrophil to lymphocyte ratio, glucose to lymphocyte ratio, platetilate to lymphocyte ratio, and electrolyte status) and nutritional status (between malnourished and well-nourished groups). Mean ± SD was used for normally distributed data.

Frequency distributions and percentages were calculated to describe and summarize the basic socio-demographic characteristics of the participants. Bivariate and multivariable logistic regression analyses assessed the association between predictor variables and the dependent variable (Nutritional status).

In the initial bivariate analysis, each independent variables were individually assessed against the outcome variable using binary logistic regression. Variables with a p-value < 0.25 from the bivariate analysis were included in the multivariable logistic regression model to determine the strength of their associations with nutritional status. All analyses are considered statistically significant if the p-value is less than or equal to 0.05 with a 95% confidence interval. Results were presented in the form of text, tables, and pie charts, to provide a comprehensive overview of the variables

4.10 Data Quality Assurance

A well-designed data collection tool was utilized for the study. Data collectors were selected based on their qualifications and prior experience in data collection. They underwent training before the actual data collection commenced. All measurements and interviews were conducted under the close supervision of the research team.

The survey questionnaire was prepared in English, translated into Afan-Oromo and Amharic, and then translated back into English to ensure consistency. The questionnaires were pre-tested on 5% of the sample size of adult gastrointestinal cancer patients, at the JUMC Oncology department, and adjustments were made based on feedback before the actual data collection. Additional preparations were also made during this phase.

Throughout the data collection period, the completeness of questionnaires was checked nightly after data collection. Specimens were collected, stored, and transported according to guidelines, and any specimens suspected of poor quality were automatically rejected. Experts closely monitored the appropriateness of methodologies and the quality of equipment and reagents.

All sample collection procedures and analyses were conducted by professionals, and internal quality control procedures were implemented for all laboratory processes following approved protocols and standard operating procedures (SOPs). The entire data collection process was supervised by the principal investigator to ensure adherence to protocols and the highest standards of data quality.

4.11 Plan for Dissemination

The study findings will be disseminated through various channels to maximize impact and reach:

Scientific Presentations: The findings will be presented at scientific conferences and meetings relevant to oncology and nutrition. This allows for direct communication of results to peers and experts in the field.

Publications in International Peer-Reviewed Journals: The study results will be published in respected, international peer-reviewed journals. This ensures that the findings are accessible to a global audience and contribute to the scientific literature.

Communication with Health Personnel: The findings will be communicated directly to health personnel involved in cancer care and nutrition. This includes oncologists, nutritionists, nurses, and other healthcare professionals who can directly apply the study findings in their practice.

Engagement with Local Stakeholders: Local stakeholders, such as health administrators, policymakers, and community leaders, will be informed of the findings. This ensures that the results can influence local health policies and practices.

Media and Public Outreach: Depending on the findings and their relevance, efforts may be made to disseminate information through media channels and public outreach activities. This helps raise awareness about cancer-related malnutrition and its implications.

By disseminating the study findings through these channels, the research aims to maximize its impact on both scientific knowledge and clinical practice, ultimately contributing to improved care and outcomes for cancer patients.

4.12 Ethical Considerations

The ethical protocol for this study was rigorously reviewed and received approval and endorsement from the Jimma University Institutional Review Board (JUIRB), with approval number Ref No. JUIH/IRB/725/23. The ethical principles guiding this study were primarily based on the Declaration of Helsinki. Permission was also obtained from Jimma Universty Medical Center to conduct the study at Jimma Universty Oncology Department. Before recruiting participants, informed consent was obtained from each individual. To ensure confidentiality, participant names and any identifiers were not used on the survey forms or laboratory requests. Codes were used instead.

Data collection commenced only after written informed consent was obtained from each participant. The collected data was strictly used for the purposes outlined in the study protocol and was not shared or used for any other purpose. Participants who had abnormal test results were informed through the data collectors and referred to the JUMC, oncology department for appropriate treatment and follow-up. This ethical approach ensures that the rights and welfare of study participants were protected throughout the research process.

5. RESULTS

5.1: The Socio-Demographic Response Rate

At the time of the study, there were a total of 134 cancer patients being treated at the Jimma University Medical Center oncology department. However, One patient was unable to answer the interview, so they were excluded from the study which provided a response rate of 99.3%. Most patients were male (65.4%), the mean age of the study subjects was 48 years with a standard deviation of 13.89. The population is almost evenly split between rural (50.4%) and urban (49.6%) residents. Most patients were married (77.4%) and many worked as farmers (48.1%). Educational levels vary, with nearly half (49.6%) not attending formal education, while smaller proportions have completed primary (28.6%), secondary (11.3%), or higher education (10.5%). Family sizes were predominantly moderate, with equal numbers (43.3%) having 2-6 or 7-11 members. Income distribution shows that half of the patients earn over 3000, with others earning less (Table 5.1).

Table 5.1.Socio-demographic response rate among adult gastrointestinal cancer patients at the oncology department of JUMC from April 1 to June 25, 2024 (n=134).

Variables	Category	Frequency	Percentage
Sex	Male	87	65.4
	Female	46	34.6
Age	18-34	21	15.8
	35-54	61	45.9
	55-64	33	24.8
	>64	18	13.5
Place of residence	Rural	67	50.4
	Urban	66	49.6
Marital Status	Single	30	22.6
	Married	103	77.4
Occupation	Farmer	64	48.1
	Merchant	19	14.3
	Government Employee	14	10.5

	Self-Employee	20	15.0
	Student	6	4.5
	House Wife	10	7.5
Educational Status	Didn't attend formal Education	66	49.6
	Primary Education	38	28.6
	Secondary Education	15	11.3
	Collage/University	14	10.5
Family size	2-6	52	43.3
	7-11	52	43.3
	>12	16	13.3
Monthly Income in ETB	<1500	26	19.5
	1500-3000	40	30.1
	>3000	67	50.4

5.2: Behavioral factors

The lifestyle factors of adult gastrointestinal cancer patients at JUMC reveal significant insights into their habits and potential risk factors. A notable majority of the patients (73.7%) do not consume alcohol, with only 26.3% reporting alcohol consumption. Smoking status indicates that a vast majority (88.7%) have never smoked, while 9.0% are former smokers, and a minimal 1.5% are current smokers. Khat chewing, a common cultural practice in some regions, is reported by 43.6% of the patients, while 56.4% do not engage in this activity (Table 5.2).

Table 5.2. Behavioral Factors among adult gastrointestinal cancer patients at the oncology department of JUMC from April 1 to June 25, 2024 (n=134).

Variables	Category	Frequency	Percentage (%)
Alcohol consumption	Yes	35	26.3
	No	98	73.7
Smoking Status	Never Smoke	118	88.7
	Current Smoker	3	1.5
	Former Smoker	12	9.0
Khat chewing	Yes	58	43.6
	No	75	56.4

5.3: Clinical Information

The clinical information of adult gastrointestinal cancer patients at JUMC provides a comprehensive overview of their health status and treatment progression. The types of cancer prevalent among this group are diverse, with the highest occurrence being colorectal cancer (36.8%), followed by esophageal cancer (26.3%), gastric cancer (20.3%), liver cancer (7.5%), and both pancreatic cancer and cholangiocarcinoma at 4.5% each. The majority of patients did not have comorbidities (67.7%), while 32.3% reported having comorbidities, among this predominantly hypertension (46.5%), chronic kidney disease (27.9%), diabetes mellitus (18.6%), and chronic liver disease (7%). Most patients are diagnosed at advanced stages, with 58.6% at Stage IV, 31.6% at Stage III, and only 9.8% at Stage II.

Regarding treatment cycles, the majority of patients (60.9%) were undergoing their first cycle, indicating a recent diagnosis or initiation of treatment. Smaller groups were in their second (7.5%), third (9.8%), and fourth or more cycles (12.8%), reflecting various stages of ongoing treatment. The WHO performance status shows a nearly even split, with 51.9% of patients performing well (able to carry out daily activities) and 48.1% not performing well. The duration of illness varies, with most patients (63.9%) having been ill for less than 12 months, 26.3% for 12-24 months, and 9.8% for 25 months or longer. The Body Mass Index (BMI) indicates that a majority (57.9%) was underweight, while 38.3% had normal weight and only a small fraction (3.8%) were overweight (Table 5.3).

Table 5.3.Clinical Information among adult gastrointestinal cancer patients at the oncology department of JUMC from April 1 to June 25, 2024 (n=134).

Variables	Category	Frequency	Percentage
Comorbidities	Yes	37	27.8
	No	96	72.2
Type of comorbidities	HTN	20	46.5
	CKD	12	27.9
	DM	8	18.6
	CLD	3	7
Type of cancer	Esophageal Cancer	35	26.3
	Gastric Cancer	27	20.3
	Liver Cancer	10	7.5
	Pancreatic Cancer	6	4.5
	Colorectal Cancer	49	36.8
	Cholangio Carcinoma	6	4.5
Stage of cancer	Stage-II	13	9.8
	Stage-III	42	31.6
	Stage-IV	78	58.6
Number of treatment cycles	First	81	60.9
	Second	10	7.5
	Third	13	9.8
	Fourth and above	17	12.8
WHO Performance	Yes	69	51.9
	No	64	48.1
Duration of illness	<12 Month	85	63.9
	12-24 Month	35	26.3
	>=25 month	13	9.8
Body Mass Index	Under weight	77	57.9
	Normal	51	38.3
	Over weight	5	3.8

5.5: Feeding habit

The feeding habits among adult gastrointestinal cancer patients at JUMC reveal significant dietary challenges and patterns. A majority of patients (65.4%) report irregular eating within the past 24 hours. The route of feeding varies, with the largest group consuming liquid diets (39.8%), followed by semi-solid (30.1%) and solid foods (27.1%), and a small percentage (3.0%) relying on tube feeding.

In the past week, before the data collection date, a substantial majority (73.7%) of patients have managed to maintain their feeding habits, while 26.3% have not. Regular breakfast consumption is low, with only 39.8% eating breakfast regularly, whereas 60.2% do not. Fasting is relatively uncommon, with 14.3% reporting fasting, while the majority (85.7%) does not fast, indicating that most patients are not engaging in prolonged periods without food.

Fluid intake among the patients varies, with 42.1% consuming more than three liters daily, which is adequate, but 30.1% consuming less than three liters, potentially risking dehydration. The majority of patients (78.2%) can eat without support, indicating a level of independence, while 21.8% require partial support (Table 5.4)**.**

Table 5.4.Feeding habits among adult gastrointestinal cancer patients at the oncology department of JUMC from April 1 to June 25, 2024 (n=134).

Variable	**Category**	**Frequency**	**Percentage**
Eating within 24 hours	Regular	46	34.6
	Irregular	87	65.4
Route of feeding	Solid	36	27.1
	Semi Solid	40	30.1
	Liquid	53	39.8
	Tube Feeding	4	3.0
Feeding habits in the last week	Yes	98	73.7
	No	35	26.3
Eating breakfast regularly	Yes	53	39.8

	No	80	60.2
Fasting	Yes	19	14.3
	No	114	85.7
Fluid intake	Less than three litters	40	30.1
	3-5 Litters	37	27.8
	More than litter	56	42.1
Means of eating	Partially supported	29	21.8
	I can eat without any support	104	78.2

5.6: Nutritional status among adult gastrointestinal cancer patients

The nutritional intake and clinical status of adult gastrointestinal cancer patients at JUMC highlight significant challenges and varied experiences among the patient population. Regarding nutrition intake, only 26.3% report no change and adequate intake, while 40.6% are experiencing minimal intake, clear fluids, or starvation, indicating severe nutritional challenges for many patients. Another 21.8% rely on full fluids or oral nutrition supplements, and 11.3% have a suboptimal solid diet.

In the past two weeks, 24.1% of patients had adequate nutrient intake, 27.8% saw some improvement but not to an adequate level, and 48.1% did not have adequate improvement. Regarding weight change over the past six months, 30.8% experienced less than 5% loss or weight stability, 27.8% had a 5-10% loss without stabilization, and 41.4% experienced more than a 10% loss or ongoing weight loss. In the past two weeks, 21.1% reported a weight increase, 37.6% had no change and 41.4% reported a weight decrease, reinforcing the ongoing concern about weight loss among the patients.

Subjectively, 30.1% of patients reported non/mild weight loss, 29.3% moderate, and 40.6% severe weight loss. Symptoms over the past two weeks showed that 56.4% experienced no change or worsening, while only 21.1% saw a resolution and 22.6% an improvement in symptoms. Functional capacity varied, with 21.1% experiencing no dysfunction, 54.1% having difficulty with normal activities, and 24.8% being bed or chair-ridden.

Functional capacity changes in the past two weeks showed 27.8% improved, 38.3% had no change, and 33.8% decreased. Body fat loss was reported as severe by 21.8%, mild/moderate by 54.9%, and no loss by 23.3%. Muscle mass loss was severe in 21.8%, mild/moderate in 55.6%, and no loss in 22.6%. The presence of edema or ascites was absent in 76.7% of patients, mild/moderate in 13.5%, and severe in 9.8% (Table 5.5).

Table 5.5.Nutritional assessment based on Subjective global assessment among adult gastrointestinal cancer patients at the oncology department of JUMC, from April 1 to June 25, 2024 (n=134).

Variables	**Categories**	**Frequency**	**Percentage**
Nutrition intake	No change; adequate	35	26.3
	Suboptimal solid diet	15	11.3
	Full fluids or only oral nutrition supplements	29	21.8
	Minimal intake, clear fluids, or starvation	54	40.6
Nutrient intake in the past 2 weeks	Adequate	32	24.1
	Improved but not adequate	37	27.8
	No improvement or not adequate	64	48.1
Non-fluid weight change past 6 months weight loss (Kg)	<5% loss or weight stability	41	30.8
	5-10% loss without stabilization	37	27.8
	>10% loss or ongoing	55	41.4
Weight change past two weeks amount (if known)	Increased	28	21.1
	No change	50	37.6
	Decreased	55	41.4
If not known has there been a subjective loss of the weight during the pa	Non/Mild	40	30.1
	Moderate	39	29.3
	Severe	54	40.6
Symptoms in the past 2 weeks	Resolution of symptoms	28	21.1
	Improving	30	22.6

	No change or worsened	75	56.4
Functional Capacity	No dysfunction	28	21.1
	Difficult with ambulatory/Normal activities	72	54.1
	Bed/Chair ridden	33	24.8
Functional capacity in the past 2 weeks	Improved	37	27.8
	No change	51	38.3
	Decreased	45	33.8
Loss of body fat	No	31	23.3
	Mild/Moderate	73	54.9
	Severe	29	21.8
Loss of Muscle mass	No	30	22.6
	Mild/Moderate	74	55.6
	Severe	29	21.8
Presence of edema/Ascites	No	102	76.7
	Mild/Moderate	18	13.5
	Severe	13	9.8

The prevalence of malnutrition among adult gastrointestinal cancer patients at the oncology department in JUMC was 78.9% (95%CI: 71.0-85.5) based on subjective global assessment tool.. In contrast, only 21.1% of patients were classified as well-nourished (Figure 2).

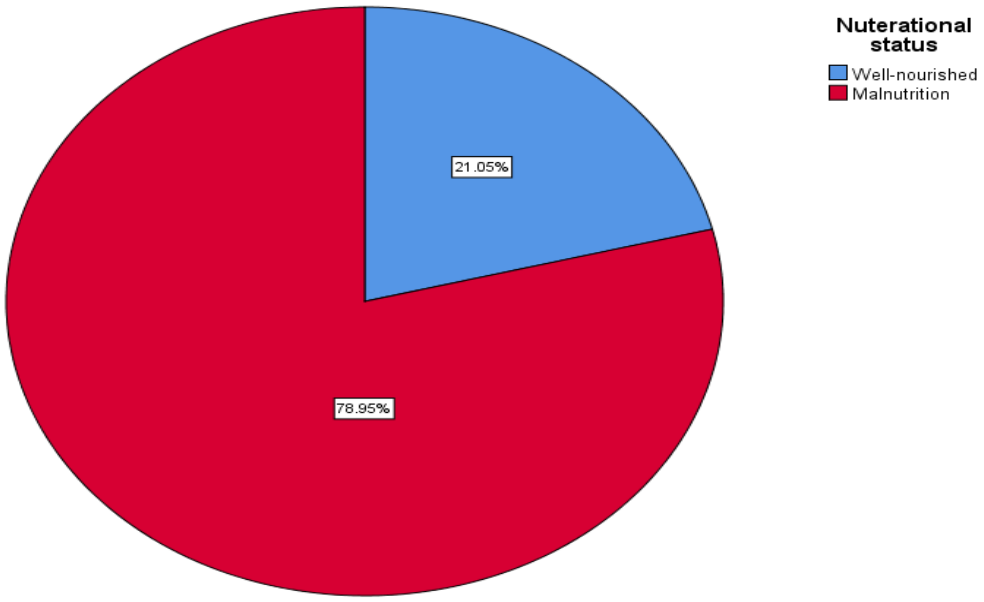

Figure 2. Nutritional status in adult gastrointestinal cancer patients at the oncology department of JUMC, 2024.

5.7: Serum biomarkers in adult gastrointestinal cancer patients

Table 5.6 below illustrates the inflammation biomarkers status of adult gastrointestinal cancer patients at the oncology department of JUMC. Examining the serm biomarkers, Total Lymphocyte Count (TLC) indicates that many patients face nutritional challenges: 46.6% have normal lymphocyte count, 39.8% have moderate lymphocyte count, and 13.5% have severely decreased lymphocyte count. Serum Albumin levels, a critical marker of protein status, show that 62.4% of the patients are experiencing hypoalbuminemia, highlighting a prevalent issue with protein deficiency. Hemoglobin levels present a similar concern, with 60.2% of patients exhibiting hypoglobinemia, indicating anemia, while a small percentage (3.0%) suffer from hyperglobinemia.

Inflammatory biomarkers such as Neutrophil-to-Lymphocyte Ratio (NLR), Glucose-to-Lymphocyte Ratio (GLR), and Platelet-to-Lymphocyte Ratio (PLR) provide a comprehensive view of inflammation and immune status. The NLR results indicate that half of the patients (50.4%) have a high NLR, suggesting significant systemic inflammation, while only 26.3% have normal levels. The GLR results show that a large majority (83.5%) have low GLR levels, which may indicate a relatively lower inflammatory state compared to other markers.

Lastly, the PLR findings show that nearly half (42.9%) have high PLR levels, pointing toward chronic inflammation, while 45.9% have normal levels. Nutritional risk assessment additional context to the dietary challenges faced by these patients. The Prognostic Nutritional Index (PNI) scores indicate that 78.9% of patients have a low PNI score, suggesting poor dietary status and potential complications. Similarly, the Geriatric Nutritional Risk Index (GNRI) levels reveal that a majority of patients (66.2%) are at high risk for malnutrition, with only a minority (13.5%) showing no risk. The Nutritional Risk Index (NRI) further corroborates these findings, with 46.6% of patients at severe risk for malnutrition and only 12.8% at no risk.

Table 5.6. Frequency and percentage of serum biomarkers among adult gastrointestinal cancer patients at the oncology department of JUMC from April 1 to June 25, 2024 (n=134).

Serum biomarkers		**Category**	**Frequency**	**Percentage(%)**
Nutritional biomarkers	TLC	Normal Total Lymphocyte count	62	46.6
		Moderate Total Lymphocyte count	53	39.8
		Severe decreased Total Lymphocyte count	18	13.5
	Serum Albumin	Normal	50	37.6
		Hypoalbunemia	83	62.4
	Hemoglobin Level	Normal	49	36.8
		Hypoglobnemia	80	60.2
		Hyperglobnemia	4	3.0
Inflammation-Biomarkers	NLR	Normal NLR	35	26.3
		Moderate abnormal of NLR	26	19.5
		Decreased NLR	5	3.8
		High NLR	67	50.4
	GLR	Low GLR level	111	83.5
		High GLR Level	22	16.5
	PLR	Normal	61	45.9

		Low PLR Level	15	11.3
		High PLR Level	57	42.9
Nutritional risk assessment	Prognostic nutritional index	low PNI score	105	78.9
		High PNI score	28	21.1
	GNRI Level	No risk for malnutrition	18	13.5
		Low risk for malnutrition	4	3.0
		moderate risk for malnutrition	23	17.3
		High risk for malnutrition	88	66.2
	NRI	No risk for malnutrition	17	12.8
		Mild risk for Malnutrition	12	9.0
		Moderate risk for malnutrition	42	31.6
		Severe risk for Malnutrition	62	46.6

The comparison of serum biomarkers between well-nourished and malnourished gastrointestinal cancer patients reveals significant differences, particularly in several key nutritional biomarkers. For Total Lymphocyte Count (TLC), the mean levels for normal (TLC) was (1777.26±730.271) and Low (decreased (TLC) was (1693.31±767.846) showing no significant difference (P = .604). However, Hemoglobin (HGB) Count and Serum Albumin levels present a stark contrast. Malnourished gastrointestinal cancer patients have significantly lower HGB levels (11.92±2.083), than well-nourished patients (13.79±1.410) with a significant P-value of <.0001, indicating a strong correlation between hemoglobin levels and nutritional status. Similarly, Serum Albumin levels are significantly lower in malnourished patients (3.10±.593), compared to well-nourished ones (3.90±.396), with a P-value of <.0001, underscoring its importance as an indicator of nutritional status.

Inflammation biomarkers such as GLR, PLR, and NLR were also evaluated. The mean GLR levels for well-nourished patients (68.54±33.401) and malnourished patients (75.67±61.084) show no significant difference (P = .554), indicating that GLR may not be sensitive enough to reflect nutritional differences in this patient group.

Similarly, the Platelet-to-Lymphocyte Ratio (PLR) and Neutrophil-to-Lymphocyte Ratio (NLR) do not show significant differences between the two groups (PLR P = .551, NLR P = .169), indicating that while these markers are valuable for assessing inflammation, they may not distinctly differentiate between nutritional statuses in gastrointestinal cancer patients.

The nutritional risk assessment biomarkers, including the Prognostic Nutritional Index (PNI), Geriatric Nutritional Risk Index (GNRI), and Nutritional Risk Index (NRI), reveal significant differences between malnourished and well-nourished patients. PNI scores are significantly lower in malnourished patients (39.45±7.305), compared to well-nourished patients (47.86±5.799), with a P-value of <.0001, indicating a strong association between higher PNI scores and better nutritional status.

Similarly, GNRI and NRI scores are significantly lower in malnourished patients compared to well-nourished patients (GNRI: 79.73±10.681 vs. 97.83±6.550; P = <.0001; NRI: 81.51±10.650 vs. 100.48±6.878, P = <.0001), highlighting their effectiveness in distinguishing nutritional risk (Table 5.7).

Table 5.7.Comparison of the mean level of serum biomarkers between well-nourished and malnourished by independent sample t-test among adult gastrointestinal cancer patients at the oncology department of JUMC from April 1 to June 25, 2024 (n=134).

Serum biomarkers		**Nutritional Status**		**P-value**
		Malnourished	**Well-nourished**	
Nutritional biomarkers	1693.31±767.846	1693.31±767.846	1777.26±730.271	.604
	11.92±2.083	11.92±2.083	13.79±1.410	<.0001
	3.10±.593	3.10±.593	3.90±.396	<.0001
Inflammation-Biomarkers	75.67±61.084	75.67±61.084	68.54±33.401	.554
	232.33±155.640	232.33±155.640	213.11±131.771	.551
	4.24±3.367	4.24±3.367	3.30±2.440	.169
Nutritional risk assessment	39.45±7.305	39.45±7.305	47.86±5.799	<.0001
	79.73±10.681	79.73±10.681	97.83±6.550	<.0001
	81.51±10.650	81.51±10.650	100.48±6.878	<.0001

5.8: Electrolyte status among adult gastrointestinal cancer patients

The analysis of electrolyte levels among adult gastrointestinal cancer patients at the oncology department of JUMC reveals several notable findings. The majority of patients have normal sodium (Na) levels, with 69.2% within the normal range. However, a significant portion of patients exhibit electrolyte imbalances, with 15.0% experiencing hyponatremia (low sodium levels) and 15.8% experiencing hypernatremia (high sodium levels).

Potassium (K) levels show a similar trend, with 76.7% of patients maintaining normal levels. Despite this, 21.8% of patients suffer from hypokalemia (low potassium levels), and a small fraction (1.5%) experience hyperkalemia (high potassium levels).

Chloride (Cl) levels present a different distribution, with only 49.6% of patients having normal levels. A significant number of patients face chloride imbalances, with 11.3% experiencing hypochloremia (low chloride levels) and 39.1% suffering from hyperchloremia (high chloride levels) (Table 5.8).

Table.5. 8. Frequency and percentage of electrolytes among adult gastrointestinal cancer patients at the oncology department of JUMC from April 1 to June 25, 2024 (n=134).

Electrolytes	**Category**	**Frequency**	**Percentage**
Na+	Normal	92	69.2
	Hypo Natriemia	20	15.0
	Hyper natriemia	21	15.8
K+	Normal	102	76.7
	Hypokalemia	29	21.8
	Hyperkalemia	2	1.5
CL-	Normal	66	49.6
	Hypochloremia	15	11.3
	Hyperchloremia	52	39.1

The prevalence of electrolyte disorders among adult gastrointestinal cancer patients at the oncology department of JUMC, as depicted in Figure 4 below, is notably high. Out of the total patients included in the study, 65.4% (95%CI: 56.7 to 73.4) exhibited some form of electrolyte disorder, while only 34.6% maintained normal electrolyte levels (Figure 3). Disorders of the serum electrolyte level also occurred in cancer patients. The most commonly occurring electrolyte alteration was chloride (Cl−)67 (50.4%) followed by Sodium (Na+) 41 (30.8%) then potassium (K+) 31 (23.3%), respectively. The frequency of serum electrolyte modification was also analyzed in terms of the increase or decrement of each electrolyte and classified as hypo and hyper based on the type of electrolyte.

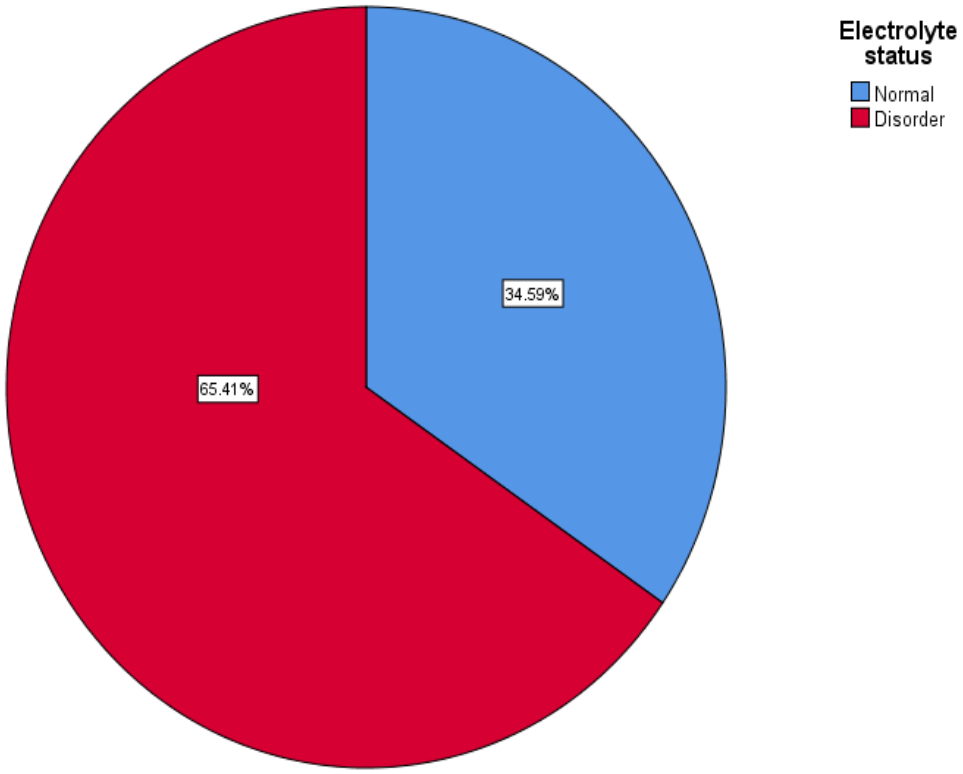

Figure 3. Electrolyte status among adult gastrointestinal cancer patients at the oncology department of JUMC, 2024.

The comparison of mean electrolyte levels between well-nourished and malnourished adult gastrointestinal cancer patients shows no statistically significant differences in sodium, potassium, and chloride levels between the two groups. Specifically, well-nourished patients have a mean sodium level of 141.08±5.185 mmol/L, compared to 139.48±6.988 mmol/L in malnourished patients, with a p-value of 0.260. This indicates that the difference in sodium levels is not significant. Similarly, the mean potassium levels are nearly identical between well-nourished (4.05±0.668 mmol/L) and malnourished (4.00±0.670 mmol/L) patients, with a p-value of 0.725, showing no significant difference. Chloride levels also do not differ substantially, with means of 106.05±5.077 mmol/L for well-nourished and 106.14±7.532 mmol/L for malnourished patients, and a p-value of 0.955 (Table 5.9).

Table.5. 9. Comparison of the mean level of electrolytes between well-nourished and malnourished by independent sample t-test among adult gastrointestinal cancer patients at the oncology department of JUMC from April 1 to June 25, 2024 (n=134).

Electrolytes	**Nutritional status**		**p-value**
	Mal-nourished (Mean$\pm Std$)	**Well-nourished** (Mean$\pm Std$)	
Na+	139.48$\pm$6.988	141.08$\pm$5.185	.260
K+	4.00$\pm$.670	4.05$\pm$.668	.725
CL-	106.14$\pm$7.532	106.05$\pm$5.077	.955

5.9: Associated factors of malnutrition among adult gastrointestinal cancer patients

Bivariate and multivariate binary logistic regression analyses were used to identify associated factors of malnutrition among adult gastrointestinal cancer patients at the oncology department of JUMC. In the bivariate analysis, factors that had a p-value < 0.25 were selected as candidate variables to allow for the inclusion of variables that may not show a strong association in the bivariate analysis for the multivariable analysis. Sex, age, place of residence, stage of cancer, WHO Performance, serum albumin, hemoglobin Level, comorbidity, duration of illness and fasting were selected as a candidate variable for the multivariable logistic regression model.

Model fitness was checked by the Hosmer and Lemshow test and the p-value was 0.240, which shows that the p-value is greater than 0.05, then fails to reject the null hypothesis, and it is stated that the logistic model is good for the data set. Multicollinearity was checked, and all variables had VIF<10. The result of multivariate analysis showed that stage of cancer, WHO Performance, serum albumin, and duration of illness were identified as factors associated with malnutrition among adult gastrointestinal adult cancer patients at the oncology department of JUMC.

The analysis reveals that patients with Stage IV gastrointestinal cancers were significantly more likely to be malnourished compared to those with Stage II cancer. Specifically, the odds of patients with Stage IV cancer being malnourished were 7.59 times higher (AOR=7.59; 95% CI: 1.05-25.3, P=.045) compared to those with Stage II cancer. Similarly, the odds of patients with Stage III cancer being malnourished were 7.95 times higher (AOR=7.95; 95% CI: 1.06-29.3, P=.043) compared to those with Stage II cancer.

Patients who did not meet the WHO Performance criteria had 5.77 times higher odds of being malnourished (AOR = 5.77; 95% CI: 1.20, 27.6, P=0.028) compared to those who met the criteria. Patients with hypoalbuminemia (low serum albumin) had 8.29 times higher odds of being malnourished (AOR = 8.29; 95% CI: 2.13, 32.2, p = 0.002) compared to patients with normal serum albumin levels. Patients with an illness duration of 25 months or more had 7.81 times higher odds of being malnourished (AOR = 7.81; 95% CI: 1.47, 41.6, p = 0.016) compared to those with an illness duration of less than 12 months (Table 5.10).

Table .5.10. Bivariable and multivariable logistic regression to identify factors of malnutrition among adult gastrointestinal cancer patients at the oncology department of JUMC, from April 1 to June 25, 2024 (n=134).

Variables	**Category**	**Nutritional status**		**COR(95%CI)**	**AOR(95%CI)**	**P-value**
		Malnourished	**Well-nourished**			
Sex	Male	56(72.7)	21(27.3)		**1**	
	Female	49(87.5)	7(12.5)	2.63(1.03,6.70)	2.50(.642,9.74)	.187
Age	18-34	15(71.4)	6(28.6)		**1**	
	35-54	47(77.0)	14(23.0)	1.34(.439,4.11)	1.01(.165,6.16)	.993

	55-64	28(84.8)	5(15.2)	2.24(.585,8.57)	3.48(.408,29.6)	.254
	>64	15(83.3)	3(16.7)	2.00(.420,9.52)	2.18(.164,29.3)	.554
Place of residence	Rural	56(83.6)	11(16.4)	1.77(.755,4.13)	1.09(.305,3.88)	.897
	Urban	49(74.2)	17(25.8)		1	
Stage of cancer	Stage-II	5(38.5)	8(61.5)		1	
	Stage-III	31(73.8)	11(26.2)	4.51(1.22,16.7)	7.95(1.06,29.3)	.043*
	Stage-IV	69(88.5)	9(11.5)	12.3(3.29,45.7)	7.59(1.05,25.3)	.045*
WHO Performance	Yes	43(64.2)	24(35.8)		1	
	No	62(93.9)	4(6.1)	8.65(2.80,26.7)	5.77(1.20,27.6)	.028*
Serum Albumin	Normal	29(58.0)	21(42.0)		1	
	Hypoalbunemia	76(91.6)	7(8.4)	7.86(3.02,20.5)	8.29(2.13,32.2)	.002*
Hemoglobin Level	Normal	31(63.3)	18(36.7)		1	
	Hypoglobnemia	68(89.5)	8(10.5)	5.23(2.06,13.3)	1.45(.408,5.15)	.566
	Hyperglobnemia	6(75.0)	2(25)	.581(.075,4.48)	3.12(.173,56.2)	.441
Comorbidity	Yes	37(86.0)	6(14.0)	1.99(.743,5.35)	1.89(.437,8.22)	.394
	No	68(75.6)	22(24.4)		1	
Duration of illness	<12 Month	43(65.2)	23(34.8)		1	
	12-24 Month	33(94.3)	2(5.7)	8.83(1.94,40.3)	5.34(.792,35.9)	.085
	>=25 month	26(81.3)	6(18.7)	5.17(1.42,18.8)	7.81(1.47,41.6)	.016*
Fasting	Yes	13(68.4)	6(31.6)	.518(.177,1.52)	.525(.103,2.67)	.438
	No	92(80.7)	22(19.3)		1	

**indicates significance at 5% level, COR: Crude odd ratio, AOR: Adjusted odd ratio,*

1: reference categories, CI: Confidence interval

6. Discussion

The prevalence of malnutrition among adult gastrointestinal cancer patients at the oncology department in JUMC was 78.9% (95% CI: 71.0-85.5). This finding is consistent with a study conducted at a university hospital in Rio Grande do Sul, Brazil, where 77% of adult gastrointestinal cancer patients were malnourished as assessed by the Subjective Global Assessment(56). Similar results were observed in a study at the Department of General Surgery, Bach Mai Hospital(199), which found a malnutrition risk of 77.6% using the SGA method. Another study at Can Tho Hospital in South Vietnam(200), focusing on surgical patients, reported a malnutrition rate of 77.7% following gastrointestinal surgery. The high prevalence of malnutrition in our study could be due to several factors such as low socioeconomic status, variations in assessment methods, under-resourced health facilities, and the lack of dietitian involvement in cancer treatment protocols (201).

The findings of this study revealed a higher prevalence of malnutrition compared to studies conducted in Hawassa, Ethiopia, where the prevalence was 48.1%(142), and Addis Ababa University 58.2% (143), and in Iran at 53.1%, with 29.1% experiencing moderate malnutrition and 24% severe malnutrition(136). The differences between these studies could be due to the inclusion of patients from various types of cancer, whereas our study specifically focused on adult gastrointestinal cancer patients in the oncology department. This focused approach may have contributed to the higher observed prevalence of malnutrition in our study population.

In other cases, the prevalence of malnutrition among adult gastrointestinal cancer patients was Lower when compared to the study conducted in Ghana at 94.3%(202), and the University of Pelotas, Brazil(203). The differences between these studies could be due to low socioeconomic status, variations in assessment methods, under-resourced health facilities, and the lack of dietitian involvement in cancer treatment protocols. Additionally, most of the participants in their study were in advanced stages hence a possible reason for the high prevalence of malnutrition.

Our study revealed that around 60.2% of gastrointestinal cancer patients were hypoalbuminemia. This finding was aligned with a study conducted among gastrointestinal cancer patients at the University of Pelotas, Brazil (68.9%)(204). This condition in cancer patients might be attributed to the production of pro-inflammatory cytokines (TNF-α, IL-2, and IL-6), which induce the synthesis of positive acute phase reactants. These reactants compete for nutrients in the liver, resulting in decreased serum albumin production(205). Another explanation could be that highly proliferative cancer cells increase the uptake of serum albumin by inducing albumin-binding proteins (ABP)(206).

However, the prevalence of hypoalbuminemia in this study was significantly higher than the findings in Ivory Coast (13.5%)(207), Palestine (14%)(92), Malaysia(33%)(208) and Ethiopia Jimma Tertiary Hospital 49.4%(58). The differences between these studies could be due to the inclusion of patients from various types of cancer, whereas our study specifically focused on adult gastrointestinal cancer patients.

In the current study, the mean serum albumin level was significantly lower in malnourished gastrointestinal cancer patients (3.10±.593 g/dl) compared to well-nourished gastrointestinal cancer patients (3.90±.396 g/dl), as shown in Table 5.7. This finding is consistent with the study conducted in Santamaria, Brazil(55). The possible explanation for this could be that cancer-related malnutrition, nutrient deprivation, and inflammation downregulate serum albumin gene expression, leading to inhibited synthesis. Additional possible explanation is that in cancer-related malnutrition, plasma antioxidant serum albumin scavenges high levels of free radicals resulting from oxidative stress, leading to serum albumin depletion(209).

This study also found that the mean hemoglobin (Hgb) level was significantly lower in malnourished gastrointestinal cancer patients (11.92 ± 2.083 g/dl) compared to well-nourished gastrointestinal cancer patients (13.79 ± 1.410 g/dl)Table 5.7. The possible explanation could be that in cancer-related malnutrition, reactive oxygen species (ROS) and interleukin-6 (IL-6) induce hepcidin, which degrades ferroportin and halts the uptake of iron from the small intestine and macrophages, leading to an unavailability of iron for heme synthesis(210). Another potential explanation might be that the disruption of glucose metabolism contributes to low Hgb levels, as the Krebs cycle affects the availability of substrates for heme synthesis(211).

Contrary to the current finding, a study conducted in Greece revealed statistically insignificant differences in the mean level of hemoglobin (Hgb) between malnourished and well-nourished patients according to Subjective Global Assessment (SGA). The discrepancy could be attributed to the relatively small sample size in the Greek study (88 patients) (212). Additionally, our study focused specifically on gastrointestinal cancer patients, among whom there are high levels of metabolic disturbances occurring, which may contribute to differences in Hgb levels between malnourished and well-nourished individuals.

However, our study found that Total Lymphocyte Count (TLC) did not significantly correlate with the SGA score, supporting a study conducted at Cipto Mangunkusumo Hospital(213), which found that TLC alone is not a reliable nutritional marker. This contrasts with some studies where TLC has been used as part of a broader assessment tool, suggesting the need for comprehensive measures rather than reliance on a single biomarker.

GNRI and NRI scores are significantly lower in malnourished patients compared to well-nourished patients (GNRI: 79.73±10.681 vs. 97.83±6.550; P = <.0001; NRI: 81.51±10.650 vs. 100.48±6.878, P = <.0001). This finding was in line with the study conducted in Greece (195), and Poland(214), stating that GNRI and NRI scores are significantly higher in well-nourished patients than undernourished cancer patients.

In another case, PNI scores are significantly lower in malnourished patients (39.45±7.305), compared to well-nourished patients (47.86±5.799), with a P-value of <.0001, indicating a strong association between higher PNI scores and better nutritional status. This finding was aligned with the study conducted in Japan(215), stating that PNI predicted mortality better than serum albumin level or total lymphocyte count alone.

In this study, the prevalence of electrolyte disorders among adult gastrointestinal cancer patients at the oncology department of JUMC was 65.4% (95% CI: 56.7-73.4). This result was in line with a previous study conducted in Southwest Ethiopia which found a prevalence of 60.7%(197). The finding was higher as compared to the studies conducted among adults admitted with metabolic syndrome in Jimma Medical Center, South West Ethiopia, the overall prevalence of electrolyte disorders was 44.1%, with hyponatremia at 42.9%, hypokalemia at 20.7%, and hypochloremia 17.6%(216).

This is due to gastrointestinal cancer playing a major role in the occurrence of electrolyte disorders by disturbing the metabolic system(217). Also, the difference between these studies could be due to varying population characteristics with various disease, whereas our study focused specifically on adult gastrointestinal cancer patients in the oncology department. Despite our specific definition of electrolyte disorders, the high prevalence indicates a significant need for intervention in this area. In other cases our findings in lined with a study conducted at Zhongshan Hospital, in Shanghai of China (58.0%) electrolyte abnormity(198).

Ethiopia's socioeconomic status and healthcare infrastructure might also contribute to the high prevalence of electrolyte disorders. Limited access to comprehensive cancer care, including regular monitoring and timely management of electrolyte levels, can lead to a higher incidence of such imbalances. The lack of integration of dietitians and nutritionists in the treatment protocols can also mean that dietary and nutritional interventions are inadequate to prevent or correct electrolyte imbalances (218).

The most commonly occurring electrolyte alteration was chloride (Cl^-) 67 (50.4%) followed by Sodium (Na^+) 41 (30.8%) then potassium (K^+) 31 (23.3%), respectively. Studies conducted in Ethiopia further support these findings at Jimma Medical Center found that electrolyte disturbances were common among patients with advanced cancer, particularly due to treatment side effects and the advanced stage of the disease(197). It was observed that 15.8%, 21.8%, and 11.3% of gastrointestinal cancer patients suffered from hyponatremia, hypokalemia, and Hypochloremia respectively in this study. Volume depletion is the most common reason for hyponatremia, which usually happens in bleeding, diarrhea, vomiting, drainage of ascites, pleural radiation, peritonitis, or ileus(219).

In terms of the hypokalemia mechanism, poor nutrition, anorexia, and volume exhaustion can activate insufficient potassium intake. Vomiting produces a loss of potassium(220). Hypochloremia can be caused by: Diarrhea, Vomiting, Excessive sweating, Syndrome of inappropriate antidiuretic hormone excretion (SIADH) when your body makes too many antidiuretic hormones (221).

Hyperchloremia is when a person has too much chloride in their blood. It is metabolic acidosis that results from bicarbonate loss, rather than acid production or retention a sign of dehydration(222). Gastrointestinal bicarbonate loss happens due to severe diarrhea, pancreatic fistula, nasojejunal tube suction from the duodenum, and prolonged laxative use(223).

The finding also showed that patients with Stage IV (85.9%) gastrointestinal cancers were significantly more likely to be malnourished compared to those with Stage II cancer, which is higher than that in Ethiopia (74.7%)(28), which reported that stage four cancer patients were more likely to have malnutrition than those with stage one. Similarly, the result was also higher than the studies done in Malaysia study (56.9%)(208), and Korea (55.6%)(224). This difference may be due to the participants' financial status and the treatment quality.

This study showed that patients with poorer performance status are more likely to be malnourished due to physical limitations and increased metabolic demands (Azam et al., 2019), highlighted this relationship, noting that lower performance status impairs the ability to maintain adequate nutrition(148).

These findings support this explanation because it was observed patients who did not meet the WHO Performance criteria had 5.77 times higher odds of being malnourished (AOR = 5.77; 95% CI: 1.20, 27.6) compared to those who met the criteria. This study was in line with other studies in Iran(136), France (225), and Ethiopia(142,226). Poor performance status is a known problem that influences the patients' physical, mental, and social well-being (227).

Our study, found that patients with hypoalbuminemia (low serum albumin levels) had 8.29 times higher odds of being malnourished compared to those with normal serum albumin levels (AOR = 8.29; 95% CI: 2.13, 32.2, p = 0.002). This aligns with findings from a study in the USA by(228), which stated that Hypoalbuminemia is associated with increased postoperative mortality and complications.This due to patients with hypoalbuminemia had more comorbidities and significantly lower hemoglobin levels compared to those with normal albumin levels(229). These factors contribute to an increased risk of complications.

Additionally, Serum Albumin transports long-chain fatty acids and steroids, which are essential for energy production, hormone balance, and various metabolic processes. Reduced albumin levels impair the transport and availability of fatty acids, steroids, and medications, potentially disrupting metabolic functions and energy balance, and contributing to malnutrition(230).

The stage of cancer was significantly related to malnutrition. Specifically, the odds of patients with Stage IV cancer being malnourished were 7.59 times higher (AOR=7.59; 95% CI: 1.05-25.3) compared to those with Stage II cancer, which was supported by a study performed in Bangladesh(231), and Ethiopia(28). This may be due to the poor quality of care for cancer-related malnutrition or the pathophysiology of cancer cells, which require a high-calorie intake of nourishment in progressed stages(232).

Additionally, this higher risk in advanced stages may stem from cancer-related malnutrition or increased psychological distress, financial strain, and social isolation experienced by stage IV patients, impacting their dietary habits and access to nutritious foods(233). Patients with a longer duration of illness (25 months or more) had 7.81 times higher odds of being malnourished (AOR = 7.81; 95% CI: 1.47, 41.6, p = 0.016) compared to those with an illness duration of less than 12 months. Various studies showed that chronicity among adult gastrointestinal cancer patients was associated with prolonged treatment modalities and systemic and local effects of cancer itself, resulting in loss of appetite, alterations in the absorption and metabolism of nutrients, and impaired organ function(234,235).

7. Strength and Limitations

The study's strengths include a high response rate among participants. Data were gathered through patient interviews, and extraction from medical records. Additionally, conducting serum biomarker analysis adds objective biochemical data to the study, which can strengthen the scientific rigor and depth of the findings. This methodological approach combines both subjective (interviews) and objective (biomarker analysis) measures, providing a comprehensive view of the study variables. Limitations of the study:- Because of the study was conducted at a single cancer center, its findings may not represent the entire nation. Another limitation of this study was that it did not evaluate Serum Prealbumin, C-reactive protein, Total protein, and Total cholestrol biochemical markers due to a shortage of reagents and financial constraints. Furthermore, because the study is cross-sectional in nature, it can identify associations between variables, but it cannot determine the direction of correlations, and the impacts of malnutrition and biomarkers alterations on treatment outcome and quality of life.

8. Conclusion and Recommendation

8.1 Conclusion

Malnutrition is prevalent among adult gastrointestinal cancer patients at JUMC's oncology department, along with significant occurrences of serum albumin and hemoglobin abnormalities, geriatric nutritional risk index, nutritional risk index, prognostic nutritional index, and electrolyte disorders. Addressing these nutritional deficiencies and imbalances in routine care is crucial for improving patient outcomes. Malnutrition in these patients is associated with factors such as Low serum albumin levels, Cancer stage, WHO performance status, Long duration of illness (25months and above). This complexity underscores the need for tailored interventions. Additionally, altered serum albumin levels, hemoglobin, geriatric nutritional risk index, nutritional risk index, and prognostic nutritional index were significantly correlated with malnutrition.

8.2: Recommendation.

- Malnutrition is highly prevalent among adult gastrointestinal cancer patients. There was a significant decrease in the mean level of serum albumin, hemoglobin, geriatric nutritional risk index, nutritional risk index, and prognostic nutritional index in malnourished as compared to well-nourished patients. These biomarkers are recommended as alternative or supplementary screening tools for early detection of malnutrition in adult gastrointestinal cancer patients.
- Healthcare providers should prioritize interventions to improve hemoglobin and serum albumin levels in malnourished patients, such as dietary modifications and nutritional supplementation, to optimize patient outcomes.
- Collaboration among healthcare professionals, including oncologists, nurses, and dietitians, is crucial for providing comprehensive care and minimizing the impact of electrolyte disorders on gastrointestinal cancer patients' health and well-being.
- Governmental and nongovernmental organizations should provide support to cancer patients who have an economic problem to improve food security so that they are not expose to stress and nutritional problems.
- Health-care providers should consider regular nutritional assessment, manage chemotherapy-induced symptoms, such as appetite loss and diarrhea, and give nutritional education mainly on food preference, energy, and nutrient balance.
- Oncologists, nurses, and dietitians within the oncology department would be responsible for conducting regular monitoring and follow-up appointments, with support from hospital administrators in ensuring the availability of resources and the development of standardized protocols
- Nutritional education initiatives should be led by the hospital's patient education department or committee, in collaboration with the oncology department's dietitians, nurses, and other healthcare providers.
- The establishment of a multidisciplinary nutritional care team would involve coordination between the oncology department's healthcare team, hospital administrators, and possibly representatives from other departments, such as social work or mental health services.
- Lastly, further prospective studies are needed to explore the impact of malnutrition on survival and quality of life among cancer patients in developing countries

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Annexes

JIMMA UNIVERSITY

INSTITUTE OF HEALTH

DEPARTMENT OF BIOMEDICAL SCIENCES

Facility-Based Head Information Sheet and Informed Consent Form (English Version). Participation in the study is fully voluntary. Participants have the right to declare whether to participate in this study. If they decide to participate, they have the right to withdraw from the study at any time and this will not label any loss of benefits to which they are otherwise entitled. Participants do not answer any questions that they do not want inquiries. If you have any questions or inquiries at any time please get in touch with the following addresses:

Principal investigator: **Mabratu Takele Desisa**:mabratutakele507@gmail.com Mobile phone: 0925909356. Jimma University Institute of Health Sciences and Bio-Medical Sciences department.

Research Ethical Review Committee: Office phone: _____ and P. O. Box: ___, Jimma.

Declaration of informed voluntary consent

I have read the participant information sheet. I have clearly understood the purpose of the

Research, the procedures, the risks and benefits, confidentiality issues, the rights of participants, and the contact address for any queries. I have been allowed to ask questions about things that have been unclear. I was informed that participants have the right to withdraw from the study at any time or not to answer any question they do not want.

Therefore, I declare my voluntary consent to allow this study to be conducted in Jimma University Medical Center on behalf of the Hospital management with my initials (signature) as indicated below.

Name & Signature of the head of hospital_____ Date_____

Name & Signature of data collector_____ Date_____

2: Participant Information Sheet & Informed Consent Form for Study Participants (English Version). Hello, my name is ……, I am working as a data collector for the study conducted by **Mabratu Takele Desisa** who is studying for his master's degree at Jimma University, Institute of Health Sciences, and Department of Bio-Medical Sciences. I kindly request you to give me your attention to explain to you about the study and being a participant.

Study title: - Evaluation of Inflammation-Nutrition biomarkers and Electrolyte Status among Adult Gastrointestinal Cancer Patients at the Oncology Department of JUMC.

Aim of Study:-Moreover, this study aims to write a thesis as a requirement for the partial fulfillment of the master's degree program.

Procedure and duration

I was interviewing you using a questionnaire to provide me a relevant data that is helpful for the study. I will interview you with about 25 questions using a questionnaire and take your height and weight which will take about 45 minutes, so I kindly ask you to spare your time with me.

Risks and benefits

There is limited minimal harm that may face you when participating in this study and will take about 45 minutes of your working time. There will not be any direct payment for participating in this study. Moreover, the findings from this research may reveal important information for the local health planners and implementers, and for the patients.

Confidentiality

The information you provide is confidential. No information will identify you in particular. The finding of the study was general to the study population and will not reflect anything particular about individual persons or housing. The questionnaire was coded to exclude showing names and other specific identities. No reference was made in oral or written reports that could link you to the research.

Rights

Participation in this study is fully voluntary. You have the right to declare whether to participate in this study. If you decide to participate, you have the right to withdraw from the study at any time and this will not label you for any loss of benefits to which you are otherwise entitled. You do not answer any question that you do not want to answer.

Contact Address

If you have any questions or inquiries at any time don't hesitate to get in touch with us at the following address:

Principal investigator: **Mabratu Takele Desisa**

Email: mabratutakele507@gmail.com

Mobile phone: 0925909356

Jimma University Institute of Health Sciences and Department of Bio-Medical Sciences Institutional Research Ethical Review Committee: Office phone: _____

P.O Box: _____, Jimma.

Declaration of informed voluntary consent

I have read/will read to me the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating, and the contact address for any queries. I have been allowed to ask questions about things that have been unclear. I will inform you that I have the right to withdraw from the study at any time or not to answer any question that I do not want. Therefore, I declare my voluntary consent to participate in this study with my initials (signature) as indicated below.

Name & Signature of the participant_____ Date_____

Name & Signature of data collector_____ Date_____

Part-I: - Socio-demographic Characteristics

S.No.	Variables	Categories(√)
1.	**MRN***	
2.	Sex	1. Male
		2. Female
3.	Age	1. 18–34
		2. 35–54
		3. 55–64
		4. > 64
4.	Residence Region	1. Afar
		2. Tigray
		3. Amhara
		4. Oromia
		5. Benishangul Gumuz
		6. Central Ethiopia
		7. South West Ethiopia
		8. Sidama
		9. Gambella
		10. Somali
		11. Harari
		12. Addis Ababa
		13. Dire Dawa
5.	Specific area of residence	1. Rural
		2. Urban
6.	Marital status	1. Single
		2. Married
		3. Divorced
		4. Widowed
7.	Family size	1. 2-6
		2. 7-11

		3. 12-16
8.	Occupation	1. Farmer
		2. Merchant
		3. Government employee
		4. self-employee
		5. Student
		6. House Wife
9.	Education Status	1. Didn't attend formal education
		2. Primary education
		3. secondary education
		4. Collage/University
10.	Monthly average income in ETB	1. ≤ 500 birr (low income)
		2. 500-1600birr(middle income)
		3. > 1600 (high income)

Part II. Behavioral factors

S.No	**Variables**	**Categories**
1.	Alcohol consumption	**1. Yes**
		2. No
2.	If part II Q.1 is yes, How often do you drink per week?	1. Daily
		2. Six days per week
		3. Four – five days per week
		4. Two to three per week
		5. Once a week
3.	Smoking status	**1.** Never smoker
		2. Current smoker

		3. Former smoker(he/she is not smoking currently, but if he/she smoked at least 100 cigarettes in his/her life)
4.	If current smoker or former smoker for part-II Q.3 amount of cigarettes smoking	1. Between 1-10 cigarettes per day
		2. Between 11-19 cigarettes per day
		3. More than 20 cigarettes per day
5.	If current smoker or former smoker for part-II Q.3 for how long	_____(years)
6.	Chat chewing	**1. Yes**
		2. No
7.	Performing regular physical Exercise	**1. Yes**
		2. No
8.	If yes part II Q. 7 How often do you perform exercise?	1. Less than once per week
		2. One – two days per week
		3. Three – four days per week
		4. Five – six days per week
		5. Daily
		6. Two times per day
		7. More than two times per day
9.	If yes part II Q. 7, for how long do you perform per session?	1. Less than 30 minutes 2. 30 minutes and above
10.	Body weight	……Kg
11.	Height	……meter
12.	Waist Circumference	……cm
13.	MUAC	_____cm
14.	CAF	_____cm_____

Part-III: Medical and Clinical related factors.

S.No	Variables	Categories
1.	Family history of cancer	**1. Yes**
		2. No
2.	Co-morbidity (chronic disease condition other than cancer)	**1. Yes**
		2. No
3.	If part-III Q.2 yes which type of chronic disease do you have?	1. HTN
		2. DM
		3. CKD
		4. CLD
		5. CVS
		6. others(specify)
4.	Any history of previous infection or active infection	1. Yes
		2. No
5.	If part-III Q.4 yes which type of do you have	
6.	Types of cancer	1. Esophageal cancer
		2. Gastric cancer
		3. Liver cancer
		4. Pancreatic cancer
		5. Colorectal cancer
		6. Breast cancer
		7. Cervical Cancer
		8. Cholangiocarcinoma (Gallbladder ca)
7.	Stages of cancer	1. Stage-I
		2. Stage-II
		3. Stage-III
		4. Stage-IV

8.	Types of Treatment	1. Chemotherapy	
		2. Surgery	
		3. Chemo-radiotherapy	
		4. Hormonal therapy	
		5. Radio-therapy	
		6. Others(Specify)	
9.	If part-III Q.8 your answer is chemotherapy and/or chemo with other combination, which treatment cycle	1. First	
		2. Second	
		3. Third	
		4. Fourth	
		5. Fifth	
		6. Sixth	
10.	Metastasize of the disease	1. Yes	
		2. No	
		3. Unknown	
11.	Plan of Treatment	1. Neoadjuvant	
		2. Concurrent chemo radio therapy	
		3. Palliative care	
		4. Curative care	
12.	Duration of illness	1. <12 months	
		2. 12–24 months	
		3. 25–36 months	
		4. 37–48 months	
		5. 49–60 months	
		6. >60 months	
13.	WHO performance status	1. Fully active, no restrictions on activities	0
		2. Unable to do strenuous activities, but able to carry out light housework and	1

		sedentary activities.	
		3. Able to walk and manage self-care, but unable to work. Out of bed more than 50% of waking hours.	2
		4. Confined to bed or a chair for more than 50% of waking hours. Capable of limited self-care.	3
		5. Completely disabled. Confined to a bed or chair. Unable to do any self-care.	4
		6. Death	5
14.	Do you have any problems during chewing/eating?	**1. Yes**	
		2. No	
15.	Do you have pain during Swallowing?	**1. Yes**	
		2. No	
16.	Have you had a loss of appetite?	**1. Yes**	
		2. No	
17.	Do you feel nausea the past month?	**1. Yes**	
		2. No	
18.	Do you have been vomiting for the past month?	**1. Yes**	
		2. No	
19.	Do you have diarrhea for the past two weeks? If yes, go to part A	**1. Yes**	
		2. No	
20.	Do you have diarrhea on this day(the day of the interview)	**1. Yes**	
		2. No	
21.	What type of diarrhea do you have	1. Watery diarrhea	
		2. Bloody diarrhea	

22.	Do you have constipation in the past Month?	1. Yes
		2. No

Part IV: Feeding Habit Survey

S.No.	Variables	Categories
1.	How much do you eat within 24 Hours?	1. Regular
		2. Irregular
		3. I do not know
	Route of feeding	1. Solid
		2. Semi-solid
		3. Liquid
		4. Tube feeding
2.	Do you have any weight loss in the Past 3 months?	☐ Yes
		☐ No
3.	Have you decreased your feeding habits in the last week? If yes, go to part A	1. Yes
		2. No
4.	What was the reason?	1. Nausea
		2. No appetite
		3. No access to food
		4. Stress
		5. Pain
		6. Others_____
5.	Have you had regular eating or Breakfast habits?	1. Yes
		2. No
6.	How many times do you eat per day?	1. Once
		2. Twice
		3. Three times

		4. Four times
7.	Are you in a fasting state?	1. Yes
		2. No
8.	How much do you take fluid per day?	1. less than 3 litters
		2. 3-5 litters
		3. More than litter
9.	How did you eat?	1. I cannot eat without support
		2. Partially supported by
		3. I can eat without any support
		4. Tube Feeding

*others: includes (head and neck, lung, oral, brain tumor).

Part V: Subjective global assessment form (filled by health professionals)

This part of the questionnaire is about the nutritional assessment of the patient. Put a tick (√) on the responses of the respondents from the given alternatives.

Medical History

Patient Name_____ Date_____/_____/_____

S.No.	Question	Response
1.	**Nutrient Intake**	1. □ No change; adequate
		2. □ Inadequate; duration of inadequate intake_____ □ Suboptimal solid diet □ Full fluids or only oral nutrition supplements □ Minimal intake, clear fluids or starvation **3. Nutrient intake in the past 2 weeks** □ Adequate □ Improved but not adequate □ No improvement or not adequate
2.	**Weight**	Usually weight_____ Current Weight_____
		4. Non-fluid weight change past 6 months Weight Loss (Kg) □ <5% loss or weight stability □ 5-10% loss without stabilization or increase □ > 10 % loss or ongoing **5. Weight change past 2 weeks amount (if known)_____** □ Increased □ No change □ Decreased
		If the above is not known, has there been a subjective loss of weight during the past six months? □ Non or Mild □ Moderate □ Severe
3.	**Symptoms**(experiencing symptoms affecting oral intake)	6. □ Pain during eating □ Vomiting □ Diarrhea □ Dental problems □ Dysphagia □ Anorexia □ Constipation □ Nausea □ Feels full quickly 7. □ Non □ Intermittent/Mild/Low □ Constant/Severe/Multiple 8. Symptoms in the past 2 weeks □ Resolution of symptoms □ Improving □ No change or worsened

6	**Functional Capacity** (Fatigue and progressive loss of function)	1. □ No dysfunction 2. Reduced capacity, duration of change_____ □ Difficult with ambulatory/Normal activities □ Bed/Chair ridden 3. Functional capacity in the past 2 weeks □ Improved □ No change □ Decreased
7.	**Metabolic Requirement**	High metabolic Requirement □ Yes □ No
8.	**Physical Examination**	1. Loss of Body Fat □ No □ Mild/Moderate □ Severe
		2. Loss of Muscle Mass □ No □ Mild/Moderate □ Severe
		3. Presence of edema/Ascites □ No □ Mild/Moderate □ Severe
9.	**SGA Rating**	**A**.□ Normal/Well-nourished **B**. □ Mild/Moderately Malnourished/Some progressive Nutritional Loss **C**. □ Severely malnourished / Evidence of wasting and progressive symptom

A- Well-nourished:- No decrease in food/ nutrient intake; < 5% weight loss; no /minimal symptoms affecting food intake; no deficit in function; no deficit in fat or muscle mass **Or** an individual with criteria for **SGA B or C** but with recent adequate food intake; non-fluid weight gain; significant recent improvement in symptoms allowing adequate oral intake; significant improvement in function; and chronic deficit in fat and muscle mass but with recent clinical improvement in function.

B- Mild/moderately malnourished: - Definite decrease in food/nutrient intake**;** 5-10% weight loss without stabilization or gain; mild/some symptoms affecting food intake; moderate functional deficit or recent dehydration; mild/moderate loss of fat and/or muscle mass **Or** individual meeting criteria for SGA C but with improvement (but not adequate) of oral intake, recent stabilization of weight, decrease in symptoms affecting oral intake, and stabilization of functional status.

C- Severe malnourished; - Severe deficit in food/nutrient intake ;> 10% weight loss which is ongoing; significant symptoms affecting food/nutrient intake; severe functional deficit **or** recent significant deterioration obvious signs of fat and/or muscle loss.

Part VI: Blood Biomarker Status Check List

S.No.	Question	Categories		Answers					
10.	Are there CBC investigations Conducted?			**Cycle of Treatment**					
				1st	**2nd**	**3rd**	**4th**	**5th**	**6th**
		1. WBC Count	1. TLC						
		2. Differential count	1. Neutrophil						
			2. Lymphocyte						
			3. Monocyte						
			4. Basophil						
			5. Eosinophil						
		3. Hematology parameter	1. RBC Count						
			2. HGB Count						
			3. PLT Count						
11.	Is there an Electrolyte investigation undertaken?	1. Na							
		2. K							
		3. Cl							
12.	Are there Inflammatory markers investigated?	1. Serum Albumin							
		2. C-Reactive -Protein							
		3. Transferrin’							
		4. Ferritin							
13.	Is there Lipid Profile Tests Conducted?	1. Total Cholesterol							
		2. Triglyceride							
		3. Total Protein							
14.	Is there Serum Biomarkers	1. Serum Creatinine							
		2. Urea							

	Investigated?	3. AST/GOT						
		4. ALT/GPT						
		5. TBIL						
		6. DBIL						
		7. ALP						
		8. RBS						
15.	Parasitology	Stool Examination						
		H.pylori stool Ag test						
		Occult blood test						
16.	Serology Tests	HBV's Ag tests						
		HCV Ab tests						
		PICT Tests						
17.	Other infection lab results	CA19-9						
18.	Is there cancer biomarkers conducted?	CEA						
		iCa++						
		nCa+						
		tCa++						
		PH						

Dabalata

Dabalata-I: 1.1.

Waraqaa Odeeffannoo Mataa Faasilitii Irratti Hundaa'ee fi Unka Hayyama Odeeffannoo Qaban (English Version). Qorannicha irratti hirmaachuun guutummaatti fedhii ofiitiin kan raawwatamudha. Hirmaattonni qorannoo kana irratti hirmaachuu fi dhiisuu isaanii labsuuf mirga qabu. Yoo hirmaachuuf murteessan yeroo barbaadanitti qorannicha keessaa ba'uuf mirga kan qaban yoo ta'u, kunis kasaaraa faayidaa karaa biraatiin argachuu qaban kamiyyuu hin mallatteessu. Hirmaattonni gaaffii gaaffii hin barbaanne kamiyyuu hin deebisan. Yeroo barbaaddanitti gaaffii ykn gaaffii yoo qabaattan teessoo armaan gadii qunnamaa:

Qorataa muummee: Mabratu Takele Deesisaa: mabratutakele507@gmail.com. Mobile phone: 0925909356. Yuunivarsiitii Jimmaa Inistiitiyuutii Saayinsii Fayyaa fi Saayinsii Baayoo-Medikaal kutaa.

Koree Gamaaggama Naamusa Qorannoo: Bilbila waajjira: _____ fi P. O. Sanduuqa: ___, Jimma.

Labsii hayyama tola ooltummaa beekumsa qabu

Waraqaa odeeffannoo hirmaattotaa dubbiseera. Kaayyoon Oromoo ifatti hubadheera Qorannoo, hojimaata, balaa fi faayidaa, dhimmoota iccitii, mirga hirmaachuu, fi teessoo quunnamtii gaaffii kamiyyuu. Wantoota ifa hin taane irratti gaaffii akkan gaafadhu naaf hayyamameera. Hirmaattonni yeroo barbaadanitti qorannicha keessaa bahuu ykn gaaffii hin barbaanne kamiyyuu deebisuuf mirga akka qaban naaf himameera.

Kanaafuu, qorannoon kun akka armaan gaditti ibsametti qubee jalqabaa (mallattoo) kootiin bakka bu'ee hoggansa Hospitaalaatiin Giddugala yaalaa Yuunivarsiitii Jimmaa keessatti akka gaggeeffamu hayyama fedhii kootiin labsa.

Maqaa fi Mallattoo itti gaafatamaa hospitaala_____ Guyyaa_____

Maqaa fi Mallattoo walitti qabaa odeeffannoo_____

Guyyaa_____ .

Dabalata 2: Waraqaa Odeeffannoo Hirmaattotaa & Unka Hayyama Odeeffannoo Hirmaattota Qo'annoo (English Version).

Akkam jirtu, maqaan koo fi Kutaa Saayinsii Baayoo-Medikaalaa. Waa'ee qorannichaa fi hirmaataa ta'uu akkan isiniif ibsuuf xiyyeeffannoo keessan akka naaf kennitan kabajaan isin gaafadha.

Mata duree qo'annoo

Kaayyoo Qo'annoo :-Kana malees, qorannoon kun sagantaa digirii lammaffaa gartokkoon akka raawwatamuuf akka ulaagaatti barruu qorannoo (thesis) barreessuu kan kaayyeffatedha.

Hojimaataa fi yeroo turtii

Daataa barbaachisaa qorannichaaf gargaaru naaf kennuudhaaf gaaffilee fayyadamee isin gaafachaa ture. Gaaffiiwwan gara 25 ta'an gaaffilee fayyadamuun isin gaafadhee dheerinaafi ulfaatina keessan kan gara daqiiqaa 45 fudhatu waan ta'eef yeroo keessan na waliin akka qusattan kabajaan isin gaafadha.

Balaa fi faayidaa

Yeroo qorannoo kana irratti hirmaattan miidhaa xiqqaan isin mudachuu danda'u daangeffamee kan jiruu fi yeroo hojii keessan keessaa gara daqiiqaa 45 kan fudhatudha. Qorannoon kun hirmaachuuf kaffaltiin kallattiin hin jiraatu. Kana malees, argannoon qorannoo kanarraa argamu karoorsitootaa fi hojiirra oolchitoota fayyaa naannoo sanaaf, akkasumas dhukkubsattootaaf odeeffannoo barbaachisaa ta'e mul'isuu danda'a.

Iccitii eeguu

Odeeffannoon isin kennitan iccitiidha. Odeeffannoon addatti eenyummaa si hin ibsu. Argannoon qorannichaa ummata qorannichaaf waliigalaa kan ture yoo ta'u, waa'ee namoota dhuunfaa ykn mana jireenyaa waan addaa hin calaqqisiisu. Gaaffiin kun maqaa agarsiisuu fi eenyummaa addaa biroo akka hin dabalamneef koodii kennameera. Gabaasa afaaniin ykn barreeffamaan qorannichaan si walqabsiisuu danda'u keessatti eeruun tokkollee hin kennamne.

Mirga

Qorannoon kun hirmaannaan guutummaatti fedhii ofiitiin kan raawwatamudha. Qo'annoo kana irratti hirmaachuu fi dhiisuu kee labsuuf mirga qabda. Yoo hirmaachuuf murteessite yeroo barbaaddetti qorannicha keessaa ba'uuf mirga qabda kunis faayidaa karaa biraatiin argachuuf mirga qabdu kamiyyuu dhabuudhaaf maqaa si hin mallatu. Gaaffii deebii kennuu hin barbaanne kamiyyuu hin deebistu.

Teessoo Quunnamtii

Yeroo barbaaddanitti gaaffii ykn gaaffii yoo qabaattan teessoo armaan gadii kanaan nu qunnamaa:

Qorataa muummee: Mabratu Takele Desisaa

Imeelii: mabratutakele507@gmail.com irratti ergaa

Bilbila harkaa: 0925909356

Yuunivarsiitii Jimmaa Inistiitiyuutii Saayinsii Fayyaa fi Kutaa Saayinsii Baayoo-Medical Qorannoo Dhaabbilee Koree Gamaaggama Naamusaa: Bilbila waajjira: _____

Sanduuqa Poostaa: _____, Jimmaa.

Labsii hayyama tola ooltummaa beekumsa qabu

Waraqaa odeeffannoo hirmaattotaa dubbiseera/naaf dubbisa. Kaayyoo qorannichaa, hojimaata, balaa fi faayidaa, dhimmoota iccitii, mirga hirmaachuu, fi teessoo quunnamtii gaaffii kamiyyuu sirriitti hubadheera. Wantoota ifa hin taane irratti gaaffii akkan gaafadhu naaf hayyamameera. Yeroo barbaadetti qo'annoo keessaa ba'uuf ykn gaaffii ani hin barbaanne kamiyyuu deebisuuf mirga akkan qabu isin beeksisa. Kanaafuu, qorannoo kana irratti hirmaachuuf fedhii kootiin akka armaan gaditti ibsametti qubee jalqabaa (mallattoo) kootiin nan ibsa.

Maqaa fi Mallattoo hirmaataa_____ Guyyaa_____

Maqaa fi Mallattoo walitti qabaa odeeffannoo_____ Guyyaa_____

Dabalata 3: Qorannoon Hawaas-dimoogiraafii

Kutaa-I: - Gaaffii 1 -10 irraa Amaloota Hawaas-dimoogiraafii dhukkubsataa madaaluuf kan qophaa'aniidha

	Jijjiiramoota	Ramaddiiwwan	Deebii
	1. Walqunnamtii saalaa	Dhiira	
		Dhalaa	
	2. Umurii	18–34 irratti	
		35–54 irratti kan argamu	
		55–64 irratti kan argamu	
		> 64 ta'e	
	3. Alkoolii dhuguu	Eeyyee	
		Lakki	
	4. Sigaaraa xuuxuu	Eeyyee	
		Lakki	
	5. Chat daakuun	Eeyyee	
		Lakki	
	1. Sochii qaamaa yeroo hunda raawwachuu	Eeyyee	
		Lakki	
	7. Haala gaa'elaa	Kan fuudhe	
		Qeenxee	
		Hiikkaan	
		Dubartii abbaan manaa irraa du'e	
	8. Hojii qabachuu	Qotee bulaa	
		Daldalaa	
		Hojjetaa mootummaa	
		ofiin of hojjechiisaa	

		Barataa	
		Kan biroo (ibsi) .	
	9. Galii ji'a ji'aan jiddugaleessa afaan Itoophiyaatiin Birrii	1.≤ Birrii 500 (galii xiqqaa) . 2. 500 1600birr(galii giddu galeessaa) .	
		3. > 1600 (galii olaanaa) .	
	10. Haala Barnootaa	1. Dubbisuu fi barreessuu kan hin dandeenye	
		2. Barnoota sadarkaa tokkoffaa	
		3. Barnoota sadarkaa lammaffaa	
		4. Barnoota olaanoo	

Kutaa III. Seenaa murteessaa yaalaa fi kan kanaan walqabatu maamilaa.

	Jijjiiramoota	Ramaddiiwwan	Deebii
	1. Seenaa maatii kaansarii	Eeyyee	
		Lakki	
	2. Co-morbidity (haala dhukkuba yeroo dheeraa kaansarii malee) .	Eeyyee	
		Lakki	
	3. Gosa kaansarii	Kaansarii ujummoo nyaataa	
		Kaansarii garaachaa	
		Kaansarii kale	
		Kaansarii xannacha	

		sombaa	
		Kaansarii garaachaa fi garaachaa	
		Kaan	
	4. Sadarkaalee kaansarii	Sadarkaa-I	
		Sadarkaa-II	
		Sadarkaa-III	
		Sadarkaa-IV	
	5. Gosa wal'aansaa	1. Keemooteraapii	
		2. Baqaqsanii hodhuu	
		3. Keemoo-raadiyooteraapii	
		4. Yaala hormoonii 5. Raadiyoo-yaala 6. Kanneen biro	
	6. 6. . Marsaa wal'aansaa	1. Tokkoffaa 2. Lammaffaa 3. Sadaffaa 4. Afraffaa 5. Shanaffaa 6. Jahaffaa	
	7. Karaa nyaataa	1. Jajjaboo	
		2. Walakkaa jabaa	
		3. Dhangala'aa	
		4. Nyaata tuubii kennuu	
	Ulfaatina qaamaa(Kg) .		
	Olka'iinsa (mts) .		
	BMI=Ulfaatina Kg/H (mts)2	< 18.5 ta'a	
		18.5–24.9 irratti kan argamu	

		≥ 25 ta'a	
	Yeroo daakuun/nyaatan rakkoon isin mudataa?	1. Eeyyee 2.Lakk	
	Dhukkubbiin yeroo... Liqimsuu?	1. Eeyyee 2.Lakk	
	Fedhiin nyaataa sitti dhaga'amee jiraa?	1. Eeyyee 2.Lakk	
	Ji'a darbe keessa garaa kaasaan sitti dhaga'amaa?	1. Eeyyee 2.Lakk	
	Ji'a darbeef garaa kaasaa turtee?	1. Eeyyee 2.Lakk	
	Torban lamaan darbaniif garaacha qabdaa? Yoo eeyyee ta'e gara kutaa A	1. Eeyyee 2.Lakk	
Garii QEENXEE	Guyyaa kana garaa kaasaa qabdaa (the guyyaa gaaffii fi deebii)	1. Eeyyee 2.Lakk	
	Dhukkuba garaachaa gosa akkamii qabda	A) Garaa bishaanii B) Garaa garaa dhiigaa	
	Yeroo darbe qufaa qabdaa Ji'a?	1. Eeyyee 2. Lakki	

Kutaa IV: Qorannoon amala nyaataa

	Jijjiiramoota	Ramaddiiwwan	Deebii
	24 keessatti meeqa nyaatta Sa'aatiiwwan?	1. Idilee	
		2. Irreecha	
		3. An hin beeku	
	Ulfaatina qaamaa hir'isuu keessaa qabduu Ji'oota 3 darban?	1. Eeyyee	
		2.Lakk	
	Torban darbe keessa amala nyaataa hir'isteettaa? Yoo eeyyee ta'e gara kutaa A	1. Eeyyee 2.Lakk	

	Sababni isaa maali ture?	A) Garaa kaasaa	
		B) fedhii nyaataa dhabuu	
		C) Nyaata argachuu dhabuu	
		D) Dhiphina sammuu	
		E) Dhukkubbii	
	Amala nyaata yeroo hunda nyaachuu ykn Ciree qabaattaniittuu?	1. Eeyyee	
		2. Lakki	
	Guyyaatti yeroo meeqa nyaattu?	1. al tokko	
		2. yeroo lama	
		2. Yeroo sadii	
		4. Yeroo afur	
	Haala soomaa keessa jirtuu?	1. Eeyyee	
		2. Lakki	
	Guyyaatti dhangala'aa hangam fudhatta?	1. 3 gadi ta’e	
		2.3-5 kan ta’an	
		3. Litters caalaa	
	Akkamitti nyaattan?	1. Malee nyaachuu hin danda'u Deeggarsa	
		4. Gartokkoon kan deeggarameedha Kaan	
		2. Osoo hin taane nyaachuu nan danda'a deeggarsa kamiyyuu	

*kanneen biroo: kan dabalatu (mataa fi qoonqoo, somba, afaanii, firii sammuu).

Kutaa VII: Unka madaallii addunyaa kan mataa (subjective global assessment unka) (ogeessota fayyaatiin kan guutame) .

Kutaan gaaffilee kun waa'ee madaallii soorataa dhukkubsataa ti. Filannoowwan kennaman irraa deebii deebii kennaa irratti geengoo/tick (√) kaa'i.

KUTAA-VI - UNKA MADAALLII ADDUNYAA SUBJECTIVE				
S.Lakk.	Gaaffii	Deebii		Koodii
1. 1. .	Jijjiirama ulfaatina qaamaa ji'a 6 keessatti	Ulfaatina qaamaa dabaluu ykn Jijjiirama hin qabu ykn Ulfaatina qaamaa salphaa hir'isuu Ulfaatina qaamaa giddu galeessaa hir'isuu Ulfaatina qaamaa cimaa hir'isuu	QEENXEE B. B C. C	
2. 2. .	Jijjiirama ulfaatinaa torban 2 darban keessatti	Ulfaatinni qaamaa dabalaa jira Jijjiiramni ulfaatinaa hin jiru Ulfaatinni qaamaa hir'achaa jira	QEENXEE B. B C. C	
3. 3. .	Jijjiirama fudhatama nyaataa	Yeroo gabaabaaf jijjiiramni ykn jijjiiramni xiqqaan hin jiru Fudhataan daangaa fi hir'achaa dhufe; Fudhatama gadhee fi dabalaa dhufe; Fudhatamni gadhee, fudhatama duraa irratti hundaa'uun jijjiiramni hin jiru Fudhatamni gaarii hin taanee fi hir'achaa dhufeera	QEENXEE B. B C. C	
4. 4. .	Turtii fi sadarkaa jijjiiramaa	Torban 2 gadi, jijjiirama xiqqaa ykn hin jiru Torban 2 ol, nyaata salphaa hanga giddu galeessaa suboptimal Nyaachuu dadhabuu ykn beela	QEENXEE B. B C. C	

5. 5. .	Mallattoon GI jiraachuu	Mallattoolee muraasa ykn hin mul'anne addaan citee Mallattoolee tokko tokko >torban 2f; mallattoolee ciccimoo fooyya'aa jiran Mallattoolee guyyaa guyyaan ykn yeroo baayyee >torban 2	QEENXEE B. B C. C	
6. 6.	Haala hojii	Cimina, dandeettii fi dandeettii hojii guutuu irratti hanqinni hin jiru; kasaaraa salphaa-giddu galeessa ta'ee fi fooyya'aa dhufeera Humna salphaa hanga giddu galeessaa, dandeettii dhabuu / sochii guyyaa guyyaa tokko tokko dhabuu ykn dhabuu cimaa garuu amma fooyya'aa jira Hojii, dandeettii fi humna cimaa dhabuu	QEENXEE B. B C. C	
7. 7. .	Haala dhukkubaa fi dhukkuba waliin dhufu	Dhiphina hin qabu Dhiphina gadi aanaa ykn giddu galeessa Dhiphina guddaa	QEENXEE B. B C. C	
8. 8. .	Gogaa jalaa cooma dhabuu	Kasaaraa xiqqaa ykn homaa hin qabu Naannoo hundatti salphaa-giddu galeessa; naannoo tokko tokkotti kasaaraa cimaa Kasaaraa cimaa naannoolee irra caalaan	QEENXEE B. B C. C	
9. 9. .	Maashaalee qisaasessuu	Kasaaraa xiqqaa ykn homaa hin qabu Naannoo hundatti salphaa hanga giddu galeessaa; naannoo tokko tokkotti kasaaraa cimaa Kasaaraa cimaa naannoolee irra caalaan	QEENXEE B. B C. C	
10. 10. .	Edema jedhamu	Edema xiqqaa ykn hin jiru Edema salphaa hanga giddu galeessaa Edema cimaa	QEENXEE B. B C. C	

11. 11. .	Asiitii (Ascites) jedhamu	Ascites hin qabu ykn suuraa qofa irratti Ascites salphaa hanga giddu galeessaa ykn kilinikaan fooyya'uu Ascites cimaa ykn ascites guddachaa dhufe	QEENXEE B. B C. C	

Qabxii SGA akkamitti akka xumurru

SGA dhuguma haala soorataa madaaluuf mala subjective dha. SGA dhukkubsataa kana akka A. Nyaata gaarii kan qabu; B. Hanqina nyaataa giddu galeessaa kan qaban; C. Hanqina nyaataa hamaa. Dhukkubsattoonni sadarkaa subjective isaanii irratti hundaa'uun naannoo bal'aa lamatti gosoota kana keessaa tokkotti ramadamu: Wantoonni unka irratti argaman ogeessi soorataa haala dhukkubsataa irratti miira waliigalaa argachuuf itti fayyadamu. Yoo sadarkaan B ykn C baay'ee jiraate, dhukkubsataan sun carraan hanqina nyaataa ykn akkas (B+C) akka hanqina nyaataatti ramadamee fi qabxiin A soorata gaarii ture. Yoo sadarkaan gama bitaa ta'e dhukkubsataan sun soorata gaarii argachuun isaa hin oolu. Haaluma walfakkaatuun, SGAn daataa kana keessatti (B+C) akka Malnourished (giddu galeessa fi cimaa): > qabxii 17tti ramadameera. Nyaata gaarii kan qabu: < qabxii 17.

አባሪ

አባሪ-I፡

በፋሲሊቲ ላይ የተመሰረተ የጭንቅላት መረጃ ወረቀት እና በመረጃ የተደገፈ የስምምነት ቅጽ (የእንግሊዘኛ ቅጂ)። በጥናቱ ውስጥ መሳተፍ ሙሉ በሙሉ በፈቃደኝነት ነው. ተሳታፊዎች በዚህ ጥናት ውስጥ መሳተፍ ወይም አለመሳተፍን የማወጅ መብት አላቸው. ለመሳተፍ ከወሰኑ በማንኛውም ጊዜ ከጥናቱ የመውጣት መብት አላቸው እና ይህ በሌላ መልኩ የተፈቀዱትን ጥቅማጥቅሞች ማጣት አይገልጽም. ተሳታፊዎች ጥያቄዎችን የማይፈልጉትን ማንኛውንም ጥያቄ አይመልሱም። በማንኛውም ጊዜ ማንኛቸውም ጥያቄዎች ወይም ጥያቄዎች ካሉዎት እባክዎን የሚከተሉትን አድራሻዎች ያግኙ።

ዋና መርማሪ፡ መብራቱ ታከለ ደሲሳ፡ mabratutakele507@gmail.com ሞባይል ስልክ፡ 0925909356. የጅማ ዩኒቨርሲቲ የጤና ሳይንስ ኢንስቲትዩት እና ባዮ ሜዲካል ሳይንስ ትምህርት ክፍል።

የምርምር የሥነ ምግባር ክለሳ ኮሚቴ፡ የቢሮ ስልክ ፡ _____ እና P. O. Box፡____፣ ጅማ።

በመረጃ ላይ የተመሰረተ የፈቃደኝነት ፍቃድ መግለጫ

የተሳታፊውን መረጃ ወረቀት አንብቤዋለሁ። ዓላማውን በግልፅ ተረድቻለሁ

ምርምር፣ አካሄዶች፣ ስጋቶች እና ጥቅማ ጥቅሞች፣ ሚስጥራዊ ጉዳዮች፣ የመሳተፍ መብቶች እና የእውቂያ አድራሻው ለማንኛውም መጠይቆች። ግልጽ ባልሆኑ ነገሮች ላይ ጥያቄዎችን እንድጠይቅ ተፈቅዶልኛል። ተሳታፊዎች በማንኛውም ጊዜ ከጥናቱ የመውጣት ወይም የማይፈልጉትን ማንኛውንም ጥያቄ ላለመመለስ መብት እንዳላቸው ተነግሮኛል።

ስለሆነም ይህ ጥናት ከዚህ በታች በተገለፀው መሰረት በጅማ ዩኒቨርሲቲ ህክምና ማዕከል የሆስፒታሉን አስተዳደር በመወከል በፊርማዬ (ፊርማ) እንዲካሄድ በፈቃደኝነት መስማማቴን አውጃለሁ።

የሆስፒታሉ ኃላፊ ስም እና ፊርማ _____ ቀን_____

የመረጃ ሰብሳቢው ስም እና ፊርማ _____ ቀን_____

አባሪ 2፡ የአሳታፊ መረጃ ወረቀት እና ለጥናት ተሳታፊዎች በመረጃ የተደገፈ የስምምነት ቅጽ (የእንግሊዘኛ ቅጂ)።

ጤና ይስጥልኝ, ስሜ ..... እና የባዮ-ሜዲካል ሳይንሶች ዲፓርትመንት. ስለ ጥናቱ እና ተሳታፊ ስለመሆንዎ ለእርስዎ ለማስረዳት ትኩረትዎን እንዲሰጡኝ በአክብሮት እጠይቃለሁ።

የጥናት ርዕስ

የጥናት ዓላማ ፡- በተጨማሪም፣ ይህ ጥናት የማስተርስ ዲግሪ መርሃ ግብር በከፊል ለማሟላት እንደ መስፈርት ሆኖ ተሲስ ለመጻፍ ያለመ ነው።

ሂደት እና ቆይታ

ለጥናቱ የሚረዳ ጠቃሚ መረጃ ለእኔ ለመስጠት መጠይቁን ተጠቅሜ ቃለ መጠይቅ እያደረግኩህ ነበር። መጠይቁን ተጠቅሜ ወደ 25 የሚጠጉ ጥያቄዎችን ቃለ መጠይቅ እሰጥዎታለሁ እና ቁመታችሁን እና ክብደታችሁን እወስዳለሁ ይህም ወደ 45 ደቂቃ ይወስዳል, ስለዚህ ከእኔ ጋር ጊዜዎን እንዲያሳልፉ በትህትና እጠይቃለሁ.

አደጋዎች እና ጥቅሞች

በዚህ ጥናት ውስጥ በሚሳተፉበት ጊዜ ሊያጋጥሙዎት የሚችሉ እና 45 ደቂቃዎችን የሚፈጅ አነስተኛ ጉዳት ሊደርስብዎት ይችላል. በዚህ ጥናት ውስጥ ለመሳተፍ ምንም አይነት ቀጥተኛ ክፍያ አይኖርም. ከዚህም በላይ የዚህ ጥናት ግኝቶች ለአካባቢው የጤና እቅድ አውጪዎች እና ፈጻሚዎች እና ለታካሚዎች ጠቃሚ መረጃን ሊያሳዩ ይችላሉ.

ሚስጥራዊነት

ያቀረቡት መረጃ ሚስጥራዊ ነው። በተለይ እርስዎን የሚለይ መረጃ የለም። የጥናቱ ግኝት በጥናቱ ህዝብ ላይ አጠቃላይ የሆነ እና ስለግለሰብ ወይም ስለ መኖሪያ ቤት ምንም የሚያንፀባርቅ አይሆንም። መጠየቂያው ኮድ የተደረገው ስሞችን እና ሌሎች ልዩ ማንነቶችን ለማሳየት ነው። እርስዎን ከጥናቱ ጋር ሊያገናኝዎት የሚችል የቃልም ሆነ የጽሑፍ ዘገባዎች ምንም ማጣቀሻ አልተደረገም።

መብቶች

በዚህ ጥናት ውስጥ መሳተፍ ሙሉ በሙሉ በፈቃደኝነት ነው. በዚህ ጥናት መሳተፍ አለመሳተፍን የማወጅ መብት አልዎት። ለመሳተፍ ከወሰኑ, በማንኛውም ጊዜ ከጥናቱ የመውጣት መብት አለዎት እና ይህ እርስዎ ያለዎትን ጥቅማጥቅሞች ማጣት አይገልጽዎትም. መመለስ የማትፈልገውን ማንኛውንም ጥያቄ አትመልስም።

የእውቂያ አድራሻ

በማንኛውም ጊዜ ማንኛውም አይነት ጥያቄ ወይም ጥያቄ ካሎት በሚከተለው አድራሻ ያግኙን፡-

ዋና መርማሪ፡ መብራቱ ታከለ ደሲሳ

ኢሜል፡ mabratutakele507@gmail.com

ሞባይል፡ 0925909356

የጅማ ዩኒቨርሲቲ የጤና ሳይንስ ኢንስቲትዩት እና የባዮ-ሜዲካል ሳይንስ ትምህርት ክፍል ተቋማዊ ጥናትና ምርምር ሥነ ምግባር ገምግሚል፡ የቢሮ ስልክ፡ _____

የፖስታ ሳጥን፡ _____፣ ጅማ

በመረጃ ላይ የተመሰረተ የፈቃደኝነት ፍቃድ መግለጫ

የአሳታፊውን መረጃ አንብቤአለሁ/አነበብኩት። የጥናቱን አላማ፣ አካሄዶችን፣ ስጋቶችን እና ጥቅሞቹን፣ ሚስጥራዊ ጉዳዮችን፣ የመሳተፍ መብቶችን እና የእውቂያ አድራሻውን ለማንኛውም ጥያቄ በግልፅ ተረድቻለሁ። ግልጽ ባልሆኑ ነገሮች ላይ ጥያቄዎችን እንድጠይቅ ተፈቅዶልኛል። በማንኛውም ጊዜ ከጥናቱ የመውጣት ወይም የማልፈልገውን ማንኛውንም ጥያቄ ላለመመለስ መብት እንዳለኝ አሳውቅሃለሁ። ስለዚህ፣ ከዚህ በታች እንደተገለጸው በዚህ ጥናት የመጀመሪያ ሆኜ (ፊርማ) ላይ ለመሳተፍ የፈቃዴ ፈቃዴን አውጃለሁ።

የተሳታፊው ስም እና ፊርማ_____ ቀን_____

የመረጃ ሰብሳቢው ስም እና ፊርማ _____ ቀን_____

አባሪ 3 ፡ የሶሺዮ-ሕዝብ ጥናት

ክፍል-1፡ - ከጥያቄ 1-10 የታካሚውን ማህበራዊ-ስነ-ሕዝብ ባህሪያት ለመገምገም የተነደፉ ናቸው

	ተለዋዋጮች	ምድቦች	መልስ
	2. ወሲብ	ወንድ	
		ሴት	
	2. ዕድሜ	18–34	
		35–54	
		55–64	
		> 64	
	3. አልኮል መጠጣት	አዎ	
		አይ	
	6. ሲጋራ ማጨስ	አዎ	
		አይ	
	7. ቻት ማኘክ	አዎ	
		አይ	
	3. መደበኛ የአካል ብቃት እንቅስቃሴ ማድረግ	አዎ	
		አይ	
	7. የጋብቻ ሁኔታ	ያገባ	

		ነጠላ	
		የተፋታ	
		ባል የሞተባት	
	8. ሥራ	ገበሬ	
		ነጋዴ	
		የመንግስት ሰራተኛ	
		የራስ ተቀጣሪ	
		ተማሪ	
		ሌላ (ይግለጹ)	
	9.የወሩ አማካይ ገቢ በኢትዮጵያ ብር	1.≤ 500 ብር (ዝቅተኛ ገቢ) 2. 500 1600ብር (መካከለኛ ገቢ)	
		3. > 1600 (ከፍተኛ ገቢ)	
	10. የትምህርት ሁኔታ	1. መሃይም	
		2. የመጀመሪያ ደረጃ ትምህርት	
		3. የሁለተኛ ደረጃ ትምህርት	
		4. ከፍተኛ ትምህርት	

ክፍል III. የሕክምና እና ተዛማጅ የደንበኛው መለያ ታሪክ።

	ተለዋዋጮች	ምድቦች	መልሶች
	1. የካንሰር የቤተሰብ ታሪክ	አዎ	
		አይ	
	4. አብሮ በሽታ (ከካንሰር በስተቀር ሥር የሰደደ በሽታ)	አዎ	
		አይ	
	3. የካንሰር ዓይነቶች	የኢሶፈገስ ነቀርሳ	
		የጨጓራ ካንሰር	
		የጉበት ካንሰር	
		የጣፊያ ካንሰር	
		የኮሎሬክታል ካንሰር	
		ሌሎች	
	4. የካንሰር ደረጃዎች	ደረጃ-I	
		ደረጃ-II	
		ደረጃ-III	
		ደረጃ-IV	
	5. የሕክምና ዓይነቶች	1. ኪሞቴራፒ	
		2. ቀዶ ጥገና	
		3. ኬሞ-ራዲዮቴራፒ	

		4. የሆርሞን ሕክምና 5. ራዲዮ-ቴራፒ 6. ሌሎች	
	6. የሕክምና ዑደት	1. መጀመሪያ 2. ሁለተኛ 3. ሦስተኛ 4. አራተኛ 5. አምስተኛ 6. ስድስተኛ	
	7. የመመገቢያ መንገድ	1. ድፍን	
		2. ከፊል-ጠንካራ	
		3. ፈሳሽ	
		4. ቱቦ መመገብ	
	የሰውነት ክብደት (ኪግ)		
	ቁመት (ሚት)		
	BMI=ክብደት በኪግ/H (mts)2	< 18.5	
		18.5-24.9	
		≥ 25	
	በማኘክ/በምግብ ወቅት ምንም አይነት ችግር አለብህ?	1. አዎ 2.አይ	

	በህመም ጊዜ ህመም አለብዎት መዋጥ?	1. አዎ 2.አይ	
	የምግብ ፍላጎት አጥተዋል?	1. አዎ 2.አይ	
	ባለፈው ወር የማቅለሽለሽ ስሜት ይሰማዎታል?	1. አዎ 2.አይ	
	ላለፈው ወር ማስታወክ ነበር?	1. አዎ 2.አይ	
	ላለፉት ሁለት ሳምንታት ተቅማጥ አለህ? አዎ ከሆነ፣ ወደ ክፍል A ይሂዱ	1. አዎ 2.አይ	
ክፍል ሀ	በዚህ ቀን ተቅማጥ አለብህ (የ ቀን)	1. አዎ 2.አይ	
	ምን አይነት ተቅማጥ አለህ	ሀ) የውሃ ተቅማጥ; ለ) የደም ተቅማጥ	
	ባለፈው ጊዜ የሆድ ድርቀት አለብዎት ወር?	1. አዎ 2. አይ	

ክፍል IV፡ የመመገብ ልማድ ዳሰሳ

	ተለዋዋጮች	ምድቦች	መልሶች
	በ 24 ውስጥ ምን ያህል ይበላሉ ሰዓታት?	5. መደበኛ	
		6. መደበኛ ያልሆነ	
		7. አላውቅም	
	በ ውስጥ ምንም ክብደት መቀነስ አለብዎት ያለፉት 3 ወራት?	5. አዎ	
		2.አይ	
	ባለፈው ሳምንት የአመጋገብ ልምዶችዎን ቀንሰዋል? አዎ ከሆነ፣ ወደ ክፍል A ይሂዱ	1. አዎ 2.አይ	
	ምክንያቱ ምን ነበር?	ሀ) ማቅለሽለሽ	
		ለ) የምግብ ፍላጎት የለም	
		ሐ) የምግብ አቅርቦት የለም	
		መ) ውጥረት	
		መ) ህመም	
	መደበኛ የመብላት ወይም የቁርስ ልምዶች ነበሩዎት?	2. አዎ	
		2. አይ	
	በቀን ስንት ጊዜ ይበላሉ?	1. አንድ ጊዜ	
		2. ሁለት ጊዜ	
		6. ሦስት ጊዜ	

		8. አራት ጊዜ	
	በጸም ሁኔታ ላይ ነዎት?	2. አዎ	
		2. አይ	
	በቀን ምን ያህል ፈሳሽ ይወስዳሉ?	2. ከ 3 ሊትር ያነሰ	
		2.3-5 ሊት	
		7. ከቆሻሻ በላይ	
	እንዴት በላህ?	3. ያለሱ መብላት አልችልም። ድጋፍ	
		8. በከፊል የሚደገፍ ሌሎች	
		4. ያለሱ መብላት እችላለሁ ማንኛውም ድጋፍ	

*ሌሎች፡ የሚያጠቃልለው (ራስ እና አንገት፣ ሳንባ፣ የአፍ፣ የአንጎል ዕጢ)።

ክፍል VII፡ ርዕሰ ጉዳዩ ዓለም አቀፍ የግምገማ ቅጽ (በጤና ባለሙያዎች የተሞላ)

ይህ የመጠይቁ ክፍል የታካሚውን የአመጋገብ ግምገማ ነው. ከተሰጡት አማራጮች መልስ ሰጪው በሚሰጣቸው ምላሾች ላይ ክብ/ምልክት (√) ያድርጉ።

ክፍል-VI - ርዕሰ ጉዳይ ዓለም አቀፍ ግምገማ ቅጽ				
ኤስ.አይ.	ጥያቄ	ምላሽ		ኮድ
1.	ከ 6 ወር በላይ ክብደት ይቀየራል	ክብደት መጨመር ወይም ምንም ለውጥ የለም ወይም ቀላል ክብደት መቀነስ መጠነኛ ክብደት መቀነስ ከባድ ክብደት መቀነስ	ሀ ለ ሲ	
2.	ባለፉት 2 ሳምንታት ውስጥ የክብደት ለውጥ	ክብደት እየጨመረ ነው የክብደት ለውጥ የለም። ክብደት እየቀነሰ ነው።	ሀ ለ ሲ	
3.	የአመጋገብ ለውጥ	ለአጭር ጊዜ ምንም ለውጥ ወይም ትንሽ ለውጥ የለም። የድንበር መስመርን መውሰድ እና መቀነስ; ድሆችን መውሰድ እና መጨመር; ድሆች መውሰድ, በቅድመ ቅበላ ላይ የተመሰረተ ምንም ለውጥ የለም ቅበላ ደካማ እና እየቀነሰ ነው	ሀ ለ ሲ	
4.	ቆይታ እና ለውጥ ደረጃ	ከ 2 ሳምንታት በታች ፣ ትንሽ ወይም ምንም ለውጥ የለም።	ሀ ለ	

		ከ 2 ሳምንታት በላይ, ከመለስተኛ እስከ መካከለኛ የሱፐቲማል አመጋገብ መብላት ወይም መራብ አልተቻለም	ሲ	
5.	የ GI ምልክቶች መኖር	ጥቂት ወይም ምንም ምልክቶች ያለማቋረጥ አንዳንድ ምልክቶች ለ> 2 ሳምንታት; እየተሻሻሉ ያሉ ከባድ ምልክቶች ምልክቶች በየቀኑ ወይም በተደጋጋሚ> 2 ሳምንታት	ሀ ለ ሲ	
6	ተግባራዊ ሁኔታ	በጥንካሬ፣ በጥንካሬ እና በተሟላ የተግባር አቅም ላይ ምንም እክል የለም፤ መጠነኛ መጠነኛ ኪሳራ እና መሻሻል ከመለስተኛ እስከ መካከለኛ የጥንካሬ ማጣት፣ ብርታት/አንዳንድ የዕለት ተዕለት እንቅስቃሴ ማጣት ወይም ከባድ ኪሳራ አሁን ግን እየተሻሻለ ነው። ከባድ ተግባርን, ጥንካሬን እና ጥንካሬን ማጣት	ሀ ለ ሲ	
7.	የበሽታ ሁኔታ እና አብሮ-በሽታ	ምንም ውጥረት የለም ዝቅተኛ ወይም መካከለኛ ውጥረት ከፍተኛ ጭንቀት	ሀ ለ ሲ	
8.	ከቆዳ በታች የስብ ማጣት	ትንሽ ወይም ምንም ኪሳራ የለም በሁሉም አካባቢዎች መለስተኛ-መካከለኛ; በአንዳንድ አካባቢዎች ከባድ ኪሳራ	ሀ ለ	

		በአብዛኛዎቹ አካባቢዎች ከባድ ኪሳራ	ሲ	
9.	የጡንቻ ብክነት	ትንሽ ወይም ምንም ኪሳራ የለም በሁሉም ቦታዎች ከመለስተኛ እስከ መካከለኛ; በአንዳንድ አካባቢዎች ከባድ ኪሳራ በአብዛኛዎቹ አካባቢዎች ከባድ ኪሳራ	ሀ ለ ሲ	
10.	ኤድማ	ትንሽ ወይም ምንም እብጠት ከመለስተኛ እስከ መካከለኛ እብጠት ከባድ እብጠት	ሀ ለ ሲ	
11.	አሲስቲስ	ምንም ascites ወይም በምስል ላይ ብቻ ከመለስተኛ እስከ መካከለኛ ascites ወይም በክሊኒካዊ ሁኔታ መሻሻል ከባድ አስሲትስ ወይም ተራማጅ አሲሲስ	ሀ ለ ሲ	

የ SGA ውጤቱን እንዴት ማጠናቀቅ እንደሚቻል

SGA በእውነቱ የአመጋገብ ሁኔታን ለመገምገም ተጨባጭ ዘዴ ነው። SGA በሽተኛውን እንደ ሀ. በሚገባ የተመጣጠነ; ለ. መጠነኛ የተመጣጠነ ምግብ እጥረት; ሐ. በጣም የተመጣጠነ ምግብ እጥረት። ታካሚዎች በሁለት ሰፊ አካባቢዎች ባላቸው የግለሰባዊ ደረጃ አሰጣጥ ላይ ተመስርተው ከእነዚህ ምድቦች ወደ አንዱ ይመደባሉ፡ በቅጹ ላይ ያሉት እቃዎች በአመጋገብ ባለሙያው የታካሚውን ሁኔታ አጠቃላይ ስሜት ለማግኘት ይጠቅማሉ። ብዙ የቢ ወይም ሲ ደረጃዎች ካሉ፣ በሽተኛው በተመጣጠነ ምግብ እጥረት የመጋለጥ ዕድሉ ከፍተኛ ነው ወይም (B+C) በምግብ እጦት ተመድቧል እና ነጥብ A ጥሩ አመጋገብ ነበር። ደረጃ አሰጣጡ በግራ በኩል ከሆነ, በሽተኛው በደንብ ሊመገብ ይችላል. በተመሳሳይ፣ SGA በዚህ መረጃ

(B+C) የተመጣጠነ ያልተመጣጠነ ምግብ እጥረት (መካከለኛ እና ከባድ): > 17 ነጥብ ተከፍሏል። በደንብ የተመጣጠነ፡ < 17 ነጥብ።