UNIVERSITY OF GHANA

NUTRITIONAL STATUS OF NEWLY REPORTING CANCER PATIENTS FROM TWO (2) HEALTH FACILITIES IN ACCRA

BY

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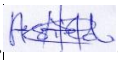
THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN DIETETICS

JULY, 2019

DECLARATION

I declare that this thesis I have presented to the Department of Nutrition and Dietetics is the record of my own research under the supervision of Dr. Laurene Boateng and Prof. Richmond Aryeetey towards the award of Master of Science Degree in Dietetics and that no part of it has been published or copyright before in the Republic of Ghana or elsewhere, except the areas quoted from published sources which have been duly acknowledged.

Signature.....  ..... Date....13/10/20.....

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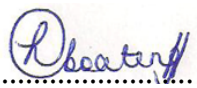
Signature.....  ..... Date…13/10/20……..

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ABSTRACT

Background: Cancer incidence, prevalence and mortality is increasing globally. In developing and economically transitioning countries, the incidence of cancer is increasing at alarming rates. Although malnutrition is a common characteristic of cancer patients, it is often ignored in treatments and follow up care. Assessing the nutritional status of newly reporting cancer patients will help to plan early and appropriate dietary interventions.

Aim: To determine the nutritional status of newly reporting cancer patients in two health facilities: Sweden Ghana Medical Centre, and National Radiotherapy, Oncology and Nuclear Medicine Center.

Methodology: The study employed a cross-sectional design. A total of 125 newly reporting cancer patients were recruited from the National Radiotherapy, Oncology and Nuclear Medicine Centre and the Sweden Ghana Medical Center. Demographic and socioeconomic data were obtained using a structured questionnaire. A patient-generated subjective global assessment (PG-SGA) tool was also used to assess malnutrition in patients. A 2-day non-consecutive 24 hour recall was taken using handy measures to estimate quantity of foods consumed on one weekday and one weekend day. Household Dietary diversity (HDD) score was calculated based on the 24 hour recall data. Anthropometric measurements were taken and data were analyzed using the Statistical Package for Social Sciences (SPSS 23.0). Descriptive statistics were calculated for continuous variables (age and income level). Proportions were calculated for categorical variables (gender, educational level, marital status and anthropometric measurements).

Differences in means between the dietary diversity and PG-SGA scores of study participants from the two hospitals was determined using independent sample t-test. Association between the PG-SGA scores and HDD scores were determined using Pearson chi square. A p-value less than 0.05 was regarded as significant.

Results: A total number of 125 cancer patients were recruited for the study. Majority (65.6%) were 50 years and above. The overall mean HDD scores of the participants from the two hospitals was 6.29 ± 1.6. The mean PG-SGA scores of all study participants was 6.80 ± 4.50. There was a significant association between the dietary diversity scores and PG-SGA scores.

Conclusion: Findings from this study showed that about 50% of the study participants were moderately malnourished with a PG-SGA score of 6.80. These findings may indicate that majority of cancer patients in Ghana may be malnourished and will benefit from nutrition intervention.

DEDICATION

I dedicate this work to the almighty God for strengthening and bringing me this far in my academic career. Also to my father, Mr. Ormsby Asiedu, my sister, Gloria Asiedu and a special friend Bernard Boakye for their prayers, support and countless words of encouragement. God bless you abundantly.

ACKNOWLEDGEMENT

I wish to express my sincere gratitude to my supervisor, Dr. Laurene Boateng for her excellent supervision, her patience, motivation and immense knowledge. Her guidance and warm reception anytime I needed assistance helped me throughout my thesis. I could not have imagined having a better mentor for my research. I would also like to thank Prof. Richmond Aryeetey for his valuable contributions, insightful comments and willingness to offer his unfailing support towards the successful completion of my work. I would also like to thank the research assistants, Daniel Ansah Obese and Mavis Asamoah Apeagyei for helping with the data collection. I cannot fail to extend my heartfelt gratitude to my family, friends and loved ones whose support both financially and morally contributed immensely towards the successful completion of my work. May the Almighty bless and replenish what was lost to all who contributed in one way or the other towards my thesis.

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LIST OF ABBREVIATIONS

ASPEN	American Society for Parenteral and Enteral Nutrition
BMI	Body Mass Index
CVD	Cardiovascular disease
DDS	Dietary Diversity Score
ECOG	Eastern Cooperative Oncology Group
ESPEN	European Society for Clinical Nutrition and Metabolism
FAO	Food and Agricultural Organization
FANTA	Food and Nutrition Technical Assistance III project
GBD	Global Burden of Disease
HDD	Household Dietary Diversity
IDD	Individual Dietary Diversity
KBTH	Korle- Bu Teaching Hospital
MNA	Mini Nutritional Assessment
NHANES	National Health and Nutrition Examination Survey
PAR	Population Attributable Risk
PG-SGA	Patient Generated- Subjective Global Assessment
SGMC	Sweden Ghana Medical Center
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Cancer is known as a group of diseases which involves abnormal cell growth and have the potential to invade or spread to other parts of the body (WHO, 2018). There are well over 100 types of cancers that affect the human body (National Cancer Institute 2014). Some common cancer sites in the body include the lung, skin, colon and rectal, cervix, prostate, oral cavity, endometrium, thyroid, throat, pancreas, stomach and breast.

About 5-10% of cancers are as a result of inherited genetic defects (Anand *et al.,* 2008). Obesity, poor diet, no or inadequate physical activity and excessive intake of alcohol are all risk factors of the disease (Kushi *et al.,* 2012). Other risk factors of cancer include exposure to ionizing radiation, certain infections and environmental pollutants (Anand *et al.,* 2008). Tobacco use has been identified as one of the main causes of cancer deaths and is the cause of about 22% of cancer deaths worldwide (WHO, 2018). Physical inactivity is another risk factor of cancer contributing to more than 10% of breast and colon cancers in the US and the Spanish population (Lee *et al.*, 2012). Engaging in physical activity can drastically reverse a person's risk of the disease even after years of physical inactivity. Obesity, another risk factor of cancer is on the rise as a result of changes in dietary patterns and physical inactivity. Obesity is an altered condition connected with insulin resistance and altered adipokines, sex hormones including estrogens, androgens and testosterone and inflammation (Goodwin & Stambolic, 2015); these increase a person's risk of developing cancers such as postmenopausal breast cancers, colon, endometrium, kidney, pancreatic, esophageal and liver cancers (Lichtman, 2010). Obesity can result in poorer treatment outcomes, worsened outcomes and increased risk of cancer mortality (Kaider-Person, Bar-Sela & Person 2011; Parekh, Chandran & Bandera 2012).

It is predicted that the proportion of detected cancer cases in less developed countries will increase from about 56% in 2008 to more than 60% in 2030 (Ferlay *et al.*, 2010). In 2012, Torre *et al*. (2015) reported that globally, 14.1 million new cancer cases and 8.2 million deaths occurred, with lung and breast cancers being the leading causes of death in males and females as of 2012 (Torre *et al,* 2012). Research has shown that the survival rate of cancer patients in developing countries is lower compared to that of the developed countries and this is evidenced by a comparative study conducted in Africa, Asia and Central America (Sankaranarayanan *et al.,* 2010). The study reported that the survival rates of cancer patients in Africa, India and the Philippines, was lower than people diagnosed with cancer in Singapore, South Korea and parts of China. The 5-year survival rate of breast cancer was found to be 50% or less in the developing countries and over 75% in developed populations (Sankaranarayanan *et al.*, 2010). Wagner and Brath (2012) have reported that about 7.6 million cancer deaths occur every year in low and middle income countries making cancer a major cause of mortality in these places. In a study carried out at the Korle-Bu teaching hospital in 1996, cancer accounted for about 2.6% of all admissions and 5.6% of all deaths. Cervical cancer is the leading cause of all deaths related to cancer (17.4% per 100,000 women) among women as compared to breast cancer deaths which also accounts for 9.9% per 100,000 women in Ghana (Adanu *et al.,* 2010).

Good nutrition and healthy lifestyle changes contribute immensely in the treatment and prevention of cancer. Refraining from tobacco products, achieving a sustained healthy weight, staying active physically and eating a healthy diet can drastically minimize a person's risk of developing or dying from cancer (Agurs-Collins, 2009). Epidemiological studies show that, including whole grains, fruits, fiber and vegetables in a person's diet can reduce the risk of cancer (Kerr, Anderson & Lippman 2017).

1.2 STATEMENT OF THE PROBLEM

Cancer incidence, prevalence and mortality is rising at an alarming rate. This has posed a major economic burden globally (John & Ross, 2010). Cancer affects quality of life and socio-economic activities of the individuals affected as well as their families. Nutrition plays a key role in the prevention and progression of cancer. About 20% to 80% of cancer patients are malnourished (Parasa & Avvaru, 2016). Patients with cancer are faced with many nutritional problems including the inability to eat well in order to maintain a good nutritional status and prevent weight loss, and further complications that accompany it.

Several studies have been conducted on the incidence of cancer, its progression, treatment and mortality rates (Torre *et al.*, 2016; Wiredu & Armah, 2006). Bovio *et al*. (2008) reported that as cancer progresses, malnutrition and weight loss become evident. Most of these studies however focused on patients already undergoing treatment and those with advanced cancer without much attention to newly reporting ones. Newly reporting patients may be either newly diagnosed or late reporting patients. Patients may report late for obvious reasons such as fear of diagnosis, ignorance, financial incapability, prayers and prayer camps and preferred use of alternative medicine (Clegg-Lamptey, Dakubo & Attobra, 2009). There is therefore paucity of data on the nutritional status of newly reporting cancer patients both in Ghana and across the globe. Assessing the nutritional status of this group of patients is essential for early identification of nutrition problems and early interventions to prevent a decline in nutritional status.

1.3 SIGNIFICANCE

Despite the presence of widely accepted standards and guidelines in screening for disease-related malnutrition in hospitals, uncertainties still exist about whether nutritional risk assessment is integrated within daily clinical practice in hospitals (Schindler, *et al.*, 2010).

Assessing the nutritional status of newly reporting cancer patients will add to existing knowledge and provide information that will help dieticians to plan dietary interventions for cancer patients early in the course of the disease. The study will provide information about the nutritional status and dietary diversity for newly reporting cancer patients. Findings of this study will also be beneficial in coming up with new treatment algorithms in cancer care.

1.4 AIM OF THE STUDY

To determine the nutritional status of newly reporting cancer patients in two health facilities, Sweden Ghana Medical Centre and the National Radiotherapy, Oncology and Nuclear Medicine Centre at the Korle-Bu Teaching Hospital in Accra, Ghana.

1.5 OBJECTIVES

1. To determine the nutritional status of newly reporting cancer patients using the Patient Generated Subjective Global Assessment (PG-SGA) tool.
2. To assess dietary quality of the cancer patients in the two hospitals using dietary diversity scores.
3. To determine the association between Patient Generated Subjective Global Assessment and dietary diversity score of the cancer patients.

CHAPTER TWO

LITERATURE REVIEW

2.1 CANCER

2.1.1 EPIDEMIOLOGY OF CANCER

Cancer incidence, prevalence and mortality is increasing at alarming rates. Evidence has shown that for most cancer types, incidence and mortality rise with age throughout adulthood and old age, with the tendency of levelling off at the highest ages (Harding, Pompei & Wilson, 2012; Bellizzi & Gosley, 2012). In 2013, 14.9 million cancer cases were recorded globally. The cancers mostly associated with men were prostate cancer (4.1 million), tracheal, bronchus and lung cancer (1.3 million) and colon and rectum cancer (873,000). The cancers mostly associated with women were breast cancer (1.8 million), colon and rectum cancer (700,000) and tracheal, bronchus and lung cancer (535,000) (Global Burden of Disease Cancer Collaboration, 2015). According to estimates, 3.586 million new cancer cases were recorded in China in 2012 (Zhang, Zheng, & Zhang 2018).

An estimated 8 million cancer deaths occurred in 2013 (GBD, 2018). Tracheal, bronchus and lung cancer were recorded to have the second highest incidence globally in developing countries and in developed countries, it ranked fourth. The lowest occurrence per 100,000 women was recorded in western sub-Saharan Africa. In 2013, there were 1.8 million cases of breast cancer and 464,000 deaths in sub-Saharan Africa. In 2015, the number of cancer cases rose to about 90.5 million (GBD, 2015). 2016 also recorded 17.2 million incidence of cancer cases worldwide and 8.9 million deaths. Tracheal, bronchus and lung cancers as well as colorectal cancer were the most prevalent cancers in males, constituting 40% of all cancers (Torre *et al.*, 2016).

Deaths are known to increase mainly due to longevity and lifestyle changes in the developing world (Jemal *et al.,* 2011). Cancer is a major cause of death in all countries, especially in the developing countries (WHO, 2015: Denny, 2012). Despite the countless steps in cancer therapy and prevention, cancer remains the major cause of death globally (Loginov, 2017). Breast cancer caused 458,503 (13.7%) deaths in women as at 2008 whiles 6.0% of deaths were recorded in men (Boyle & Levin, 2015). Cancer resulted in over 8 million cases of death across the world in 2013. This has raised its position as the 3rd highest cause of mortality in 1990 to the 2nd highest cause after cardiovascular disease (GBD, 2013; Fitzmaurice *et al.,* 2017).

The situation is not much different in Ghana. Mortuary reports in Ghana revealed 3,659 deaths annually with a male to female ratio 1.2:1 (Wiredu and Armah, 2008). The common causes of mortality in females were breast cancer (17.24%), hematopoietic cancer (14.69%), liver cancer (10.97%) and cervical cancer (8.47%) and in males, liver cancer recorded the highest mortality (21.15%), followed by prostate (17.35%), hematopoietic organs (15.57%) and stomach cancers (7.26%). Worldwide, the burden of cancer increases to a great extent because of aging and living cancer prone lifestyles. Averagely, the risk of getting cancer before age 75 is about 20%, and the risk of dying from it is about 10%. About 18.1 million new cases of cancer and 9.6 million deaths occurred in 2018 worldwide (Ferlay *et al.,* 2019). The most common cancers as at 2018 were lung cancer; accounting for about 1.76 million deaths, colorectal cancer; constituting about 860,000 deaths, stomach cancer ; accounting for about 780,000 deaths, liver cancer; making up about 780,000 deaths, and breast cancer; accounting for about 620,000 deaths.

2.1.2 PATHOPHYSIOLOGY

Cancers are described as a large family of diseases that involve the abnormal growth of cells with the potential to invade or spread to remaining parts of the body (WHO, 2018). It a disease of tissue growth. For a normal cell to change into cancer cell, the genes that control cell growth and differentiation must be transformed (Croce, 2008). Cancer cells are part of tumor cells which possess stem cell features and are capable of growth and proliferation (Clark & Fuller, 2006). The hallmarks of cancer cells include proliferative signal sustenance, attacking growth suppressors, invasion and growth activation, the evasion of the immune system, the formation of blood vessels and refusing to die (Hanahan & Weinberg, 2011).

Virtually all cancers can metastasize (Siegel, Miller & Jemal, 2015). Metastasis is the spread of cancer to other sites in the body. The spread of cancer cells are referred to as metastatic tumors, whereas the initial is called the primary tumor. Most cancer deaths are as a result of cancer that has metastasized (Seyfried & Huysentruy, 2013). Stem cells have been suggested to be the target cells from which cancer originates because they have many features as cancer cells.

About 5-10% of cancers are as a result of inborn genetic defects (Anand *et al.*, 2008). Obesity, poor diet, physical inactivity and too much alcohol intake are all risk factors of the disease (The National Cancer Institute, 2012). Some cancers have been associated with family history. Estimating cancer risk in individuals was done using only first-degree relations or a family history of close relatives (Brandt, Sundquist, & Hemminki, 2011). A study conducted by Win, Reece, and Ryan (2015) reported that women with a first-degree family history of endometrial or colorectal cancers have a greater risk of getting endometrial cancer. Another study revealed that among African American women, estimates for first-degree family history of breast cancer range from 1.65 to 1.78 (Palmer *et al.*, 2009). A history of prostate cancer in the family makes an individual susceptible to prostate cancer. A family history of gastric cancer is accorded a

strong risk factor (Yaghoobi, 2010). Although most gastric cancers are unpredictable, approximately 10% show familial aggregation (Oliveira *et al.,* 2015).

2.3 NUTRITIONAL STATUS OF CANCER PATIENTS

Assessing the nutritional status of cancer patients plays a key role in their management. It helps to distinguish those who are malnourished from those who are not (Senesse *et al.,* 2008). Nutritional assessment serves as a basis for diagnosing the type, cause and severity of malnutrition (Cederholm, 2017).

2.3.1 Malnutrition in cancer patients

Malnutrition is a usual finding in cancer patients. Patients with cancer have a higher tendency to be malnourished than patients with other disease conditions (Ryan *et al.,* 2016). Disease-associated malnutrition affects over 50% of patients with certain kinds of cancers such as pancreatic, esophageal, gastrointestinal, head and neck cancers (Hebuterne *et al.,* 2014).

The degree and frequency of malnutrition in cancer patients is dependent mainly on the stage and site of the tumor (Hebuterne *et al.,* 2014). Although malnutrition generally worsens with progression in the disease and with the use of cytotoxic treatment, cancer- related malnutrition can show at any moment in the course of the disease, even at the time the disease is detected. A research undertaken by Baldwin *et al.* (2009) showed that 70% of patients with lower gastrointestinal tract cancers, 78% of patients with esophageal or stomach cancer and 87% of patients with pancreatic cancer had experienced weight loss at diagnosis.

2.3.2 Inflammation in cancer

Acute and chronic inflammation contribute primarily in the pathogenesis of cancer-related malnutrition (Jensen *et al.,* 2013) and systemic inflammation is often existent in cancer. This is as a result of the release of pro-inflammatory cytokines from tumors or immune cells (Ryan

et al., 2016). The inflammation may cause an increase in the body's metabolic needs, reduce appetite and increase the breakdown of muscle protein (Dev *et al.,* 2015; Prado *et al.,* 2016).

2.3.3 Maintaining a good nutritional status

Patients with cancer are usually faced with many struggles which includes the ability to eat well to maintain a good nutritional status and prevent weight loss and the complications that come with them. A number of factors may directly lead to reduced food intake in cancer patients thereby leading to inadequate energy intake. These factors include nausea, dysphagia, xerostomia, and changes in taste and smell (Blum *et al.,* 2011). Other factors may also indirectly affect energy intake by affecting appetite and the urge to eat. They include pain as a result of the disease, tiredness and psychological problems (Bye *et al.,* 2013). According to Arends *et al.* (2017), insufficient nutritional intake is established if patients with cancer are not able to eat for a week or if their intake is lower than 60% of estimated energy needs for 1 - 2 weeks.

2.3.4 Effects of malnutrition in cancer

In 2010, the occurrence of malnutrition among cancer patients was estimated to range between 15 - 80% (Von Haehling, 2010). According to Braun and Marks (2010), malnutrition, if not treated early and properly, progresses to cachexia, a wasting disorder that causes extreme weight loss and muscle wasting and can include fat wasting and impaired immune, physical and mental functions (Fearon *et al.,* 2011). Loss of muscle mass can lead to implications that are comparable to those of malnutrition. These include increased infections, decreased immunity, increased skin breakdown, decreased healing and increased death rates (Demling, 2009).

2.3.5 Nutrition intervention

A systematic review and meta-analysis carried out in malnourished patients with cancer revealed that nutritional intervention as well as nutritional counseling and oral supplementation significantly improved weight and calorie intake in participants as compared with routine care and had positive effects on certain facets of quality of life (Baldwin *et al.*, 2012). Weight loss is a major sign of progressing malnutrition requiring early identification. Early nutrition interventions are recommended in properly identified patients (Senesse *et al.*, 2014) for improving tolerance to treatments and patients' survival (Ravasco, Monteiro-Grillo &Camilo 2012).

2.3.6 The Mini Nutritional Assessment Scoring

The etiology of malnutrition in cancer patients is complicated. Several factors have been related to changes in the nutritional status of cancer patients; the presence of metabolic disorders linked to the neoplastic process, inadequate nutrient intake and a high incidence of gastrointestinal effects as well as diarrhea and nausea (Nicolini *et al.*, 2013).

Approximately 13% of all deaths worldwide are as a result of cancer (Ferlay *et al.*, 2010). However the death of about 20% of cancer patients takes place as a result of malnutrition and its complications, rather than the disease itself (Wie *et al.*, 2010; Pressoir *et al.*, 2010). Cancer patients report with malnutrition at any time of the disease, even at diagnosis (Baldwin *et al.*, 2009). Based on the Mini Nutritional Assessment (MNA) scoring, a study conducted reported that 51% of cancer patients had nutritional impairment, including risk of malnutrition and over nutrition. As identified by the MNA, 40.1% of patients without metastases already had poor nutritional status at their first cancer visit (Muscaritoli *et al.*, 2017).

2.3.7 Malnutrition incidence

Malnutrition in cancer patients completely varies from malnutrition in otherwise healthy people. Cancer patients are susceptible to physical constraints that reduce food intake and absorption of nutrients such as diarrhea, mouth ulcers, pain, vomiting, intestinal obstructions or malabsorption (Farhangfar *et al.*, 2014; Arend *et al.*, 2017). Malnutrition was highest in patients with single site cancers such as neck and lung tumors, gastroesophageal, head and pancreatic cancers. Patients with breast cancer were less likely to be malnourished. More than 70% of pancreatic and gastroesophageal cancer patients, more than 60% of liver, colorectal and the gastrointestinal tract and more than 40% of lung, head and neck and genitourinary cancer patients could be classified as cachectic, based on BMI and weight loss using the criterion based on Fearon *et al.* (2011). Another study conducted in France in 2012 reported that out of 2209 patients that were studied, 826 (39%) of them were malnourished (Gyan *et al.*, 2018).

2.3.8 Side effects of cancer treatment

Apart from anorexia, inadequate food intake will often occur as a result of cancer treatment side effects or tumor related local effects like tissue infiltration or physical obstruction (Cushen *et al.*, 2017; Mir *et al.*, 2012). A study revealed that colorectal cancer patients who were malnourished tolerated fewer chemotherapy cycles (Aaldriks *et al.*, 2013) with other cancer patients with malnutrition being at a greater risk for toxicity of chemotherapy treatment (Prado *et al.*, 2016). Malnourished patients who were undergoing treatment for oral cancers had lower quality of life scores in relation to physical function, whereas those who were well nourished and able to maintain or gain weight had comparatively better quality of life score (Gellrich *et al.*, 2015).

The high prevalence of malnutrition risk coupled with reduced mean body weight and BMI and progressive weight loss during hospitalization indicates that the nutritional status of cancer

patients deteriorates during hospitalization. A study conducted in Spain reported that about 24 to 62% of the respondents had hospital malnutrition (Vilaetal *et al.,* 2010). Studies conducted in Germany, France, Spain and Brazil (Maasberg *et al.,* 2017; Pressoir *et al.,* 2010; Planas *et al.,* 2016; Silva *et al.,* 2015) reported malnutrition prevalence ranging from 25% to over 70% based on nutritional assessments. Of these, 36.5% were at risk of malnutrition and 3.5% were malnourished.

2.3.9 Managing malnutrition in cancer patients

Nutritional counseling is the primary and most often employed intervention for the management of malnutrition in cancer patients and a properly functioning gastrointestinal tract (Guinan *et al.,* 2017). For care of cancer patients, nutritional guidelines continuously advise screening for nutritional risk as soon as cancer diagnosis is made and a full nutritional assessment when risk is present (Thompson *et al.,* 2017). The Academy of Nutrition and Dietetics has also established guidelines on the nutritional management of cancer patients in acute care and ambulatory settings (Thompson *et al.,* 2017).

2.4 QUALITY OF LIFE OF CANCER PATIENTS

Cancer is an obstacle to progress and wellbeing in all societies (Stewart & Wild, 2014). Everyone is affected and it poses a great burden on communities and the country at large. The direct and indirect costs of cancer care can cause significant hardships for families without financial resources to lessen the additional expenses (Jagsi *et al.,* 2014; Ramsey *et al.,* 2013). This is because, families are not prepared to manage the expenses associated with cancer care (Peppercorn, 2014). This poses a burden on them throughout survivorship (Meneses *et al.,* 2012).

Based on an individual's economic status and circumstances, the toll of cancer can be overwhelming. Patients who are employed may be less productive at work and this can lead to

loss of employment and work-related benefits altogether (Bradley *et al.*, 2007; Gordon *et al.*, 2007). Household finances may also be affected if the patient's family members have to take a break or quit their jobs to help with their care (Timmons, Gooberman-Hill & Sharp, 2013). Malnutrition in cancer patients increases financial costs because of longer hospital stays and the complications that accompany it (Planas *et al.*, 2016). Maasberg *et al.* (2017) reported that malnourished cancer patients had a 2 to 5 fold risk of dying as compared to patients with little or no signs of malnutrition.

2.5 DIETARY DIVERSITY

Food diversity has been identified as one of the features of a healthy diet (Sarrafzadegan *et al.*, 2009). However, the choice of food is dependent on an individual's income levels and nutritional knowledge (Lee *et al.*, 2014). Studies emerging from developing countries have identified that there is a link connecting dietary diversity and nutrient adequacy (Moursi *et al.*, 2008; Steyn *et al.*, 2014).

Assessment of dietary diversity has therefore become an important tool in nutrition epidemiology that could identify the correlation between dietary intake and health outcome. Increasing food diversity across and within food groups has been approved in most dietary guidelines universally (FAO, 2017).

Dietary diversity is defined as the number of different foods or food groups consumed over a given reference period (Pangaribowo, Gerber &Torero, 2013). The dietary Diversity Score (DDS), which is an easy and inexpensive tool, is used extensively in large studies and surveys to assess dietary quality. In the National Health and Nutrition Examination Survey (NHANES) which was conducted among US adults to assess dietary diversity on body fat, it has been discovered that increased dietary diversity is associated with improved diet quality (Vadiveloo *et al.*, 2015) and reduced all-cause mortality risk as well as a decrease in chronic diseases,

including cardiovascular disease (CVD) and some types of cancer (Lucenteforte *et al.*, 2008 & Isa *et al.*, 2013).

Household Dietary Diversity (HDD) reflects the financial ability of a household to access a variety of foods. The HDD score is built on the food groups propounded by the Food and Nutrition Technical Assistance III project (FANTA) (Swindale & Bilinsky, 2006). It is made up of 12 food groups; cereals, white tubers and roots, vegetables, fruits, eggs, meat, fish and other seafood, milk and milk products, legumes, nuts and seeds, oils and fats, sweets, spices, condiments and beverages.

2.6 PATIENT GENERATED-SUBJECTIVE GLOBAL ASSESSMENT TOOL

Despite the availability of several nutritional screening and assessment tools used in the healthcare facilities, only a few have been approved in hospitalized oncology populations (Young *et al.*, 2013). The hospitalized oncology patients encounter certain nutritional challenges (Leuenberger, Kurmann, & Stanga, 2010). Cancer patients may be extremely ill or suffering from side effects of treatment which affect their nutritional status. Regular nutritional screening in the inpatient setting has therefore been recommended by national, European and American guidelines (Huhmann & August, 2008). The goal of nutrition screening is to identify patients who need a more extensive nutritional assessment.

The Scored Patient-Generated Subjective Global Assessment (PG-SGA) is widely used in both clinical settings and in the research field as the reference method for assessing the nutritional status of patients with cancer. The Patient-Generated Subjective Global Assessment (PG-SGA) is a simple applied method of nutritional assessment, which was modified from Subjective Global Assessment (SGA). The PG-SGA was developed by Ottery in 1996. It is a subjective and specific instrument which is considered as the most appropriate tool for assessing malnutrition in individuals with cancer (Gabrielson *et al.*, 2013).

The PG-SGA is a tool that is widely used in determining malnutrition status in cancer patients and non-cancer patients and is used to validate other screening tools. The PG-SGA is recommended in various countries such as Australia, Brazil, the Netherlands and United Kingdom and the United States and included in various national guidelines for nutrition in oncology (Jager-Wittenaar & Ottery, 2017; Talwar *et al.,* 2016). In addition, the tool has been regarded useful for identifying nutritional risk and malnutrition in patients with gynecologic cancers (Laky *et al.,* 2010). It is however, not an instrument designed specifically for cancer care.

The PG-SGA covers the scope of the definitions of malnutrition as defined by the European Society for Clinical Nutrition and Metabolism (ESPEN) and the American Society for Parenteral and Enteral Nutrition (ASPEN) (Sealy *et al.,* 2016). The PG-SGA is made up of two parts (appendix V). The first section has four boxes, officially known and used independently as the PG-SGA Short Form, designed to be completed by the patients to reflect approximately 80-90% of the score (Ottery, 1996). This includes weight changes, changes in the consistency, amount and type of food (food intake), presence of nutrition symptoms that negatively affect food intake and functional capacity based on the Eastern Cooperative Oncology Group (ECOG) performance status. The second part of the PG-SGA tool is made up of five worksheets. It assesses the percentage weight loss, metabolic demands of the disease, its impact on nutritional requirements and includes scoring of muscle status, fat stores and fluid status, based on the nutrition-focused physical examination. Patients are then rated as well nourished (A), moderately malnourished (B) or severely malnourished (C).

Using this tool for routine screening can be very challenging because it requires skilled personnel and it is labor intensive (Young *et al.,* 2013).

2.7 ANTHROPOMETRIC MEASUREMENTS AND BODY COMPOSITION

Obesity is a global health issue because it affects a large number of people both in the developing and the developed world. The identification of obesity as a risk factor for several cancers is widely based on the use of anthropometric measures such as BMI (Lauby-Secretan *et al.,* 2016). Body fatness and weight gain throughout the life cycle are mostly determined by modifiable risk factors such as excessive intake of energy and, to a greater extent, lack of physical activity. In 2013, an estimated 4.5 million deaths worldwide were as a result of overweight and obesity (Lauby-Secretan *et al.,* 2016).

Obesity-related cancer burden represents up to 9% of cancer burden among women in North America, Europe, and the Middle East (Arnold *et al.,* 2016). Risk factors for developing ovarian cancer include aging and obesity (Onstad, Schmandt & Lu, 2016; Harper, Sheedy & Stack, 2018). Country specific data estimated for the UK by Parkin, Boyd, and Walker (2011) suggested that approximately 17,294 of cancer cases (5.5% of all cancers) occurring in 2010 were as a result of overweight and obesity. Four to thirty- eight percent of cancers such as esophageal, colorectal, gall bladder, pancreas, breast, endometrium, ovaries, kidney and prostate (advanced) can be linked to excess weight (Te Morenga, 2012). The estimated population-attributable risk (PAR) as a result of overweight and obesity was 3.2% in men and 8.6% in women. These associations were estimated by a meta-analysis of prospective cohort studies in which there was a clear positive association with BMI for some other cancers including thyroid, liver, leukemia, malignant melanoma, multiple myeloma and non- Hodgkin lymphoma (Renehan, Roberts & Divel, 2008). Other recent prospective studies have provided further proof of positive associations between BMI and gastric cancer (Chen *et al.,* 2013) and advanced prostate cancer (Discacciati, 2012) compared with normal weight subjects.

Body fat percentage indicates the total fat in the human body. It is made up of essential body fat and storage fat (Jeukendrup & Gleeson, 2010). A long- term prospective study conducted

by Iyengar *et al.* (2019) revealed that high body fat levels were associated with an increased risk of breast cancer. The study also found that higher trunk fat was positively associated with increased risk of breast cancer in women who remained in the normal BMI range.

CHAPTER THREE

METHODS

3.1 STUDY DESIGN

The study employed a cross-sectional design. Consecutive participants who reported to the study sites for treatment and were willing to participate were invited and recruited.

3.2 STUDY SITE

The study was carried out at the Sweden Ghana Medical Centre and the National Radiotherapy, Oncology and Nuclear Medicine Centre at the Korle-Bu Teaching Hospital (KBTH) in Accra, Ghana. Korle-Bu teaching hospital is the largest health facility, a leading teaching hospital and center of healthcare services in Ghana. It is located in the Accra Metropolitan District. It is the leading national referral center for the management of cancer cases in Ghana and also offers treatment to cancer patients from neighboring countries. The centre which receives about 1200 patients a year, was established in 1997 and offers treatments including chemotherapy and radiotherapy (Korle-Bu Annual Report, 2016). The common cancers treated in the center are breast, cervical and prostate cancers.

The Sweden Ghana Medical Center (SGMC) on the other hand is a fairly recently opened private health facility which specializes in cancer care in Ghana. It is located at East Legon Hills. It is a comprehensive oncology center that offers treatments including chemotherapy and radiotherapy. The common cancers treated in the facility are breast, cervical and prostate cancers.

3.3 STUDY POPULATION

All newly reporting patients with a diagnosis of cancer were eligible for the study.

3.3.1 Inclusion criteria

Cancer patients who had been referred from other hospitals for cancer treatment as well as patients who had defaulted doctors' appointments and were returning to continue with their treatment were recruited for the study.

All newly reporting cancer patients who were 18 years and above were eligible for the study.

Patients who consented to participate in the study were recruited for the study.

3.3.2 Exclusion criteria

Patients who did not meet the inclusion criteria were excluded from the study;

All newly reporting cancer patients who were less than 18 years were excluded from the study.

All cancer patients who could not stand for anthropometric readings were excluded from the study.

All cancer patients who could not extend their hands for the bioelectric impedance analysis readings were excluded from the study.

3.4 SAMPLING TECHNIQUE

Daily visits were paid to the health facilities to recruit, interview and measure patients until the total number of patients needed for the study was obtained.

3.5 SAMPLE SIZE DETERMINATION

$N = (Z)^2 (P) [1-P]/ (d^2)$ (Daniel, 1999)

N = sample size

Z = z-score with the confidence interval of 95% (with a standard value of 1.96)

P= anticipated proportion of population exhibiting what is being studied (p=50)

P was set at 50% due to the scarcity of research data on the nutritional status of newly reporting cancer patients in Ghana.

d= the minimum error (5% or 0.05).

$N = \frac{(\mathbf{1.96})^2(0.5)(0.5)}{(\mathbf{0.05})^2} = 196$ participants.

A total number of 200 participants, 100 from each hospital were expected to be recruited for the study. However, 125 patients, 99 from KBTH and only 26 patients from Sweden Ghana Medical Center (SGMC) consented to be part of the study.

3.6 DATA COLLECTION

Total enumeration where all eligible patients present on each day of visit to the Centre were invited to participate in the study. Staff at the facilities helped the researchers to identify patients who met the inclusion criteria. The principal investigator explained the objectives and relevance of the study, as detailed in the patient information sheet (Appendix I) to all eligible patients. Their expected role, voluntary participation, risk and confidentiality were also explained. Study participants' consent was sought to participate in the study. All newly reporting cancer patients who gave consent were recruited for the study. Repeated visits were paid to the Centre until the required number of patients needed was obtained.

3.6.1 DEMOGRAPHIC AND SOCIO ECONOMIC INFORMATION

Demographic and socioeconomic data were obtained by the use of an interviewer administered structured questionnaires. Information obtained were age, gender, ethnicity, religion, marital status and occupation, educational background, residential address, income from all sources and household size (Appendix III).

3.6.2 ANTHROPOMETRIC MEASUREMENTS

HEIGHT

Height was measured to the nearest 0.1cm using a Seca stadiometer (Model 213, Germany). Participants were asked to be in minimal clothing. Participants stood upright on a base plate without shoes with their heads in Frankfurt's plane position and back straight, feet together and heels touching the back of the plate. Participants were made to breathe in and the head plate of the stadiometer was lowered to touch the top of the head and height noted.

WEIGHT

Weight was measured with the Seca scale (Seca 770, Seca, Hamburg, Germany) with a maximum weighing capacity of 200 kg to the nearest 0.1kg. Participants were asked to be in minimal clothing. They were asked to remove shoes, jackets, watches and other heavy objects before standing on the platform of the scale.

BODY MASS INDEX (BMI)

BMI was calculated as weight (kg)/ height (m^2). A simple range of values expressed as "underweight (<18.5 kg/m^2), normal (18.5-24.9 kg/m^2) overweight (25-29.9 kg/m^2) and obese (> 30 kg/m^2)" was used in the study based on the WHO criteria for adults (WHO, 2012).

BODY COMPOSITION

Body composition measurements were taken using the Omron body composition analyzer (BC-418, Tokyo, Japan). Patients' age, gender and height were keyed in. Patients were asked to be in minimal clothing and made to stand barefooted and looking straight ahead. The two arms were raised at 90 degrees to the body with elbows straightened while holding firmly to the grip electrodes of the display unit.

Body fat and visceral fat

Body fat and visceral fat of the study participants were measured to the nearest 0.1% with an Omron body composition analyzer (BC-418, Tokyo, Japan). The table below shows the classification of body fat percentage for males and females (Table 3.1). The results of visceral fat were categorized as (1 - 9) normal, (10 - 14) high and (15 - 30) very high.

Table 3.1: Body Fat Classification (%)

GENDER	**BODY FAT CLASSIFICATION (%)**				
	AGE	**LOW (-)**	**NORMAL (0)**	**HIGH (+)**	**VERY HIGH (++)**
FEMALE	18-39	< 21.0	21.0 – 32.9	33.0 – 38.9	≥ 39.0
	40-59	<23.0	23.0 – 33.9	34.0 – 39.0	≥ 40.0
	60 – 80	< 24.0	24 – 35.9	36.0 – 41.9	≥ 42.0
MALE	18 – 39	< 8.0	8.0 – 19.9	20.0 – 24.9	≥ 25.0
	40 – 59	< 11.0	11.0 – 21.9	22.0 – 27.9	≥ 28.0
	60 – 80	< 13.0	13.0 – 24.9	25.0 – 29.9	≥ 30.0

(Omron Healthcare Inc, 2018)

3.6.3 DIETARY ASSESSMENT (HOUSEHOLD DIETARY DIVERSITY SCORES)

A 2-day 24 hour recall was taken to determine dietary diversity. Participants were asked to list all the foods they had consumed on one weekday and one weekend. This included snacks and drinks. The 24 hour recall was taken with the help of handy measures to estimate varieties and

quantities of foods consumed over the preceding 24 hours. Dietary quality of respondents was determined using the Household Dietary Diversity (HDD) score (Swindale & Bilinsky, 2006). Based on information obtained from the 24 hour recall, the sixteen (16) item food groups of the dietary diversity questionnaire was completed (Appendix IV). These food groups included cereals, white roots, vitamin A rich vegetables and tubers and tubers, dark green leafy vegetables, other vegetables, vitamin A rich fruits, other fruits, organ meat, flesh meats, eggs, fish and seafood, legumes, nuts and seeds, milk and milk products, oils and fats, sweets, spices and condiments. Information on the consumption of red palm products was also obtained. Foods eaten from a group were scored as one (1) while those not consumed from a group were scored a zero (0). For any food group not mentioned, respondents were asked if they consumed any food item from that group. The individual scores were now aggregated into the Household Dietary Diversity (HDD) score to obtain the dietary diversity score for each participants. The HDD is made up of twelve (12) food groups. They included; cereals, white tubers and roots, vegetables, fruits, meat, eggs, fish and other seafood, legumes, nuts and seeds, milk and milk products, oils and fats, sweets, spices, condiments and beverages. The dietary diversity score was calculated by adding up the number of food groups consumed by a respondent over the 24 hour recall period. Total scores were classified as low (≤3 food groups), medium (4 or 5 food groups) or high (≥6 food groups) dietary diversity (FAO, 2010).

3.6.4 NUTRITIONAL STATUS ASSESSMENT (PATIENT GENERATED-SUBJECTIVE GLOBAL ASSESSMENT TOOL)

A patient generated subjective global assessment (PG-SGA) tool designed by Ottery (1996) was used to assess the nutritional status or nutrition risk in study participants. The scored Patient Generated Subjective Global Assessment (PG-SGA) tool has two sections (see Appendix V). The first section has four boxes, designed to be completed by the patients. This includes weight changes experienced over 2 weeks, one month or 6 months, changes in food

intake (changes in the consistency, amount and type of food), presence of nutrition symptoms that negatively affect food intake and activities and functional capacity based on the Eastern Cooperative Oncology Group (ECOG) performance status. The second part of the PG-SGA tool is made up of five worksheets. This is to be completed by a health professional. It assesses the percentage weight loss, metabolic demands of the disease, its impact on nutritional requirements and includes scoring of muscle status, fat stores and fluid status (ankle edema, sacral edema and ascites), based on the nutrition-focused physical examination. Based on the scores from the two parts, a total PG-SGA was generated. The greater the score, the greater the risk of malnutrition. Based on the scores, patients were then rated as being well nourished (A), moderately malnourished (B) or severely malnourished (C).

3.7 DATA MANAGEMENT

Completed questionnaires were stored in a locker at the Nutrition and Dietetics department under lock and key. Data collected were saved on a password protected computer. Three- digit codes were assigned to participants for confidentiality.

3.8 DATA ANALYSIS

Data were analyzed using the Statistical Package for Social Sciences (SPSS 23.0) using a 95% confidence interval. Tables and figures were used to summarize results obtained. Descriptive statistics (mean, standard deviations and ranges) was calculated for continuous variables (age and income level) while proportions were calculated for categorical ones (gender, BMI, educational level, marital status and anthropometric measurements). Differences between dietary diversity score and PG-SGA were determined using independent sample T test. Association between the PG-SGA scores and HDD scores were determined using Pearson chi square. A p-value less than 0.05 was considered significant.

3.9 ETHICAL CONSIDERATION

Ethical approval was obtained from the Ethics and Protocol Review Committee of the University of Ghana Medical School with the ethical clearance protocol identification number: MS-Et/M.10-P 3.1/2012-2013. Permission was sought from the National Radiotherapy, Oncology and Nuclear Medicine Centre of the Korle-Bu Teaching Hospital and the Sweden Ghana Medical Center. The purpose for the study was communicated to participants and a written informed consent was obtained from each participant. Participants received dietary counseling as compensation for participating in the study.

CHAPTER FOUR

RESULTS

4.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF STUDY PARTICIPANTS.

A total of 125 patients from the two health facilities participated in the study. Ninety-nine were from Korle-Bu teaching hospital (KBTH) and 26 from Sweden Ghana Medical Center (SGMC). Majority (72.0%, n=90) of the participants were females. Significantly, a higher percentage of the study participants who visited KBTH were females (76.70%). Most (40.4%) of the study participants who visited KBTH were 65 years or older and most (34.6%) of the study participants who visited SGMC were within the age group of 30 - 49 years.

About a third (30.4%, n=38) of the study participants had completed Senior High School. Majority (62.1%, n=77) of the study participants were married with about a third (30.97%) of the study participants earning a monthly income in the range of 100.00 to 499.00 Ghana cedis. Four out of every ten (39.5%, n=49) of the study participants were traders or business people, with more than half (56.1%, n=69) of them having 5 or more members in the household (Table 4.1). Most (39.52%) of the study participants were traders with a few (4.06%) being students or unemployed.

Table 4.1: Demographic characteristics of study participants

		HEALTH FACILITY		
Characteristics	**Total (N=125) n (%)**	**KBTH (N=99) n (%)**	**SGMC (26) n (%)**	**P-value**
Gender				0.002
Male	35 (28.00)	23 (23.23)	12 (46.15)	
Female	90 (72.00)	76 (76.77)	12 (46.15)	
Age group				0.001
18-29 years	6 (4.80)	1 (1.01)	5 (19.23)	
30-49 years	37 (29.60)	28 (28.28)	9 (34.62)	
50-64 years	36 (28.80)	30 (30.03)	6 (23.08)	
65 years and above	46 (36.80)	40 (40.4)	6 (23.08)	
Educational background				0.001
None	19 (15.2)	18 (18.18)	1 (3.85)	
Primary	14 (11.2)	13 (13.13)	1 (3.85)	
Junior high	21 (16.8)	20 (20.20)	1 (3.85)	
Senior high	38 (30.40)	30 (30.30)	8 (30.77)	
Post- secondary	33 (26.40)	18 (18.18)	15 (15 (57.69)	
Ethnicity				0.069
Akan	53 (42.4)	40 (40.40)	13 (50)	
Ewe	35 (28)	25 (25.25)	10 (38.46)	
Ga	17 (13.6)	14 (14.14)	3 (11.54)	
Others	20 (16)	20 (20.20)	0 (0)	
Marital status				0.075
Married	77 (62.1)	60 (61.22)	17 (65.38)	
Divorced	11 (8.87)	10 (10.2)	1 (3.85)	
Single	14 (11.29)	8 (8.16)	6 (23.08)	
Widowed	22 (17.74)	20 (20.41)	2 (7.69)	

Monthly income level				<0.001
<Ghs 100	33 (29.2)	32 (34.04)	1 (5.26)	
Ghs 100 to 499	35 (30.97)	30 (31.91)	5 (26.32)	
Ghs 500 to 900	31 (27.43)	26 (27.66)	5 (26.32)	
>Ghs 999	14 (12.39)	6 (6.38)	8 (42.11)	
Occupation				0.01
Traders	49 (39.52)	43 (43.88)	6 (23.08)	
Professional/ office workers	20 (16.13)	10 (10.20)	10 (38.46)	
Farmers/ casual workers	23 (18.55)	20 (20.41)	3 (11.54)	
Retired/ pensioners	27 (21.77)	21 (21.43)	6 (23.08)	
Unemployed/ students	5 (4.03)	4 (4.08)	1 (3.85)	
Household size				0.567
1-2	17 (13.82)	15 (15.31)	2 (8)	
3-4	37 (30.08)	28 (28.57)	9 (36)	
5 or more	69 (56.1)	55 (56.12)	14 (56)	

Pearson's chi-square
n: frequency.
%: column percentage.
SD: standard deviation
KBTH: Korle- Bu Teaching Hospital
SGMC: Sweden Ghana Medical Center

4.2 CATEGORIZATION OF BODY MASS INDEX OF THE STUDY PARTICIPANTS

Majority (38.71%) of the study participants had a normal BMI and 31.45% of them were obese (p-value 0.44). Only 8.06% of the study participants were underweight. Majority of the study participants from both KBTH (36.36%) and SGMC (48%) had a normal BMI. The mean BMI of study participants was 26.81kg/m^2 ± 8.25 (Table 4.2).

Table 4.2: Categorization of Body Mass Index of the study participants

		HEALTH FACILITY		
	Total	**KBTH (N = 99)**	**SGMC**	
	(N=125)		**(N=26)**	
Characteristics	**n (%)**	**n (%)**	**n (%)**	**P-value**
BMI category				0.44
Underweight(<18.5 kgm^{-2})	10 (8.06)	7 (7.07)	3 (12)	
Normal(18.5 to 24.9 kgm^{-2})	48 (38.71)	36 (36.36)	12 (48)	
Overweight(25 to 29.9 kgm^{-2})	27 (21.77)	22 (22.22)	5 (20)	
Obese (>29.9 kgm^{-2})	39 (31.45)	34 (34.34)	5 (20)	

n: frequency.
%: column percentage.
KBTH: Korle- Bu Teaching Hospital
SGMC: Sweden Ghana Medical Center
BMI: Body Mass Index.

4.3 TYPE, STAGE AND DURATION OF CANCER

Women with breast cancer made up 34.15% of the 125 study participants. Men with prostate cancer made up 15.45% of the 125 study participants (p- value 0.085). About 25% of the study participants had other types of cancers (Table 4.3). Majority (43.37%) of the study participants had stage II cancers while stage V cancer (p- value 0.001) was the least recorded (4.82%) (Table 4.3). Duration since cancer diagnosis for majority (48.18%) of the study participants was 6 months and below. Only 18% of them had been diagnosed with cancer for over a year (p- value 0.085) (table 4.3).

Table 4.3: Type, stage and duration of cancer

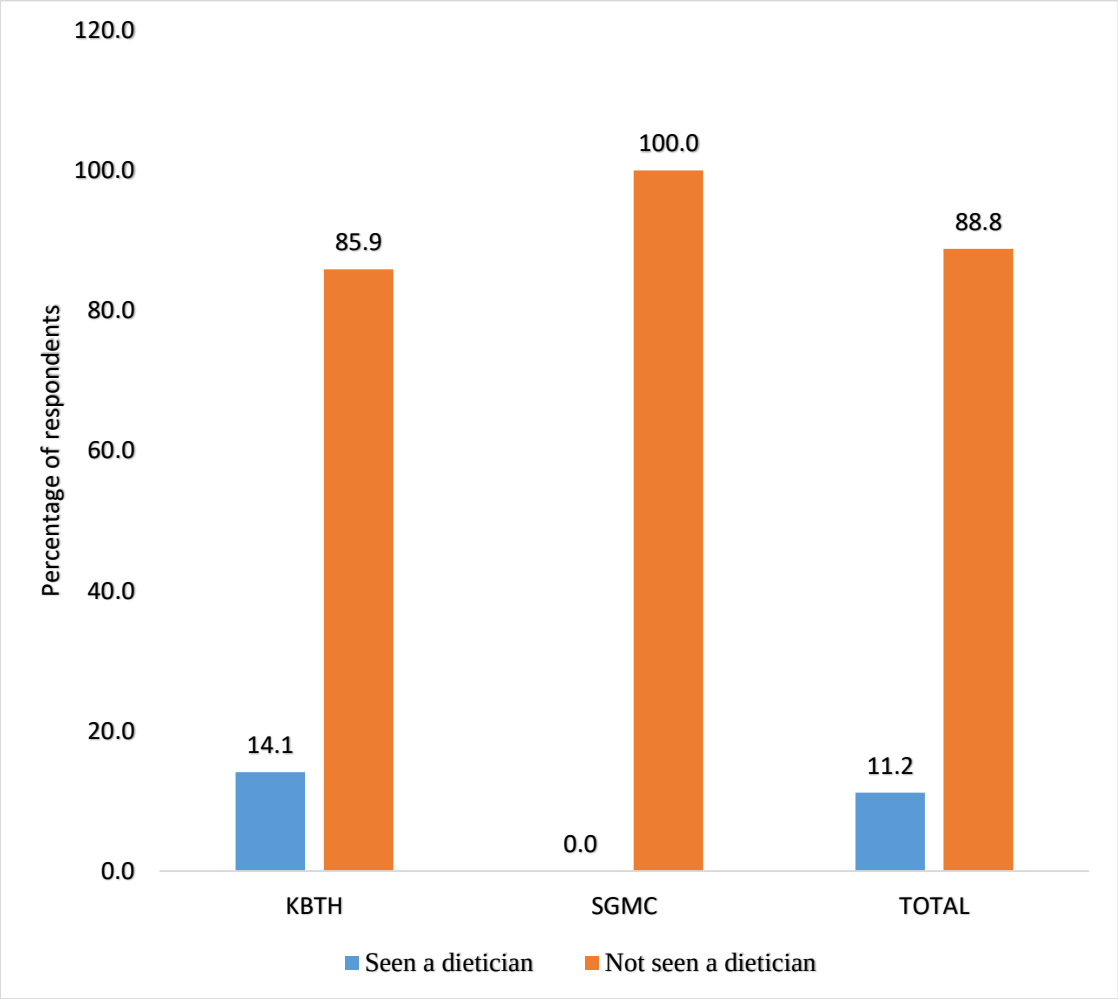
		Health facility		
	Total	**KBTH**	**SGMC**	
Characteristics	**n (%)**	**n (%)**	**n (%)**	**P-value**
Type of cancer				0.085
Breast cancer	42 (34.15)	34 (34.34)	8 (33.33)	
Cervical cancer	31 (25.2)	29 (29.29)	2 (8.33)	
Prostate cancer	19 (15.45)	15 (15.15)	4 (16.67)	
Other cancers	31 (25.2)	21 (21.21)	10 (41.67)	
Stage of cancer				**<0.001**
Stage I	4(4.82)	4 (6.15)	0(0)	
Stage II	36 (43.37)	31 (47.69)	5 (27.78)	
Stage III	30 (36.14)	26 (40)	4 (22.22)	
Stage IV	10 (12.05)	4 (6.15)	6 (33.33)	
Stage V	3 (3.61)	0 (0)	3 (16.67)	**0.085**
Time of diagnosis				
0 to 6 months	53 (48.18)	49 (49.49)	4 (36.36)	
6 to 12 months	37 (33.64)	32 (32.32)	5 (45.45)	
Above 12 months	20 (18.18)	18 (18.18)	2 (18.18)	

Pearson's chi-square
n: frequency
%: column percentage
SGMC: Sweden Ghana Medical Center
BMI: Body Mass Index.
Other cancers- Upper and lower GI cancers, chondrosarcoma, pituitary cancer

4.4 CONSULTATION WITH A DIETICIAN

Only 14 all of whom were recruited from KBTH were currently seeing dieticians (figure 4.1).

Figure 4.1: Percentage of respondents who were currently seeing dieticians.



4.5 PATIENT-GENERATED SUBJECTIVE GLOBAL ASSESSMENT

Weight changes were relatively higher among patients who visited both KBTH and SGMC. Majority (33.6%) of the participants reported no change in weight or could not tell it there was a change in weight in 2 weeks, 1 month and 6 months. However, 19.2% had experienced a change in weight in 2 weeks, 1 month and 6 months (p-value 0.023). With regards to food intake, majority (41.6%) of the study participants reported consuming less than usual or less

than normal amount of food (p-value 0.001). Sixty percent of the study participants from both hospitals reported that they had experienced symptoms that kept them from eating enough or usually over the previous 2 weeks (p-value 0.006). Table 4.4 shows that majority (56.0%) of the study participants reported that they were able to perform optimally while 7 patients (5.6%) reported being able to function normally without any limitations (p-value 0.001).

Table 4.4: Patient Generated Subjective Global Assessment tool parameters completed by the patient

		Health Facility		
	Total	**KBTH**	**SGMC**	
Characteristics	**n (%)**	**n (%)**	**n (%)**	**P-value**
Weight change				0.023
0	42 (33.60)	38 (38.38)	8 (15.38)	
1	27 (21.60)	23 (23.23)	4 (15.38)	
2	32 (25.60)	20 (20.20)	12 (46.15)	
3	24 (19.20)	18 (18.18)	6 (23.08)	
Food intake				<0.001
0	5 (4.00)	0 (0.00)	5 (19.23)	
1	52 (41.60)	51 (51.52)	1 (3.85)	
2	8 (38.40)	35 (35.35)	13 (50.00)	
3	17 (13.60)	12 (12.12)	5 (19.23)	
4	1 (0.80)	1 (1.01)	0 (0.00)	
5	2 (1.60)	0 (0.00)	2 (7.69)	
Symptoms reported by patients				0.006
0	6 (4.80)	6 (6.06)	0 (0.00)	
1	76 (60.80)	63 (63.64)	13 (50.00)	
2	28 (22.40)	22 (22.22)	6 (23.08)	
3	10 (8.00)	6 (6.06)	4 (15.38)	
4	4 (3.20)	2 (2.02)	2 (7.69)	
6	1 (0.80)	0 (0.00)	1 (3.85)	
Patients' functional capacity				<0.001
Normal with no limitation	7 (5.60)	0 (0.00)	8 (26.92)	
Fairly normal	70 (56.00)	58 (58.59)	12 (46.15)	
Not feeling up to most things	43 (34.40)	40 (40.40)	3 (11.54)	
Able to do little activity	5 (4.00)	1 (1.01)	4 (15.38)	

Pearson's chi-square
n: frequency
%: column percentage

Weight change;
0- No change in weight in 2 weeks, 1 month or 6 months
1- A decrease in weight during 6 months, 1 month or 2 weeks
2- Decrease in weight in 2 of the above durations (6 months, 1 month, 2 weeks)
3- A decrease in weight in all of the above durations (6 months, 1 month and 2 weeks)

Food intake;
0- no change in food intake or more than usual food intake
1- Less than usual intake
2- Little solid food
3- Only solid foods or only nutritional supplements
4- Very little of anything
5- The summation of any of the changes in food intake

Symptoms reported by patients;
0 - no symptoms associated with eating (nausea, vomiting, constipation, diarrhea, mouth sores, dry mouth, pain, fatigue, problems swallowing).
The greater the number, the higher the number of symptoms associated with feeding.

4.5.1 CLINICIAN SUBJECTIVE GLOBAL ASSESSMENT (PG-SGA)

Table 4.5 shows the second part of the PG-SGA tool scored by a clinician. Weight loss in 6 months for majority (77.78%) of the study participants was between 0-1.9% that is they had experienced little or no weight loss in 6 months. Only 1.71% had experienced a weight loss between 5- 9.9% (p- value 0.001). Disease and its relation to nutritional requirement showed that, apart from the presence of cancer in all study participants, 2. 48% of them had decubitus (p- value 0.001). For metabolic demands, only 4% and 0.8% of the study participants scored moderate and low (0.437). With regards to physical examination scores which includes Nutrition Focused Physical Findings, 97.6% of the participants had no deficit in relation to the nutrition focused physical findings (muscle status, fat stores, fluid status). Less than 1% of the total study participants had severe deficits in muscle status, fat stores and fluid status (p- value 0.003).

Table 4.5: Patient Generated Subjective Global Assessment Parameters completed by the clinician

		HEALTH FACILITY		
	Total (N=125)	**KBTH (N=99)**	**SGMC (N=26)**	
Characteristics	**N (%)**	**N (%)**	**N (%)**	**P-value**
Weight loss in 6 months				<0.001
0 (0-1.9%)	91 (77.78)	86 (86.87)	5 (27.78)	
1 (2-2.9%)	17 (14.53)	11 (11.11)	6 (33.33)	
2 (3-4.9%)	4 (3.42)	2 (2.02)	2 (11.11)	
3 (5-9.9%)	2 (1.71)	0 (0.00)	2 (11.11)	
4 (≥ 10%)	3 (2.56)	0 (0.00)	3 (16.67)	
Disease and its relation to nutritional requirement				<0.001
Cancer	118 (97.52)	99 (100.00)	19 (86.36)	
Presence of decubitus	3 (2.56)	0 (0.00)	3 (13.64)	
Metabolic demand scores				0.437
0 (no)	119 (95.20)	93 (93.94)	26 (100.00)	
1 (low)	5 (4.00)	5 (5.05)	0 (0.00)	
2 (high)	1 (0.80)	1 (1.01)	0 (0.00)	
Physical exam score				0.003
0 (no deficit)	122 (97.60)	99 (100.00)	23 (88.46)	
1(mild deficit)	2 (1.60)	0 (0.00)	2 (7.69)	
3 (severe deficit)	1 (0.80)	0 (0.00)	1 (3.85)	

Pearson's chi-square
n: frequency
%: column percentage
SGMC: Sweden Ghana Medical Center
BMI: Body Mass Index.

4.6 THE MEAN TOTAL PG-SGA SCORES OF STUDY PARTICIPANTS

The mean PG-SGA scores of the study participants was 6.80 ± 4.50. The mean total PG-SGA scores of the participants from KBTH was 5.93 ± 3.81 and that of the participants from SGMC was 10.43 ± 5.79 (Table 4.6) (p- value 0.001).

Table 4.6: Mean total PG-SGA scores of study participants

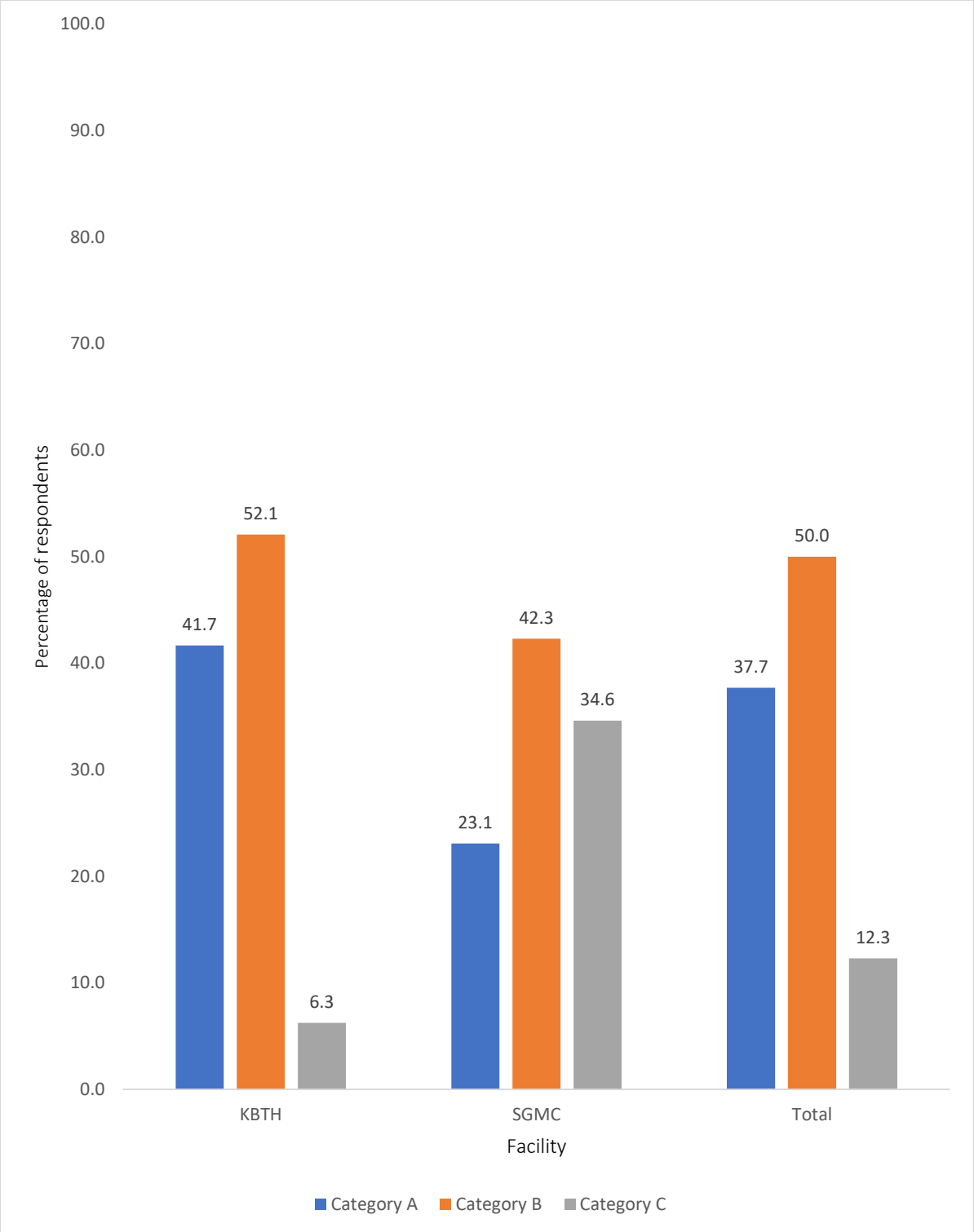
		Health facility		
		KBTH	SGMC	
Characteristics	**Total Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**P-value**
Total PG-SGA scores	6.80 ± 4.50	5.93 ± 3.81	10.43 ± 5.79	0.001

SD: standard deviation.
SGMC: Sweden Ghana Medical Center
BMI: Body Mass Index.

4.7 RATING OF NUTRITIONAL STATUS OF STUDY PARTICIPANTS BASED ON PG-SGA SCORES

Out of 122 participants, 50% were moderately malnourished, 37.7% were well nourished and 12.3% were severely malnourished. Forty-one percent of patients who visited KBTH were well nourished while 23.1% of the patients who visited SGMC were well nourished (Figure 4.2). Category A (well nourished), category B (moderately malnourished), category C (severely malnourished).

Figure 4.2: Rating of nutritional status of study participants based on PG-SGA scores

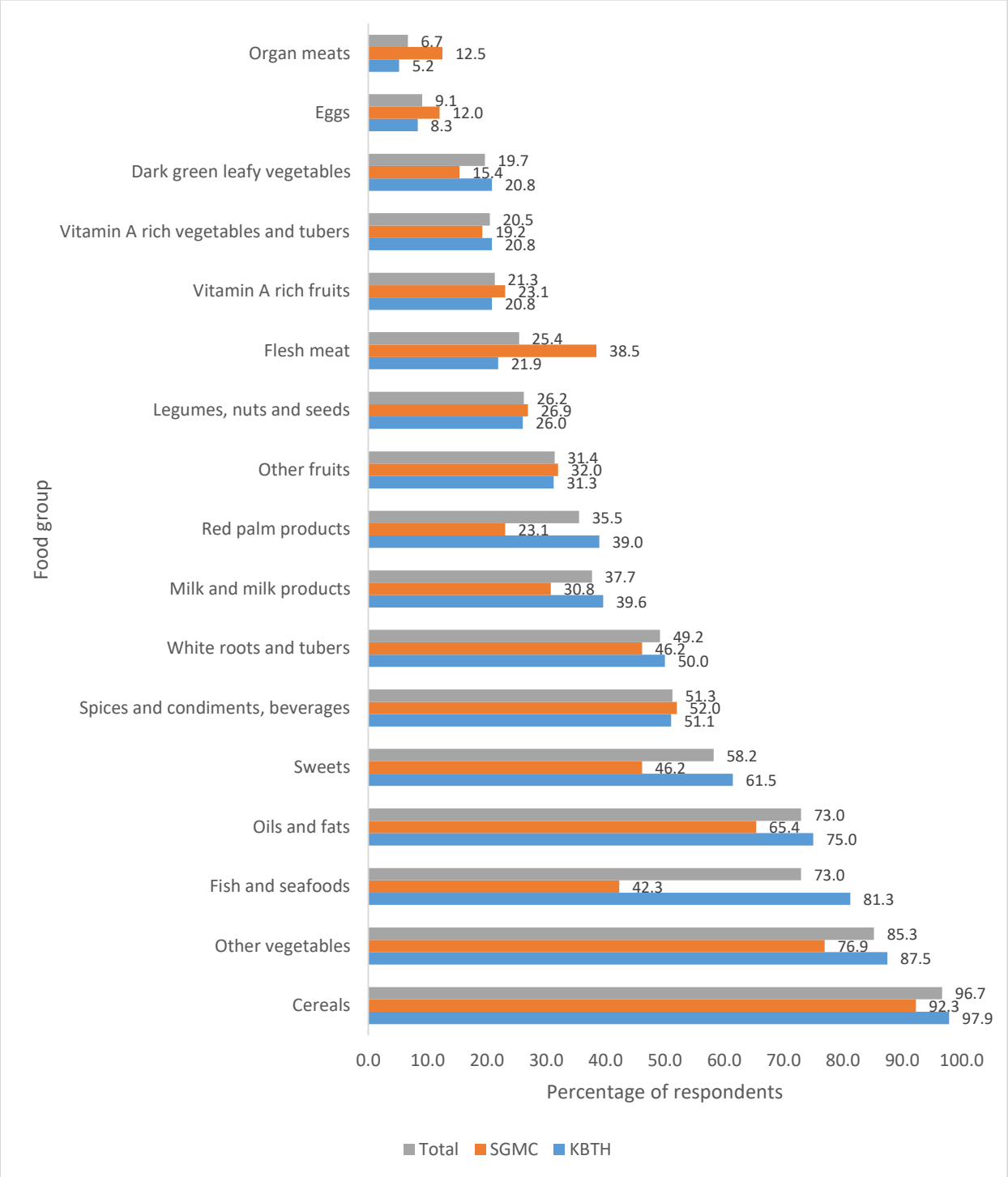


DIETARY DIVERSITY OF PATIENTS

4.8 FOOD GROUPS CONSUMED BY STUDY PARTICIPANTS.

Figure 4.3 below shows the percentage distribution of food groups consumed by participants from KBTH and SGMC. The three food groups most commonly consumed by the study participants were cereal (96.7%), other vegetables (85.3%) and fish and sea foods (73.0%). The three least consumed foods by the study participants were organ meats (6.7%), eggs (9.1%) and dark green leafy vegetables (19.7%).

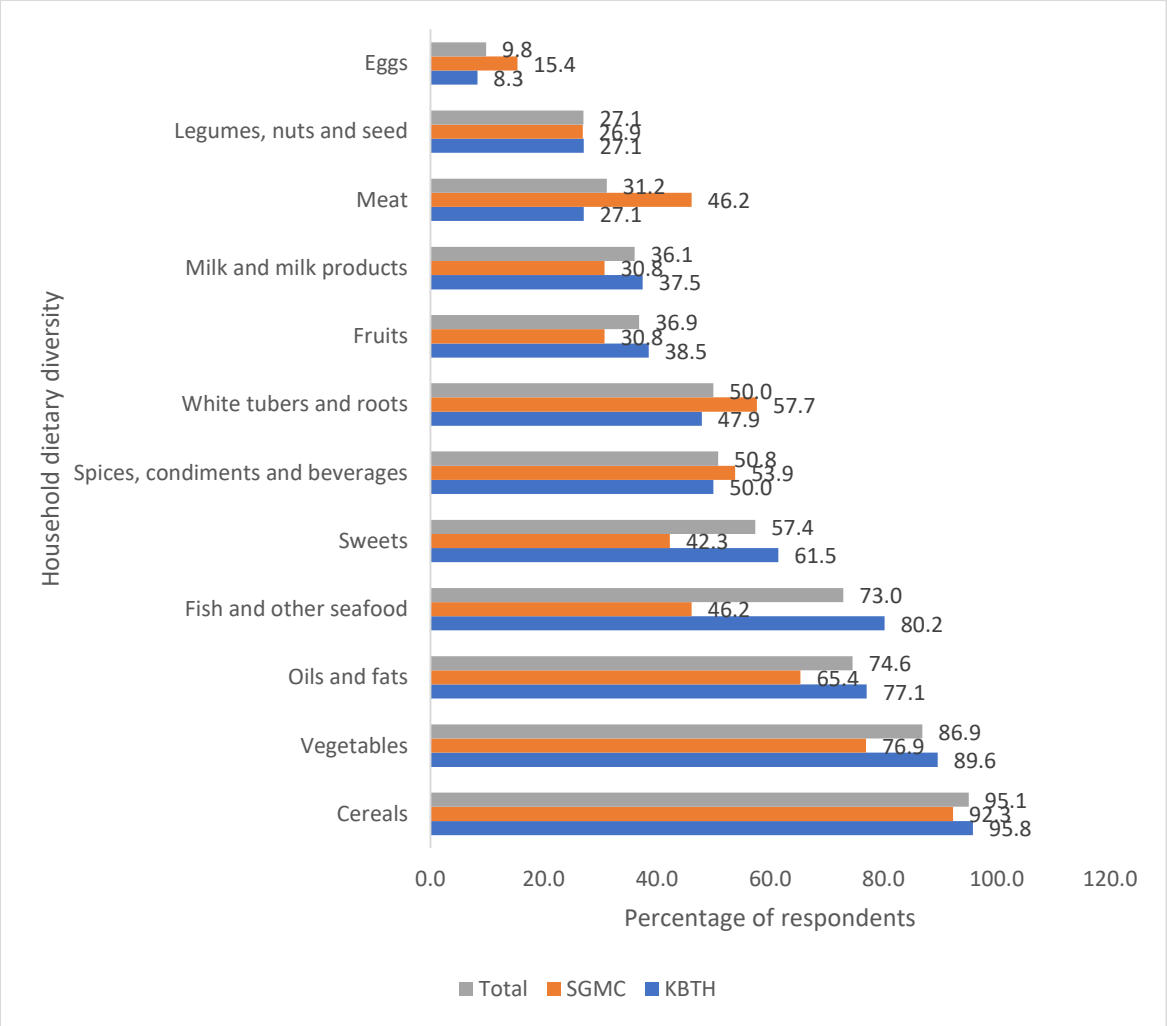
Figure 4.3: Percentage distribution of food groups consumed by participants by health facilities.



4.9 HOUSEHOLD DIETARY DIVERSITY (HDD) SCORES

Figure 4.4 below shows the consumption patterns of twelve food groups consumed by study participants from KBTH and SGMC. The three food groups most commonly consumed among the study participants were cereal (95.1%), vegetables (86.9%) and oils and fats (74.6%).The three least consumed foods among the patients were meat (31.2%), legumes, nuts and seeds (27.1%) and eggs (9.8%) (Figure 4.4).

Figure 4.4: Household Dietary Diversity (HDD) Scores



4.10 MEAN HOUSEHOLD DIETARY DIVERSITY SCORES OF STUDY PARTICIPANTS FROM THE TWO (2) HOSPITALS

Based on the 12 item food groups, the mean HDD score was 6.29±1.60. There was no significant difference in the mean HDD scores between the two health facilities (p-value 0.132) (Table 4.7).

Table 4.7: Mean household dietary diversity scores study participants from the two (2) hospitals

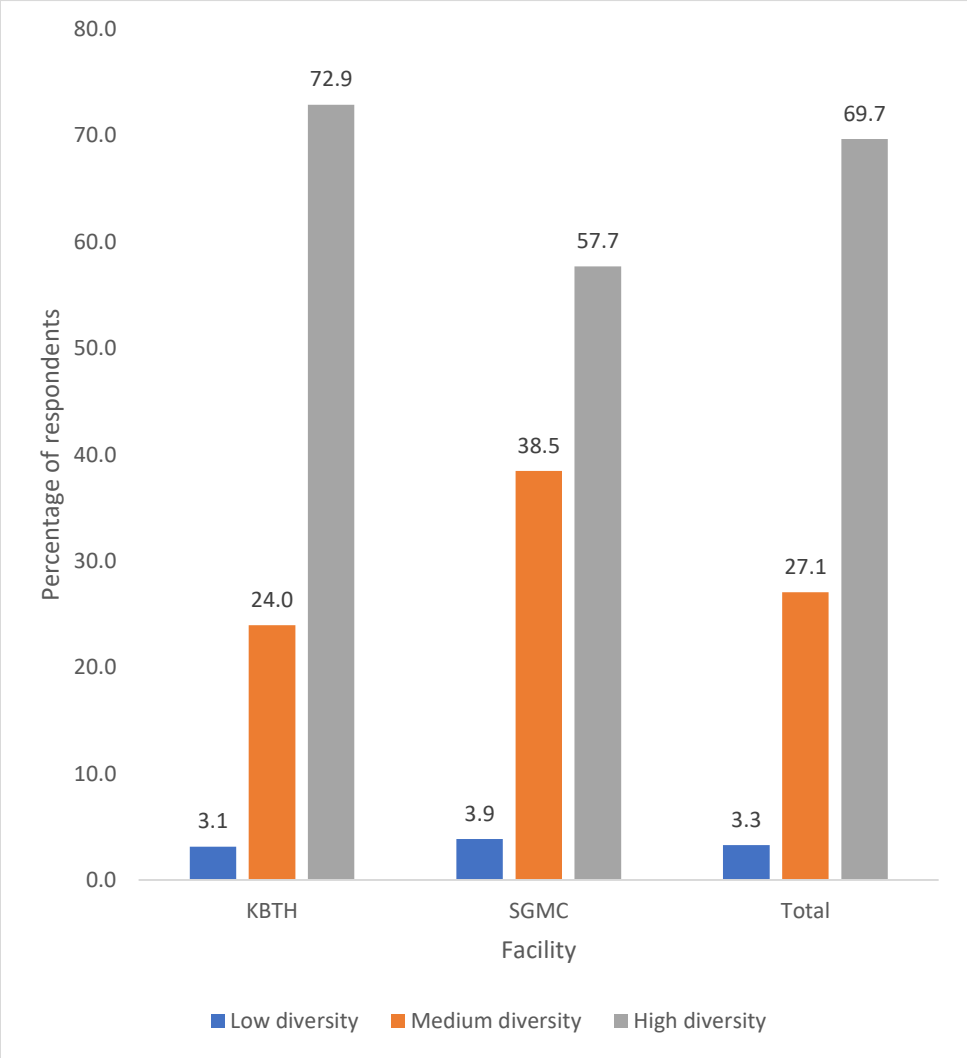
		Health Facility		
	Total	**KBTH**	**SGMC**	
Characteristics	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**P-value**
HDD scores	6.29 ± 1.60	6.41 ± 1.57	5.85 ± 1.67	0.132

T-test statistic
SD: standard deviation.
SGMC: Sweden Ghana Medical Center
BMI: Body Mass Index.

4.11 CLASSIFICATION OF HOUSEHOLD DIETARY DIVERSITY SCORES OF PARTICIPANTS

Majority (69.7%) of the study participants had high diversity scores with 27.1% having medium HDD scores and 3.3% having low HDD scores. Majority of the study participants from both hospitals (72.90% from KBTH and 57.70% from SGMC) had a high dietary diversity score. Only 3.10% and 3.90% of the participants from both KBTH and SGMC respectively had a low dietary diversity score (Figure 4.5).

Figure 4.5: Classification of Household Dietary diversity scores of participants



4.12 ASSOCIATION BETWEEN PG-SGA SCORES AND DIETARY DIVERSITY.

There was a significant association between the nutritional status of the study participants and their HDDS categories (p-value = 0.003) (Table 4.8).

Table 4.8: Association between PG-SGA scores and dietary diversity scores

		Nutritional status				
		category	Category	Category		
	Total	A	B	C		
Characteristics	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**χ^2-value**	**P-value**
HDDS category					16.17	**0.003**
Low Diversity	4 (3.28)	1 (2.17)	3 (4.92)	0 (0)		
Medium Diversity	33 (27.05)	5 (10.87)	19 (31.15)	9 (60)		
High Diversity	85 (69.67)	40 (86.96)	39 (63.93)	6 (40)		

n: frequency.
%: column percentage.
χ^2: Pearson chi-square value.

CHAPTER FIVE

DISCUSSION AND CONCLUSION

5.1 DISCUSSION

A total number of 125 participants were recruited for the study comprising 90 females and 35 males. Earlier studies reported that females are at a higher risk of developing cancer. (Edgren *et al.*, 2012: Kim *et al.*, 2015). The reason for this disparity, has not been established. However recent studies have reported that males are more prone to developing cancer as compared to females (Kim, Lim & Moon, 2018; Feng *et al.*, 2019).

More than half (65.6%) of the study participants were 50 years and older. According to a report by the Ghana Living Survey in 2008, people 50 years and above are among the age groups most vulnerable to diseases (Ghana Statistical Service, 2008). Niccoli and Patridge (2012) reported that aging is among the greatest known risk factors for most human diseases. A study conducted by Smith *et al.* (2009) also reported that aging is a major risk factor for developing cancer. In addition, Bellizzi and Gosley (2012) reported that as people increase with age, the incidence and mortality of cancer also increases.

Sixty two percent of the study participants earned less than 500 Ghana cedis as monthly income. This reveals that majority of the participants were earning low incomes. Socioeconomic status has been shown to be a fundamental element of public and individual health indicating an individual's resources and ability to thrive and survive (Frieden, 2015). The incidence of some cancer types has been associated with socioeconomic status (Clegg *et al.*, 2009; Singh & Jemal, 2017). A low socioeconomic status has been associated with colorectal cancer (Doubeni *et al.*, 2012). Studies conducted by Quaglia (2013) and Krieger *et al.*, (2010) revealed that a high socioeconomic status has been linked to early diagnosis of breast, malignant melanoma and prostate cancers. Various studies have reported that individuals with low socioeconomic status have higher rates of late-stage diagnoses of cancers

including breast, lung, colorectal, and cervical (Du *et al.*, 2011; Baade *et al.*, 2011) and this can be linked to less frequent visits to the health facilities for cancer screening as a result their limited access to medical care (Byers *et al.*, 2008). A higher socioeconomic status meant frequent screening and better treatment and access to therapy (Meijer, Bloomfield & Engholm, 2013).

Obesity is one of the most serious public health problems globally (Centers for Disease Control and Prevention, 2012; Karnik & kanekar, 2012). Overweight and obesity have been identified as major risk factors for noncommunicable diseases (Rossen & Rossen, 2011). Participants of this study were generally overweight with a mean BMI of 26.81kgm^{-2} ± 8.25.

This evidence supports other findings that overweight and obesity are major risk factors of varying forms of cancer (Somdyala *et al.*, 2015; Cheng *et al.*, 2015). Wolin, Carson, and Colditz (2010) have reported that up to 20% of all malignancies could be related to weight gain and obesity.

Lorton *et al*. (2019) conducted a study in 200 cancer patients and it was revealed that 40% of them were overweight and obese. Another study conducted among 1172 Arab women involved healthy women and women with cancer. The study revealed that 75.8% of the women with breast cancer were overweight or obese as compared to women who did not have cancer (61.3%) (Elkum *et al.*, 2014). This shows that obesity is a significant risk factor for breast cancer among women. Another study also reported that there is an association between obesity and increased risk of aggressive prostate cancer (Zhang *et al*. 2015). Obesity can lead to poorer treatment outcome, worsened prognosis, and increased cancer-related mortality (Kaider-Person, Bar- Sela & Person, 2011).

Excessive body fat has also been associated with different cancers including breast cancer (Anderson *et al.*, 2015).

Majority of the study participants had breast cancer, followed by cervical and prostate cancer. This is consistent with a study conducted by Bray *et al.* (2018). This study was carried out in 185 countries. They reported that breast (11.6%) and cervical cancers (3.2%) are the most commonly diagnosed cancers in women and in men, prostate cancer (7.1%) was the second most commonly diagnosed cancer. Cancers of the breast and prostate have also been identified as the leading causes of cancer deaths in women and men worldwide (Jemal *et al*., 2011; Siegel *et al*., 2015). As reported by Akarolo-Anthony (2010), the incidence of breast cancer is increasing at alarming rates in the low and middle income countries.

Stage at diagnosis is a major contributing factor to poor survival of breast cancer patients. Early stage disease is associated with a better prognosis than late stage disease (Allemani *et al.*, 2015). Forty-three percent of the study participants presented with stage two cancers (localised). However, more than half (51.8%) of the study participants had been diagnosed with stages three to five cancers. Later stage cancer diagnosis is a major contributing factor to poor cancer outcomes (Richards, 2009). In Sub-Saharan Africa, most patients with breast cancer present with late stage disease. This could be attributed to poor awareness, absence of organized early detection programs, inadequate facilities for accurate, timely diagnosis and treatment and limited access to healthcare (Rachet *et al.,* 2010). The late diagnosis could also be as a result of the low socioeconomic status of majority of the participants in this study. Hudson *et al.* (2013) reported that lower socio-economic status of people over the life's course was related to poorer self-reported health status. Differences in socioeconomic status at the time of cancer diagnosis best explain the differences in cancer survival for some types of cancers (Ibfelt *et al.*, 2013).

Majority of the study participants had not seen a dietician at the time of the study. This is because participants were newly reporting patients and may probably be referred to the dietician later. Hospital studies conducted in Europe revealed that only 1 in 3 cancer patients

at risk of malnutrition received any nutritional support (Hebuterne *et al.,* 2014) and even patients who were referred to see a dietician was as a result of weight loss (Lorton *et al.,* 2019). The degree and prevalence of malnutrition in cancer patients is mainly dependent on the stage and site of the tumor (Hebuterne *et al.,* 2014). Participants in the current study were generally malnourished; either moderately or severely malnourished with just a third being well nourished. Studies have revealed that as cancer progresses, malnutrition becomes evident (Freijer *et al.,* 2013). Cancer, as well as its treatment also affects the nutritional status of the patient (Ryan *et al.,* 2016). The pre-existence of malnutrition before cancer diagnosis can also threaten the nutritional status of patients reporting with cancer. Patients with cancer are usually faced with many challenges including eating well to maintain a good nutritional status and avoid weight loss as well as the complications that come with it (Blum *et al.,* 2011). Evaluating nutritional status of cancer patients is very important when providing treatment especially in the early stages (Muscaritoli *et al.,* 2017).

Although vegetable consumption was high among study participants, fruit consumption was slightly low. Fruits and vegetables consumption play a vital role in maintaining good health and longevity. This is because; they are rich sources of vitamins, minerals, dietary fiber and phytochemicals. They are also important in preventing non-communicable and chronic diseases (De Bruijn, 2010). In 2014, an estimated 1.7 million deaths globally were linked to inadequate intake of fruits and vegetables (Rekhys & McConchie, 2014). Fruit and vegetable consumption has been inversely associated with cancer and all-cause mortality (World Cancer Research Fund, 2007). A meta-analysis of 95 studies conducted to observe the relationship between fruit and vegetable intake and reduction in the risk of cancer (Aune *et al.,* 2017). The study observed intakes up to 800 grams/day. It revealed that for every 200 grams intake of fruits and vegetables per day, there was a 3-4% reduction in the risk of cancer and a 13% reduction in the risk of cancer for an intake of 500 grams of fruits and vegetables per day. An

intake of 800 grams per day was associated with a 14% reduction in the risk of developing cancer. This implies that the intake of fruits and vegetables as well as the quantities consumed are important in reducing a person's risk of cancer and all-cause mortality. This study however, did not assess the quantities participants were consuming. Socioeconomic status, food cost, taste, convenience, shelf life, accessibility and availability of fruits and vegetables also influence the consumption of fruits and vegetables (Li *et al.,* 2012). In Ghana where fruits and vegetables are seasonal, purchasing them when they are not in season can be expensive.

It has been observed that increased dietary diversity is associated with improved diet quality (Vadiveloo *et al.*, 2015). This study revealed that majority of the participants had a high dietary diversity with a few of them having medium and low dietary diversity. Although majority of the participants had not seen a dietician at the time of the study, they might have had some knowledge on the choice of foods. Some studies have identified that appropriate food choice is dependent on nutritional knowledge (Lee *et al.*, 2014; McDonald *et al.,* 2015).

This study also identified that, although majority of the study participants had a high dietary diversity, majority of them were moderately malnourished. Various studies have reported that cancer in itself increases a person's risk of malnutrition and as the disease advances, there is an increased risk of malnutrition (Arends *et al.*, 2017). This is because patients are faced with many challenges related to feeding. Participants may have been consuming a diverse diet, but in small quantities due to their condition and this could account for the differences identified in this study.

The nutritional status of patients showed significant association with the dietary diversity (P= 0.003). Dietary diversity is associated with diet quality hence affecting nutritional status (Vadiveloo *et al.,* 2015). Several studies (Kant *et al.,* 2004; Savy *et al.,* 2006) have reported that dietary diversity is positively associated with nutritional status. The more diverse the diet,

the better a patient's nutritional status. This implies that dietary quality plays important roles in improving the nutritional status of cancer patients.

5.2 LIMITATIONS

1. The study did not take into account seasonal variability in the dietary diversity assessment.
2. There were large differences in the number of study participants from the two hospitals.

5.3 CONCLUSION

Findings from this study showed that majority of the study participants (50%) were moderately malnourished with a PG-SGA score of 6.80. This implies that majority of newly reporting cancer patients in Ghana may be malnourished and will benefit from nutrition interventions. Dietary diversity score of study participants was significantly associated with their nutritional status (P-value of 0.003). This implies that diet quality is an important factor in the nutrition of newly diagnosed cancer patients. The more diverse the diet, the better the patient's nutritional status may be.

5.4 RECOMMENDATIONS

1. Routine nutritional screening and support is recommended in the management and treatment of newly reporting cancer patients.
2. Clinicians should be educated on the importance of nutrition intervention in the early stages of cancer.
3. The Scored Patient-Generated Subjective Global Assessment (PG-SGA) can be used as part of routine nutrition assessments by health workers for newly reporting cancer patients.

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APPENDICES

APPENDIX I

CONSENT FORM- STUDY PARTICIPANTS

Title: Nutritional Status of Newly Diagnosed Cancer Patients in Ghana: A Comparative Study of Patients from Two (2) Health Facilities in Accra

Principal Investigator: Mrs Laurene Boateng, Mphil

Collaborators: Dr. Richmond Aryeetey, PhD

Mrs. Nana Yaa Nyarko, Mphil

Address: P.O.Box KB 143 Korle-Bu, School of Allied Health Sciences, University of Ghana.

This consent form contains information about the research named above. In order to be sure that you are informed about being in this research, we are asking you to read (or have read to you) this consent form. You will be asked to sign it (or make your mark in front of a witness). We will give you a copy of this form. This consent form might contain some words that are unfamiliar to you. Please ask us to explain anything you may not understand.

Reason for the research

Although the WHO has noted that cancer is a major source of morbidity and the second most common cause of mortality worldwide, studies in cancer patterns in Africa have hitherto not been given much priority as a result of the focus of on more pertinent problems such as malnutrition and infectious diseases. Nutrition plays a key role in both the prevention and progression of cancer. Available information shows that the nutritional status of cancer patients is correlated with their overall prognosis and outcome. In Ghana currently, there is a lack of documentation on how cancer patients are assessed and managed nutritionally. The aim of this

study is to determine the nutritional status of newly reporting cancer patients in some health facilities in Accra.

For study subjects

For this study, you will first agree to participate in this study. Your weight, height, Body Mass Index and body fat measurements will be taken. A physical examination will also be performed. You will then be interviewed extensively on your dietary intake. The aforementioned process will take up to 30-45 minutes.

Possible risks

There are no foreseeable risks to participation in this research activity. You will only be called on to expend the duration indicated above for your participation

Possible benefits (For Study Subjects)

You will benefit from nutrition education on your condition. The study outcome will also make recommendations to Government, the Ministry of Health, and the Ghana Health Service on improving the nutritional management of cancer patients in Ghana.

If you decide not to be in the research

You are free to decide if you want to be in this research or otherwise. Your decision as to whether to participate or not will have no effect on any benefits you now receive or may wish to receive in the future from any agency.

Confidentiality

We will protect information about you and your taking part in this research to the best of our ability. You will not be named in any reports. Someone from the Ethics and Protocol Review

Committee might want to ask you questions about being in the research, but you do not have to answer them. A court of law could order that questionnaire transcripts be shown to other people, but that is unlikely. If necessary for the completion of data collection, we may contact you again after the initial contact, through a means you may provide to obtain the necessary information, with recognition of the need to not compromise your status.

Compensation

You will not be paid for your participation in this study, since you do not have to take part in this research.

Alternatives to participation

You do have to participate in the research in order to continue to receive care from this facility or any other support system.

Leaving the research

You may decide to terminate your participation in the research at any time. If you choose not to take part, you can change your mind at any time and withdraw. If you choose to leave the study at any time, please tell the research assistant why you wish to leave.

If you have a problem or have other questions

Please call Dr. Laurene Boateng, School of Allied Health Sciences, 0244 742 893 if you have questions about the research.

Your rights as a participant

This research has been reviewed and approved by the Ethical and Protocol Review Committee of the University of Ghana Medical School. An Ethics and Protocol Review Committee is a committee that reviews research studies in order to help protect participants.

Appendix II

INFORMED CONSENT FORM

PARTICIPANT ID:

NAME OF INSTITUTION: SCHOOL OF BIOMEDICAL AND ALLIED HEALTH SCIENCES, COLLEGE OF HEALTH SCIENCES, UNIVERSITY OF GHANA.

PROJECT TITLE: NUTRITIONAL STATUS OF CANCER PATIENTS IN GHANA

The document describing the benefits, risks and procedures for the above named research title has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

....

Date Signature or mark of volunteer

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

....

Date Signature or mark of volunteer

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

APPENDIX III

DATA CAPTURE SHEET

Patient ID.....

Date.....

SECTION 1: SOCIO-DEMOGRAPHICS

1.1 Gender [ ] FEMALE [ ] MALE

1.2 Age .....

1.3 Which one of these groups would you say best represents your ethnicity?

[1] Akan [4] Upper West

[2] Ewe [5] Upper East

[3] Ga [6] Northern

[7] Other [specify] .....

1.4 Marital status [ ] Married [ ] Divorced [ ] Single [ ] Widowed

1.5 How many people live in your household? [ ] 1-2 [ ] 3-4 [ ] 5 or more

1.6 What is your main occupation?

.....

1.7 Do you have an additional occupation that brings income? [ ] yes [ ] no

1.8 Monthly household income from all sources

.....

1.9 Educational background

[ ] none [ ] primary [ ] junior high [ ] senior high [ ] post-secondary/tertiary

1.0 Residential Address

.....

SECTION 2: ANTHROPOMETRY

2.1 Height (cm) ..... **2.2** Weight (kg) .....

2.3 BMI (kg/m^2) ..... **2.4** Total body fat .....

2.5 Visceral fat .....

SECTION 3:

3.1 TYPE OF CANCER .....

3.2 STAGE OF CANCER [ ] I [ ] II [ ] III [ ] IV [ ] V

SECTION 4

4.1 Have you seen a dietitian before for your condition? [ ] Yes [ ] No

4.2 How long has it been since you were diagnosed .....

4.3 From the time of diagnosis till date, have lost weight? [ ] [ ] No

4.4 What type of treatment are you currently on .....

THIS IS THE END OF THE QUESTIONNAIRE, THANK YOU FOR PARTICIPATING.

24- HOUR DIET RECALL SAMPLE FORM

☐ **FACE TO FACE** ☐ **BY PHONE CALL**

Patient ID ☐ WEEKDAY WEEKEND ☐ Day of the week: Mon, Tue, Wed, Thur, Fri, Sat, Sun Does this represent your typical eating habits? Yes ( ) N0 ( ) Please be as specific and honest as possible for review with the dietitian. Thank you.		
Time	Food/ beverages/ method of preparation	Amount/ serving size

APPENDIX IV

Question number	Food groups	Examples	Yes=1 No= 0
1	CEREAL	Corn/maize, rice, wheat, sorghum, millet or any other grains or foods made from these (eg. Bread, noodles, porridge or other grain products) + insert local foods eg. Ugali, nshima, porridge or paste	
2	WHITE ROOTS AND TUBERS	White potatoes, white yam, white cassava, or other foods made from roots	
3	VITAMIN A RICH VEGETABLES AND TUBERS	Pumpkin, carrot, squash, or sweet potato that are orange inside + other locally available vitamin A rich vegetables (e. g. Red sweet pepper)	
4	DARK GREEN LEAFY VEGETABLES	Dark green leafy vegetables including wild forms + locally available vitamin A rich leaves such as amaranth, cassava leaves, kale, spinach	
5	OTHER VEGETABLES	Other vegetables (e. g. tomato, onion, eggplant) + other locally available vegetables	

6	VITAMIN A RICH FRUITS	Ripe mango, cantaloupe, apricot (fresh or dried), ripe papaya, dried peach, and 10% fruit juice made from these + other locally available vitamin A rich fruits	
7	OTHER FRUITS	Other fruits, including wild fruits and 100% fruit juice made from these	
8	ORGAN MEAT	Liver, kidney, heart or other organ meats or blood-based foods	
9	FLESH MEATS	Beef, pork, lamb, goat, rabbit, game, chicken, duck, other birds, insects	
10	EGGS	Eggs from chicken, duck, guinea fowl or any other egg	
11	FISH AND SEAFOOD	Fresh or dried fish or shellfish	
12	LEGUMES, NUTS AND SEEDS	Dried beans, dried peas, lentils, nuts, seeds or foods made from these (e.g. hummus, peanut butter)	
13	MILK AND MILK PRODUCTS	Milk, cheese, yoghurt or other milk products	
14	OILS AND FATS	Oil, fats or butter added to food or used for cooking	
15	SWEETS	Sugar, honey, sweetened soda or sweetened juice drinks, sugary foods such as chocolates,	

		candies, cookies and cakes	
16	SPICES, CONDIMENTS, BEVERAGES	Spices (black pepper, salt), condiments (soy sauce, hot sauce), coffee, tea, alcoholic beverages	

Question number(s)	Food group
1	Cereals
2	White tubers and roots
3,4,5	Vegetables
6,7	Fruits
8,9	Meat
10	Eggs
11	Fish and other seafood
12	Legumes, nuts and seeds
13	Milk and milk products
14	Oils and fats
15	Sweets
16	Spices, condiments and beverages

APPENDIX V

PATIENT-GENERATED SUBJECTIVE GLOBAL ASSESSMENT PATIENT ID _____ DATE_____

1. Weight *(See Worksheet 1)*
Summary of my current and recent weight:

During the past **six months** my weight has:

-decreased (1) not changed (0) increased (0) cannot tell (0)

During the past **one month** my weight has:

-decreased (1) not changed (0) increased (0) cannot tell (0)

During the past **two weeks** my weight has:
-decreased (1) not changed (0) increased (0) cannot tell (0)

Box 1

2. Food Intake:
As compared to my usual dietary intake, I would rate my food intake during the past month as:
__ unchanged (0)
__ more than usual (0)
__ less than usual (1)

I am now taking:
____ *Usual normal food* but less than normal amount (1)
____ little solid food (2)
____ only liquids (3)
____ only nutritonal supplements (3)
____ very little of anything (4)
____ only tube feedings or only nutrition by vein (0)

Box 2

3. Symptoms: I have had the following problems that have kept me from eating enough during the past two weeks (check all that apply):
__no problems eating (0)
__no appetite, just did not feel like eating (3)
__nausea (1) vomiting (3)
__constipation (1) diarrhea (3)
__mouth sores (2) dry mouth (1)
__things taste funny or have no taste (1) smells bother me (1)
__problems swallowing (2) feel full quickly (1)
__pain; where? (3)_____ fatigue (1)
__other** (1)_____
** Examples: depression, money, or dental problems

Box 3

4. Activities and Function: Over the past month, I would generally rate my activity as:
___normal with no limitations (0)
___not my normal self, but able to be up and about with fairly normal activities (1)
___not feeling up to most things, but in bed or chair less than half the day (2)
__able to do little activity and spend most of the day in bed or chair (3)
pretty much bedridden, rarely out of bed (3)

Box 4

The remainder of this form will be completed by your doctor, nurse, dietitian, or therapist. Thank you.

Scored Patient-Generated Subjective Global Assessment (PG-SGA)

Worksheet 1 - Scoring Weight (Wt) Loss

To determine score, use 1 month weight data if available. Use 6 month data only if there is no 1 month weight data. Use points below to score weight change and add one extra point if patient has lost weight during the past 2 wk.

Wt loss in 1 month	Points	Wt loss in 6 months
10% or greater	4	20% or greater
5-9.9%	3	10 -19.9%
3-4.9%	2	6 - 9.9%
2-2.9%	1	2 - 5.9%
0-1.9%	0	0 - 1.9%

Numerical score from Worksheet 1 ☐

Additive Score of the Boxes 1-4 (See Side 1) ☐ A

5. Worksheet 2 - Disease and its relation to nutritional requirements

All relevant diagnoses (specify) _____

One point each:

☐Cancer ☐AIDS ☐Pulmonary or cardiac cachexia ☐ Presence of decubitus, open wound, or fistula
☐Presence of trauma ☐ Age greater than 65 years ☐Chronic renal insufficiency

Numerical score from Worksheet 2 ☐ B

6. Work Sheet 3 - Metabolic Demand

Score for metabolic stress is determined by a number of variables known to increase protein & calorie needs. The score is additive so that a patient who has a fever of > 102 degrees (3 points) and is on 10 mg of prednisone chronically (2 points) would have an additive score for this section of 5 points.

Stress	none (0)	low (1)	moderate (2)	high (3)
Fever	no fever	>99 and <101	≥101 and <102	≥102
Fever duration	no fever	<72 hrs	72 hrs	> 72 hrs
Corticosteroids	no corticosteroids	low dose (<10mg prednisone equivalents/day)	moderate dose (≥10 and <30mg prednisone equivalents/day)	high dose steroid (≥30mg prednisone equivalents/day)

Numerical score from Worksheet 3 ☐ C

7. Worksheet 4 - Physical Exam

Physical exam includes a subjective evaluation of 3 aspects of body composition: fat, muscle, & fluid status. Since this is subjective, each aspect of the exam is rated for degree of deficit. Muscle deficit impacts point score more than fat deficit. Definition of categories: 0 = no deficit, 1+ = mild deficit, 2+ = moderate 3+ = severe

Muscle Status:				
temples (temporalis muscle)	0	1+	2+	3+
clavicles (pectoralis & deltoids)	0	1+	2+	3+
shoulders (deltoids)	0	1+	2+	3+
interosseous muscles	0	1+	2+	3+
Scapula (latissimus dorsi, trapezius, deltoids)	0	1+	2+	3+
thigh (quadriceps)	0	1+	2+	3+
calf (gastrocnemius)	0	1+	2+	3+
Global muscle status rating	**0**	**1+**	**2+**	**3+**

Fat Stores:				
orbital fat pads	0	1+	2+	3+
triceps skin fold	0	1+	2+	3+
fat overlying lower ribs	0	1+	2+	3+
Global fat deficit rating	**0**	**1+**	**2+**	**3+**

Fluid Status:				
ankle edema	0	1+	2+	3+
sacral edema	0	1+	2+	3+
ascites	0	1+	2+	3+
Global fluid status rating	**0**	**1+**	**2+**	**3+**

Numerical score from Worksheet 4 ☐ D

Total PG-SGA score ☐
(Total numerical score of A+B+C+D above)

(See triage recommendations below)

Global PG-SGA rating (A, B, or C) = ☐

Clinician Signature _____ RD RN PA MD DO Other ___ Date _____

Worksheet 5 - PG-SGA Global Assessment Categories

	Stage A	Stage B	Stage C
Category Weight	Well nourished No wt loss OR Recent wt gain	Moderately malnourished ≤ 5% wt loss in 1 month (or 10% in 6 mos) OR Progressive wt loss	Severely malnourished > 5% wt loss in 1 month (or >10% in 6 mos) OR Progressive wt loss
Nutrient intake	No deficit OR Significant recent improvement	Definite decrease in intake	Severe deficit in intake
Nutrition Impact Symptoms	None OR Singificant recent improvement allowing adequate intake	Present of nutrition impact symptoms (PG-SGA Box 3)	Present of nutrition impact symptoms (PG-SGA Box 3)
Functioning	No deficit OR Recent improvement	Moderate functional deficit OR Recent deterioration	Severe functional deficit OR recent significant deterioration
Physical Exam	No deficit OR Chronic deficint but recent improvement	Evidence of mild to moderate loss of muscle mass / SQ fat / muscle tone on palpation	Obvious signs of malnutrition (eg, severe loss muscle, SQ tissue, possible edema)

Nutritional Triage Recommendations: Additive score is used to define specific nutritional interventions including patient & family education, symptom management including pharmacologic intervention, and appropriate nutrient intervention (food, nutritional supplements, enteral, or parenteral triage).

First line nutrition intervention includes optimal symptom management.

Triage based on PG-SGA point score

0-1	No intervention required at this time. Re-assessment on routine and regular basis during treatment.
2-3	Patient & family education by dietitian, nurse, or other clinician with pharmacologic intervention as indicated by symptom survey (Box 3) and lab values as appropriate.
4-8	Requires intervention by dietitian, in conjunction with nurse or physician as indicated by symptoms (Box 3).
≥ 9	Indicates a critical need for improved symptom management and/or nutrient intervention options.

Committee for review and approval before its implementation.

You are required to report all serious adverse events related to this study to the Ethical and Protocol Review Committee within seven (7) days verbally and fourteen (14) days in writing.

This ethical clearance is valid till April 2014.

As part of the review process, it is the Committee's duty to review the ethical aspects of any manuscript that may be produced from this study. You will therefore be required to furnish the Committee with any manuscript for publication.

Please always quote the protocol identification number in all future correspondence in relation to this protocol.

Signed: .....

PROFESSOR JENNIFER WELBECK
(CHAIRPERSON, ETHICAL AND PROTOCOL REVIEW COMMITTEE)

cc: Dean
Head of Department
Research Office