

**NUTRITIONAL KNOWLEDGE IN ASSOCIATION WITH DIETARY PRACTICES OF
CANCER PATIENTS: A CASE STUDY OF KENYATTA NATIONAL HOSPITAL
CANCER TREATMENT CENTER, NAIROBI**

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DECLARATION

I, hereby declare that this dissertation is my original work and has not been presented for a degree in any other university.

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DEPARTMENT OF FOOD SCIENCE, NUTRITION AND TECHNOLOGY

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OPERATIONAL DEFINITIONS

Nutrition- the oxford dictionary defines nutrition as *“the process of obtaining the food necessary for health and growth”*

Nutrition Knowledge- refers to the state or fact of knowing the balance of nutrients taken into the body as compared to the body's requirements for them.

Dietary Practice - To do or perform something habitually or repeatedly of or relating to the diet

Palliative Care- this is the care that has been severally been defined as *“the care given to patients and their families when facing life-threatening illness in order to improve the quality of life”* by the World Health Organization

Nutritional Support- the supply of foods and liquids necessary to facilitate healing and support health.

Dietary diversity Score - is defined as the number of food groups consumed over a period of 24 hours

Food frequency questionnaire- A used as tool of measuring food consumption. This is done obtaining retrospective information on patterns of food use during a longer, less precisely defined period of time. This method is used to assess the usual intake of foods.

Nutritional knowledge - one is said to be nutritionally knowledgeable when; they have accurate information about what they should be eating and the implications on their health if they eat wrong foods.

Cancer – By definition is the abnormal growth of cells caused by multiple changes in gene expression leading to an imbalance of cell multiplication and cell death that ultimately evolves to a population of cell that invade other tissues and spread to different sites causing disease and death of a person if left untreated.

Hypoxia- deficiency in the amount of oxygen reaching the tissues

LIST OF ABBREVIATIONS

CTC- Cancer Treatment Center

DDS- Dietary Diversity Score

DNA- Deoxyribonucleic acid

EDC- Endocrine Disrupting Chemicals

EPIC- European Prospective Investigation into Cancer

GIT- Gastro intestinal Tract

HIV- Human Immunodeficiency Virus

HPN- Home Parental Nutrition

HPV- Human Papilloma Virus

IDH- Infectious Disease Hospital

KNCCS- Kenya National Cancer Control Strategy

KNH- Kenyatta National Hospital

NCDs- Non-Communicable Diseases

NK- Nutritional Knowledge

ROS- Reactive Oxygen Species

SD- Standard Deviation

UoN- University of Nairobi

USD- United States Dollar

WHO- World Health Organization

YOD- Year of Diagnosis

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ABSTRACT

Cancer is on the increase in Kenya and has become one of the leading public health problems. This increase is possibly attributed to change in behavior and adoption of predisposing lifestyles such as smoking, alcohol intake, low consumption of fruits and vegetables, high intake of highly processed foods and lack of physical activity. Cancer patients undergoing treatment such as chemotherapy and radiotherapy experience side effects such as lack of appetite, nausea, vomiting and diarrhea. This often leads to malnutrition and low immune function, making them even more predisposed to infections. In this light therefore, cancer patients need nutritional counseling and education to assist them make prudent dietary choices.

This study was therefore designed to assess the nutritional knowledge and association with dietary practices of cancer patients. The study was cross sectional and involved a sample of 132 patients attending the cancer treatment centre clinic at Kenyatta National Hospital. The study was carried out in the months of October to November 2012. The patients were either undergoing chemotherapy or radiotherapy. Information from the patients was collected using a previously pretested structured questionnaire.

Information was collected on socio demographic, social economic status, nutritional knowledge and dietary practice. The nutrition knowledge section was divided into Recommended Dietary Intake, food groups and food choice and diet-disease relationship. Food consumption frequencies were assessed and data on dietary intake obtained. Results were subjected to analysis as frequencies, percentages, chi-square tests and linear and logistic regression.

Results showed that of the patients 75% were female and 25% were males. Various patients (44%) were unemployed others (27%) were farmers. The most prevalent cancer among the female patients 55% was breast cancer followed by cervical cancer 17% nasal esophagus cancer at 5% respectively. In males the most prevalent one was prostate (21%), followed by nasal esophagus 18%, stomach cancer and palate cancer 9% respectively. The age-group that had most patients at 58% was the middle age (36-59yrs). The education level of patients who were secondary graduates was 40%, college graduates were at 34%, primary school graduates was at 9% and those who had not gone to school were at 17%. The patients who were unemployed were 44%, those employed were 30% while those who were self-employed were 37%. The average income for patients attending the clinic was Kshs 9,111.

The total nutrition knowledge average score was 46%. The most frequently consumed foods included green leafy vegetables, beans, fruits and beef. The average Individual Dietary Diversity Score (IDDS) was 4 with the most consumed food group being starchy staples (92%).

There was a significant positive correlation between the nutrition knowledge and IDDS of patients, but nutritional knowledge only influenced the IDDS only up to 3%. Patients with average to above average Nutrition knowledge were 9 times more likely to consume fruits compared to those with below average nutrition knowledge. Patients with average and above average nutritional knowledge were 4 times likely to consume vegetables than those below average nutritional knowledge.

Results indicate that there was significant positive association between nutritional knowledge of the patients and their dietary practices especially for foods like fruits and vegetables and protein

foods that are considered crucial in the management of cancers. However, considered on their own consumption of beans and peas as source of protein showed a negative correlation.

CHAPTER ONE: INTRODUCTION

1.1 BACK GROUND

Cancer is a term used to define diseases in which abnormal cells develop without control, these cells develop and invade other cells and spread to different sites in the body causing disease and if left untreated could lead to the death of an individual (Legare et al., 2011). Cancer is a global concern with an estimated incidence 12.7million in 2008 and 7.6 million deaths from cancer that year. In Africa approximately 715,000 new cases are diagnosed with 542,000 deaths occurring in 2008 (Sylla et al., 2012). Based on the Kenya National Cancer Control Strategy (KNCCS) 2011-2016 this trend has been predicted to rise over the coming years especially in Kenya (Opiyo et al., 2011).

The cancer burden continues to increase due to adoption of lifestyles and behaviors that increase the risk of getting cancer and the increase in population causing strait resources pushing the economies to produce more that causes pollution and also increases exposure of masses to carcinogens (Jemal et al., 2011).

Nutrition and cancer have been shown to have an association since the 20th century through scientific and ecological studies (Riboli et al., 2002). For instance prospective studies have shown some evidence for breast cancer that caloric restriction slows growth rates for this cancer. Red meat on the other hand, has been shown to have a causative role for development of colon and prostate cancer (Willett, 1995).

The relationship between nutrition knowledge and dietary practice has been controversial some studies indicate that nutrition knowledge is an important factor in determining food choices

hence practice (Wardle et al., 2000). A study of middle aged men in France showed that the nutrition knowledge was associated with specific patterns of food choice and nutrient intake thus concluding that nutrition knowledge influenced the men's dietary behavior (Dallongeville et al., 2000). Furthermore according to an article report in cancer journal for clinicians which indicated that informed lifestyle choice is very important for completion of therapy where by lifestyle includes what a person eats and physical activity (Brown et al., 2003).

Cancer can alter metabolism of nutrients (Schattner et al., 2006), thus leading to development of symptoms and disturbances of the GIT (Gastro Intestinal Tract) leading to malnutrition (Nitenberg *et al.*, 2000). Hence having the right knowledge is vital to enable cope with the symptoms as the treatment goes on and even after treatment to prevent relapse.

1.2 PROBLEM STATEMENT

It has been established for long that malnutrition is an outcome of cancer patients which can affect up to 85% of patients depending on the type of cancer (Argilés, 2005). Moreover, studies show low rates of response to treatment among those patients who are malnourished. Cancer survival trends in the developing countries are worrying due to a combination of late stage diagnosis and limited access to standard treatment (Jemal et al., 2011).

Due to the effects of cancer and its treatment on nutrition among cancer patients a nutritionist has an important role to play, however this role is usually underutilized in the oncology setting (McGrath and Bsocwk, 2002). Patients might have no information of how good nutrition practices could help them to respond well to therapy.

In Kenya cancer is rapidly taking lives of productive citizens because of the way the society has branded it as a dreaded disease such that persons who succumb to it are always expected to die. The perception that cancer is a killer needs to change and be viewed like any disease that needs a lot of care to manage both medically and nutritionally. Giving optimum nutrition knowledge to patients to enable them make right choices selecting their diet to enable them successfully finish therapy and prevent recurrence of cancer.

1.3 STUDY JUSTIFICATION

It has been indicated that by 2030 cancer incidence will double and the increase will be mostly be seen in the developing countries in which Kenya is among (Sylla et al., 2012). As a way of combating cancer Kenya and Africa as a whole has to develop effective strategies to cope with the cropping problem of cancer by including education and information so as to raise the profile of cancer and promote focus on prevention.

Nutritional management of cancer at the household and community levels becomes easier when the information on how to manage family or community members affected by the disease is passed on the family and community members. This also helps the community to learn good dietary practices.

Cancer patients who practice proper dietary habits have reduced risk for disease and functional decline. Studies have shown that dietary counseling based on regular foods improves the dietary behaviors of cancer patients resulting to an improved nutrition status and less morbidities. From previous studies it has been shown that most cancer patients have suboptimal dietary behaviors

(Morey et al., 2009) but the proactive patients who seek information (from media or from interpersonal sources) may have improved nutrition (Lewis et al., 2012).

This study will seek to establish whether patients possess the required nutritional knowledge and if the knowledge translates to their food habits. Due to the effect of the intense cancer treatment through chemotherapy, radiotherapy or surgery, nutrition is an important aspect to ensure response to treatment and recovery (McGrath and Bsocwk, 2002).

It has been estimated that cancer deaths could be avoided by modification of diet by a percentage that ranges between 10 and 70 percent.

1.4 STUDY OBJECTIVES

1.4.1 Main Objective

The main objective of the study was to assess the nutritional knowledge and determine its association with dietary practices of cancer patients.

1.4.2 Specific- Objectives

1. To determine the socio- economic and socio-demographic characteristics of cancer patients attending the cancer treatment center at KNH (Kenyatta National Hospital).
2. To determine nutritional knowledge among cancer patients attending Cancer Treatment Center (CTC) at KNH.
3. To determine dietary practices (Food frequency and Dietary diversity) among cancer patients attending cancer treatment center at KNH.
4. To determine the association between nutritional knowledge and dietary practices among cancer patients.

1.5 HYPOTHESIS

Nutritional knowledge of cancer patients is significantly associated with their dietary practices.

CHAPTER TWO: LITERATURE REVIEW

2.1 CANCER: AN OVERVIEW

Cancer by most definitions is the abnormal growth of cells caused by multiple changes in gene expression leading to an imbalance of cell multiplication and cell death that ultimately evolves to a population of cell that invade other tissues and spread to different sites causing disease and death of a person if left untreated (Raymond, 2007).

By description cancer is a disease of multicellular organisms characterized by alterations in gene expression leading to distorting of normal cell division and differentiation. The difference between malignant tumor and benign tumor is that the malignant tumor has the ability to spread to lymph nodes and other areas. At molecular level all cancers have several things in common such as cause disease and death if left untreated (Raymond, 2007).

The cancer burden is continually increasing due to aging, the increase of the world's population and adopting lifestyles and behaviors that are cancer causing such as smoking and inappropriate diets. Breast cancer is the most frequent cancer diagnosed and also the leading cancer in females while lung cancer is the leading cancer in males (Jemal et al., 2011). In developing countries cancer survival rates are very poor due to a combination of late stage diagnosis and limited timely standard treatment (Jemal et al., 2011).

Cancer though can be prevented to a certain point by practicing existing cancer control knowledge such as increasing physical activity, healthy dietary intake, implementing tobacco control, vaccination(in the case of cervical cancer), early detection and treatment. (Jemal et al., 2011)

Any organ can be affected by cancer and unlike regular believe, cancer is curable depending on the type and stage (Bozzetti, 2005). To maintain normal nutrition status patients can use a normal diet that has been fortified but this depends on the stage and type of cancer where nutrition support may be required (Bozzetti, 2005).

2.2 COMMON TYPES OF CANCERS

Most cancers are classified as carcinomas, sarcomas, lymphomas, or leukemia. Carcinomas constitute about 80% to 90% of all cancers (Byrd et al., 2009). Carcinomas develop from epithelial cells that cover external and internal areas of the body and affect secretory organs such as the breast. Sarcomas are cancer of the connective tissue such as bone. Lymphomas are cancer of the lymphatic system. Leukemia is cancers that are formed in the bone marrow. The major carcinomas include: bladder, colorectal, breast, lung and prostate cancer (Byrd et al., 2009).

Bladder cancer affects the bladder and it's mostly transitional. This cancer occurs in two forms which are squamous cell carcinoma and adenocarcinoma.(Stein, et al., 2001) One of the main known causes of bladder cancer is tobacco smoking; other causes include exposure to carcinogens especially at work place eg. For bus drivers, rubber workers, motor vehicles. Water intake at 1.5 liters per day is seen to have a protective nature against bladder cancer; this is due to

the dilution of carcinogens that may be present in the bladder. Fruits and carrots have also been seen to have a preventive effect on bladder cancer as they contain selenium according to W.H.O.

Breast cancer is the most common in women (Key et al., 2001). Based on A.D.A. M. medical encyclopedia 2011, the cancer affects the breast, usually the cancer may be, the ducts carcinoma or lobules carcinoma. Breast cancer can also occur in men though affects majorly women Breast cancer is not a women's only disease but also affects men but women are 100times more likely to develop breast cancer than men (Albano, 2007). Lifestyle that exposures one to an increased risk of breast cancer includes smoking, lack of physical activity, alcohol intake, obesity, high fat diet and interestingly dietary iodine deficiency(Aceves, 2005). Age is also a risk factor where about 97% of the patients with breast cancer are over the age of 40 years. Family history is also an important factor in breast cancer as a person who has first degree relative with breast cancer has a higher risk of developing the cancer (Aceves, 2005).

Colorectal cancer as the name suggests is cancer that forms in the tissues of the large bowel. It is mostly managed by surgery whereas chemotherapy usually results in brief decrease of the tumor (Moertel, 1994). Colon cancer occurs mostly to the old people and also due to lifestyle. Current recommendations to prevent colorectal cancer include the consumption of whole grains, fruits, vegetables and reducing the intake of red meat. Low vitamin D and calcium intake has been associated with risk of colorectal cancer (May et al., 2011).

The main causes of lung cancer have been shown to be tobacco smoking, (Alberg and Samet, 2003) radon gas which comes from decaying radium it causes mutations since it is a radioactive gas. Another major cause of lung cancer is air pollution by traffic exhaust asbestos among others.

Lung cancer is usually diagnosed using a chest radiograph, and then a bronchoscopy is done to sample the tumor for histopathology (WHO, 2002).

Prostate cancer is the major cancer affecting men. One of its common symptoms includes urinary obstruction due an enlarged prostate (Reifel, 2000). Management of prostate cancer depends on the stage of the disease for example during the very early stages curative treatments include surgery and radiotherapy; hormonal therapy and chemotherapy is done on patients with a more advanced form of the disease (Schroder et al., 2009).

Prostate cancer is related with the consumption of trans fats saturated fats and carbohydrates. High calcium intake is linked to aggravating benign tumor to an advanced stage. Consuming fish may lower prostate cancer deaths. (Willet, 1995)

2.3 CAUSES OF CANCER

Cancer occurs when there is abnormal growth of cells (Moscow et al., 2007). Cancer has many causes ranging from chemicals and environmental toxins to genetic problems and metabolic complications (Moscow et al., 2007). This and many more factors can cause the occurrence of cancer, for example, breast cancer can develop due to genetic inheritance or mutation and also may occur due to exposure to environmental toxins (Stacey et al., 2006).

In most cases cancer is a disease of the aging. The average age of diagnosis is over 65 years and it has been indicated that malignant cancer arise due to a lifetime exposure to carcinogens such as radiation, viral, bacterial, parasitic or from endogenously generated agents such as free radicals (Raymond, 2007).

There is a long latent period between the time of first exposure and the appearance of clinically detectable tumor in which some take as long as 20 years depending on the dose of exposure to a carcinogen (Raymond, 2007).

An increase in industrialization, has led carcinogenic chemicals being released to the environment which are hard to detect. These chemicals affect wildlife, livestock and humans. The Endocrine disruptors as carcinogens (EDCs) mostly affect the carefully regulated hormones in our bodies they are synthetic chemicals that mimic the naturally occurring hormones causing a negative feedback. These EDCs include chemicals found in insecticides, herbicides fumigants mostly used in farms. The endocrine system is affected by exposure to EDCs which in turn could cause the transformation of cells in this system to malignant form (Soto et al., 2010).

Mutation of genes caused by radiation, chemicals or viruses could lead to cells transforming to malignant cells which when they proliferate cause a tumor/ cancer (Ralph et al., 2010). In addition during hypoxia (deficiency in the amount of oxygen in the tissues) and conditions of nutrient deprivation, multiplying cells could transform to malignant cells and lead to cancer development especially when some cells evade cell death (Ralph et al., 2010).

The pathway to this transformation has been shown to be due to increased production of mitochondria ROS which results to HIF-2 alpha expression which in stabilizes the cells. (Ralph et al., 2010) During hypoxia and/or low glucose conditions, regulation of DNA synthesis process is disrupted by HIF-2alpha leading to DNA damage and increasing numbers of mutations driving the malignant transformation process. (Ralph et al., 2010)

2.4 NUTRITION AND CANCER

Cancer has the ability to exert effect on every organ in the body hence requires nutrition management in addition to clinical management (Bozzetti, 2005). Scientific and ecological studies have established that the type of diet and the way of life could contribute to cancer development and also response to treatment (Riboli et al., 2002).

In an overview report done by Walter Willet that cited Doll and Peto review of 1981, estimated about a 35% decrease in death due to cancer by modification of diet of a percentage ranging from 10-70 percent (Willet, 1995).

The same report by Willet indicated that Vitamin C, Beta- carotene, Fiber, high Folic acid intake, calcium and physical activity had a protective role against colon cancer. In the case of breast cancer this report shows that saturated fat increases risk while reduction in energy intake and increased caretonoids reduced tumor growth markedly and reduced the risk. Willet 1995, reports an increase in incidence of prostate cancer to populations consuming red meat in large amounts with a specific association to alpha-linolenic fatty acid. Lastly, the report indicates that it has been hypothesized that beta- carotene has a protective factor against lung cancer (Willet, 1995).

In various clinical and experimental studies, diet has been linked to the development of cancer (Robert et al., 2011, Paige et al., 2010, Willet, 1995). In showing this relationship it has been indicated that frequent consumption of salt-cured meat and high fat intake are associated with increase in risk of having cancer (Paige et al., 2010). Furthermore high caloric intake which is associated with body weight and obesity is postulated to have an association with cancer (Paige

et al., 2010). In animals, it has been shown that reducing caloric intake reduces age-specific incidence of cancer.

Proteins have in most cases been associated with breast, kidney, pancreatic, prostate and colon rectal cancer. Due to the fact that most dietary proteins sources are linked to other non-nutrients compounds and also that high protein intake is highly correlated to high fat intake.

Carbohydrates which constitute cellulose, starches and sugars, it has been postulated that highly refined sugars increase the risk of cancers such as of the breast, pancreas and stomach cancer. In study done showed that high mortality rate in pancreatic cancer patients only reflected among women. While high intake of potatoes caused increased mortality of liver cancer patients in both males and females frequent consumption of starch was associated with high-incidence of stomach cancer.

Dietary fiber which includes pectin, gum, hemicelluloses, cellulose, lignin and others that are mostly found in vegetables, fruits and wholegrain cereals have been hypothesized to reduce the risk of colorectal cancer (Tienboon, 2012). Several vitamins have been associated with reduction of cancer incidence and these include vitamin A, C and E. Vitamin A has shown an inverse relationship with risk of cancer but high doses of intake of Vitamin A are toxic (Tienboon, 2012).

2.4.1 Malnutrition in Cancer

Malnutrition is common among cancer patients and little attention is paid to its risks and consequences (Gyung-Ah et al., 2010) moreover malnutrition is an important factor influencing both their morbidity and recovery, early detection of nutritionally at risk would allow early

intervention which may prevent later complications. Cancer patients suffer from protein energy malnutrition due to the elevated basal energy requirements caused by the disease and decreased oral intake of food, most of them are nutritionally at risk and well nourished patients have better outcomes however routine nutritional screening is not usually done due to scarcity of logistics (Gyung-Ah et al., 2010).

Malnutrition may occur in cancer patients due to modification in smell and taste senses. This is mainly due to the effect the therapy has on rapidly growing cells such as the taste receptors (Sanchez-Larak et al., 2011). Weight loss and high mortality rates have been shown to associate by a study done on cancer patients (Bozzetti, 2005). Furthermore (Bozzetti, 2005), indicates that malnourished patients respond poorly to chemotherapy than the patients who are well nourished.

Majority of cancer patients are likely to suffer weight loss or be malnourished during the course of their illness (Schattner, 2003); an outcome that may be attributable to either inadequate intake of nutrients or cancer cachexia/anorexia syndrome in which there is involuntary weight loss (Barrera, 2002).

It has been indicated by (Barrera, 2002), that during the entire cancer experience, many metabolic pathways can be altered, including carbohydrate metabolism and protein metabolism (Barrera, 2002). As In malignant disease the reaction to anti-cancer treatment further alters the nutrient metabolism is often well defined in statistical terms, but may be tricky to foretell for the individual patient (Mckinlay, 2004).

Due to a combination of a disrupted metabolic function and reduced appetite leading to inadequate intake of nutrients physical side effects are experienced by cancer patients (Fearon & Moses, 2002). Since such patients are at a high risk of death (Inui, 1999), tools for nutrition screening have been made to detect nutrition risk score. Patients are categorized as low risk, Moderate risk and High risk (Reilly et al., 1995).

Chemotherapy is associated with various acute and delayed toxicities such as nausea, vomiting and altered taste. These toxicities lead to an impaired nutritional status; increased treatment related morbidity, mortality and decreased quality of life. The nutritional status in cancer is also affected by metabolic alterations induced by the tumor. This leads to the anorexia, anemia and weight loss which is the pathogenesis of cancer cachexia (Meiji et al., 2010).

2.4.1.1 Cancer Cachexia

Cachexia is the involuntary loss of weight that complicates cancer further and may lead to death. (Bozzetti, 2005). This is a syndrome that occurs during the late stages of cancer in majority of the patients (Bozzetti, 2005). The symptoms include anorexia, weight loss, anemia, depletion and alterations in body compartments, disturbances in water and electrolyte metabolism, and hence impairment of critical body functions (Bozzetti, 2005).

Treatment for cancer cachexia is limited to palliative support. This is because nutrition supplementation and appetite stimulation alone are inadequate to reverse the metabolic abnormalities. Anabolic agents are used to build muscle mass, to increase strength in order to overcome functional limitations (Donson et al., 2011).

2.4.2 Palliative Support for Cancer Patients

The World Health Organization defines palliative support as "the active total care of patients whose disease is not responsive to curative treatment which may include pain control, treatment of psychological, social and spiritual problems."

It has been shown that about sixty seven percent of patients with cancer at the palliative home care are usually nutritionally at risk but still enteral and parenteral nutrition remains a debated matter since there is no solid evidence on the benefits or risk of nutrition intervention and nutrition support . Palliative care is important to patients with an early stage of a disease and those in the late stages of the disease. In early palliative phases palliative care can be given in conjunction with treatments such as chemotherapy and radiotherapy while in late palliative care patients are in the terminal stages of the disease and solely focus on improving the quality of life. (Orrevall et al., 2013)

Nutrition support in palliative care of patients is debatable because its effects vary on each patient hence the kind of nutrition support given depends on the nutrition problem of the patient hence the nutrition intervention is very specific and cannot be generalized for all patients for example a patient who cannot feed enteral has to be put on parenteral feeding otherwise the patient may die not due to the disease but due to starvation. (Orrevall et al., 2013)

Studies show that the outcome of early integration of palliative care when given throughout for advanced lung cancer patients resulted in survival that was prolonged by roughly two months and clinically meaningful improvements in quality of life and mood (Temel et al., 2010).

Moreover, this palliative care has shown to have resulted to improved quality of life and recovery (Temel et al., 2010).

2.5 NUTRITION KNOWLEDGE OF CANCER PATIENTS

Nutritional knowledge that is specifically related to a disease can be achieved through various ways including nutrition self help groups (Noeres et al., 2011). A lot of information has been disseminated to the public as it concerns cancer back by scientific findings. However, some information circulated has no scientific backing (Hawkings et al., 2010).

A study indicated that patients who proactively seek nutrition information from various sources have improved nutrition. This desire to engage in healthy behaviors may be particularly salient if the patients are aware of the risk recurrence of the disease. A diet rich in fruits and vegetables may confer protective benefits (Nehama et al., 2012)

Most cancer survivors need informed choices concerning their lifestyle and diet (Brown et al., 2003). Cancer patients battle with questions that include what they should eat, whether they should lose weight, how much exercise they should do and so on. Consequently, to ensure that the patients are well equipped to manage the disease, adequate information should be given so that they can apply it in their daily lives so as to improve their prognosis.

In attempts to improve health through dietary change has tended to centre on education. This is because of the assumption that providing people with the information necessary to choose healthy foods will ultimately lead to an improvement in diet (Parmenter and Wardle, 1999).

Education has been used as a means of improving diet of population; though, associations between nutrition knowledge and dietary have not been shown (Parmenter and Wardle, 1999). However, if nutrition knowledge associated with dietary practice, then campaigns to improve people's diet are important. If not resources used for public education programmes are being wasted (Parmenter and Wardle, 1999). Another reason why association between nutrition knowledge and dietary behavior doesn't show could be that knowledge is poorly assessed.

2.6 DIETARY PRACTICES OF CANCER PATIENTS

Dietary practices of a person refer to the person's choices in food consumption. Decrease in morbidity and mortality associated with lifestyle disease may be achievable if satisfactory nutritional habits are adopted in early life and maintained in the long term.

It is recommended that those patients who experience early satiety take small amounts of food frequently to ensure they meet their nutrient requirement (Brown et al., 2003). Also the article indicates that antioxidants supplements must be taken with a lot of caution if they are really necessary as it has been shown that antioxidants may repair the tumor cells that have been destroyed by the therapy whether chemotherapy or radiotherapy thus counteracting the treatment.

From this it is clearly shown that if a cancer survivor is not given the necessary nutrition information which is very important the patient may end up practicing the wrong things that would further deteriorate the survivor's condition. Hence right nutrition information from the health care givers would lead to correct dietary practice.

Some tools have been developed to measure nutrition knowledge mainly in a questionnaire format. One of these tools includes a nutrition knowledge questionnaire by Parmenter and

Wardle (1999) which nutrition knowledge can be clearly measured for adults. This questionnaire by Parmenter and Wardle (1999) encompasses nutrition knowledge in the aspects of; understanding of terms, awareness of recommended intake, knowledge of food related advice, using information to make food choices and awareness of diet disease associations.

Tools for measuring dietary intake are several depending on how you want to capture your information. For an individual data methods used are 24h recalls, dietary diversity score, Food frequency, food records and food habit. To determine usual intake, food frequency is the most used method is the food frequency questionnaire. First, food frequency is practical for large epidemiologic studies, second is that it asks the respondent to report on their usual intake. However the food frequency cannot be used to quantify intake accurately a 24h recall would be most appropriate (Subar et al., 2001).

Dietary diversity tool is also a useful instrument as a simple proxy indicator for intake especially for adequacy of micronutrient intake at individual level. Other advantages include its ability to measure the quality of diets and also can be used for situation and vulnerability assessments (Razes and Dop, 2011).

CHAPTER THREE: STUDY DESIGN AND METHODOLOGY

3.1 STUDY DESIGN

This study was cross-sectional design which used a structured questionnaire to get quantitative information. The participants enrolled in the study comprised of cancer patients attending the cancer treatment centre (CTC).

3.2 STUDY SETTING

The study was carried out in Kenyatta National Hospital (KNH) which is located in Nairobi. The hospital is in upper hill community area which is about 5 km from the Central Business District.

The hospital is a National Referral and Teaching Hospital, and provides medical research environment. The hospital started off as a 40-bed facility, then called Native Civil Hospital but was renamed King George Hospital in 1952. After Kenya's Independence its name changed to the Kenyatta National Hospital, named after Kenya's first President, Jomo Kenyatta.

The mandate of the hospital is to act as teaching and referral hospital to provide specialized health care and training of health professionals to research and participate in national health planning policy. KNH is the major training institution for health and personnel in various disciplines and as reference point of training postgraduate medical doctors in various specialties and also for providing internship for health professionals.

Being a public hospital equipped to handle all types of cases its cancer wing is usually fully booked for the entire year since the private hospitals that offer the same services are quite expensive for the common citizen.

The study was based at CTC clinic located in the old section of the KNH. The CTC is located adjacent to Theatre Department to the North and Orthopedics Clinic to the south. The cancer treatment center receives patients from everywhere in the country since it is the largest public referral cancer treatment center in the whole country.

3.3 STUDY POPULATION AND SAMPLING FRAME

Study population consisted cancer patients above the age of 15 years at cancer treatment centers all over the country. The sampling frame included all patients above the age of 15 years

attending the CTC at Kenyatta National Hospital. This population was chosen through a purposive method.

3.4 SAMPLE SIZE DETERMINATION

The CTC clinic receives between 40 and 50 patients every week. Most patients attend the clinic after every 3 weeks for chemotherapy and radiotherapy, Hence patients were interviewed for a period of three weeks voluntarily. The sample size was determined by multiplying the least number of patients to attend per week i.e. 40 multiplied by three weeks to get a minimum of 120 patients. The number of patients interviewed was 132.

3.4.1 Eligibility Criteria

The eligibility criteria included all patients above the age of 15 years cancer patients that were attending the CTC clinic.

3.4.2 Exclusion Criteria

Those patients who were critically ill hence incapable of responding to questions, those who did not want to participate in the study and the patients who were below 15 years.

3.4.3. SAMPLING PROCEDURE

3.4.3.1 Selection Procedure

The study involved patients with cancer attending the CTC in KNH hence; purposive sampling was used to select population. Exhaustive sampling was used to interview the patients for the study. The target population was exhaustively surveyed as shown in the Figure 1.

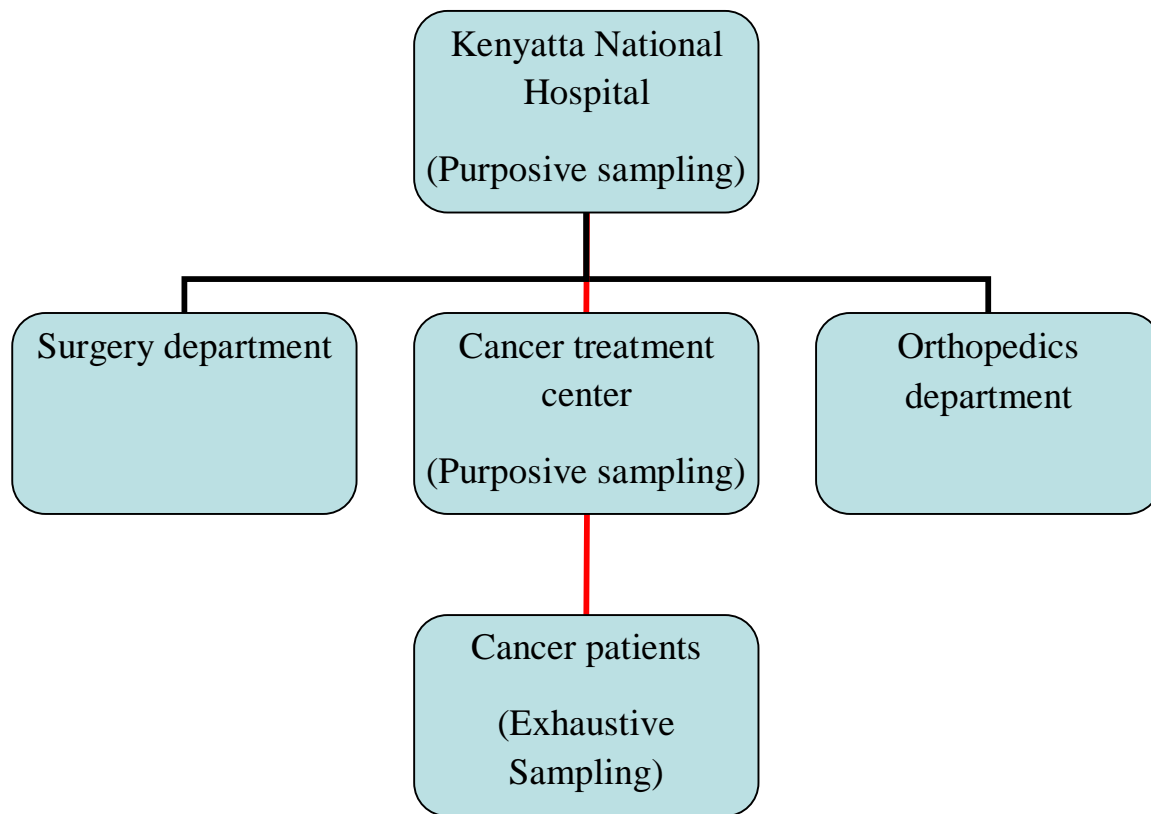


Figure 1: Sampling Procedure

3.4.3.2 Sampling of Key Informants

Key informants involved two doctors, one pharmacist, two nurses, and one nutritionist. The key informants were purposively sampled because they have in-depth information of patients due to their close contact with the patients.

3.5 DATA COLLECTION TOOLS

The study included both quantitative (Appendix 1- Section A to Section D) and qualitative (Appendix 1- Section E) research tools. The quantitative data was used to provide actual statistics while qualitative research methodologies offered explanations of dietary practices of cancer patients attending the CTC at KNH.

3.5.2 Questionnaires

For nutrition knowledge section was tailored to measure the patient's basic nutritional knowledge and knowledge of a healthy anti-cancer diet to prevent relapse and cancer development. For food frequency was based on American Cancer society Guidelines on nutrition and Physical Activity for Cancer Prevention. For the dietary diversity score is based on FAO food group classification. For key informants, a question guide was administered to professional experts dealing with cancer patients who included clinicians and nutritionist.

3.5.3 Question Guides for Key Informant

Key Informant interviews used a question guide to probe information from respondents.

3.6. DATA COLLECTION PROCEDURES

Information was obtained from respondents by probing with questions in the questionnaires. To ensure that the respondent confidentiality was respected, the interview took place in a private room. Before every interview the interviewer made introduction of the study to create rapport. Moreover informed consent was sought from the respondent. A face to face interview was conducted where the questions were administered by the interviewer. Responses given were written in the questionnaire for each respondent and tagged with a reference number. At the end of each interview the respondent was thanked for his/her cooperation.

3.6.1 Social-demographic and Socio-economic Characteristics

The information sought in the questionnaire (Appendix-1 section A) included, gender, age, level of education, religion, marital status, treatment receiving, years since diagnosis, type of cancer

income and occupation. This information was obtained by asking the respondents their year of birth, year of diagnosis, level of education and so on.

3.6.2 Nutrition Knowledge

The nutrition knowledge (Appendix-1 section B) was categorized in to four sections. The first section involved questions on recommended intakes of food (vegetables, sugar meat and so on) which had twelve questions. The second section had thirty two questions, which were in detail focusing on the patients' knowledge on food groups. Patients were asked about nutrients contained in particular foods for example 'are nuts a source of fat?' The third section was on food choices and it had four questions. These questions were designed in such a way that the patient chose according to his/her knowledge the best option and not according to his/her dislikes or likes e.g. 'what would be the best choice for a low fat, high fiber snack?' The fourth section had nine questions; it sought to determine the knowledge of patients on diet related diseases. The total number of questions was fifty seven. The respondents were asked each question and their response was written down on the questionnaire. Later, the responses were marked and for every correct answer one mark was given, for every wrong answer no mark was given (all responses had the same weight). After marking each respondent was awarded a percentage grade for each of the four sections. In addition, a compiled score from the all sections was used to give a total knowledge score. The nutritional knowledge was rated on percentages and respondents grades using three cut off points. The three cut off points were:

Low Nutritional Knowledge ó Below average nutrition knowledge score

Adequate Nutrition Knowledge ó Average nutrition knowledge score

High Nutritional Knowledge- Above average nutrition knowledge score

3.6.3 Dietary Practices of Cancer Patients

The patients were assessed on their dietary habits and using a food frequency questionnaire (Appendix 1- section C) and dietary diversity (Appendix 1 ó section D). Food frequency was categorized in two groups High (if the respondents had a frequency of eating food more than once per day to those who had a food frequency of 3-6 times per week) and Low (if the respondents had a food frequency of eating a food once or twice a month to those never eat that food).

Dietary diversity scores are calculated by summing 16 food groups consumed in the by the individual respondent over the 24-hour recall period. The following steps are included in creating the IDDS (Individual Dietary Diversity Score): new food group variables for those food groups that need to be aggregated were created to form a total of nine food groups. For example in the IDDS the food group "Starchy staples" is a combination of "Cereals" and "White roots and tubers". A new variable termed "Starchy staples" was created by combining the answers to "Cereals" and "White roots and tubers". This was done using the following type of logical syntax:

Starchy staples = 1 if (Cereals) =1 or (White roots and tubers) = 1

Starchy staples = 0 if (Cereals) = 0 and (White roots and tubers) =0

Values for the dietary diversity variable were computed by summing all food groups included in the dietary diversity score. As a check on the creation of the variables, all scores were within the

following range: IDDS (0-9). The cut off points according to Bukusuba et al., (2010) low for DDS (0-3 food groups) ,moderate DDS(4-7 food groups) and high DDS(8-9 food groups).

3.6.4 Key Informant Interviews

Qualitative in-depth interviews was carried out on doctors, nutritionists and nurses at the Cancer Treatment Centre at KNH since they have the professional background which enables them to better understand the cancer patients behavior and background. Data was collected in the form of written notes to strengthen the information pertaining to the objectives of the study. The format of the interview was face to face to enable more detailed responses and for easier recording of information in form of written notes.

3.7 RECRUITMENT AND TRAINING OF RESEARCH ASSISTANT

3.7.1 Recruitment

The purpose of the research assistant was to assist in data collection from the patients therefore as the patients arrive the principal investigator and research assistant administer the questionnaires to avoid delays and ensure each patient has been interviewed since the study is exhaustive.

One research assistant was recruited through and was then an interviewed and indentified. Both genders were given an equal opportunity. The research assistant was a holder of a Bsc.

Biochemistry degree. The candidate was required to be fluent in both Kiswahili and English. It was required that the candidate be a current resident of Nairobi to enable transport to and fro.

The candidate was required to be fully available for a period of four weeks for a minimum of six hours during the day.

3.7.2 Training Procedure for Research Assistant

The research assistant was informed and trained on the purpose, objective and procedure of the study. The emphasis was placed on administration of questionnaires, recording of data from key informant interviews and ethics in fieldwork. Issues of ethics included keeping the identity of each respondent anonymous and getting informed consent from the respondents. The methods learning used were: lecturing, discussion, role-play and field trip (pre-test) according to the training curriculum in appendix 2.

3.7.3 Pretest of Questionnaire

Ten cancer patients from Kenyatta National Hospital from the cancer ward were involved in a pretest of the questionnaire. After which the questionnaires were reviewed. On the basis of comments and responses collected during the pretest, minor revisions were made to the questionnaire, and the data collection instrument was refined. The pretest was done in order to give the research assistant hands-on experience and validate the tools against the objectives of the study.

3.8 DATA QUALITY CONTROL

A review of each questionnaire was done on daily basis for omissions to ensure that each questionnaire is filled appropriately. Training of the research assistant and pretesting was used as quality control since it enabled the research assistant to familiarize with questions hence minimizing errors. The student was supervised while collecting data by the university supervisor.

3.9 DATA ANALYSIS

3.9.1 Analysis of Quantitative Data

Then data carefully entered into the computer software this and cleaned by running frequencies and cross tabulation using spss v.16 program. Quantitative data was explored to check for outliers. Where outliers were found, data was transformed to ensure normality using log transformation. For all categorical variables were analyzed using frequencies and proportions while measures of central tendency and dispersion was used for continuous variables. For hypothesis testing the confidence interval of 95% was be used as a degree of certainty. A variable with a P-value that is less than alpha ($P < 0.05$) was considered to be statistically significant.

To show relationship between two continuous dependent and independent variables, linear regression was used. Linear regression was used to the relationship between dietary diversity score and nutrition knowledge score variables. This was related to the objective that intended to show association between nutritional knowledge and dietary practices. The equation of the linear regression model was:

$$Y = B_0 + B_1 X_1$$

Where Y is a continuous dependent variable B_0 is constant B_1 is regression coefficient and X_1 is independent variables continuous.

Logistic regression is a type of regression analysis used for predicting the outcome of a categorical dependent variable based on one or more predictor variables. It is used in estimating

empirical values of the parameters and to describe relationships between two variables. Binary logistic regression specifically was used where dichotomous (high nutrition knowledge and low nutrition knowledge) independent and dependent variables were used. The equation of the logistic regression model was used.

$$\ln \left(\frac{P_i}{1-P_i} \right) = B_0 + B_1 X_1 + B_2 X_2 + \dots + B_n X_n$$

Where $\frac{P_i}{1-P_i}$ probability of patients having high nutrition knowledge/ patients have low nutrition knowledge.

B_0 is constant

B_1 is regression coefficient slopes parameter in the intercept and X_1 is the explaining variable.

Logistic regression was used in order to show the association or relationship between nutrition knowledge and dietary practices. The variables used in this analysis were both categorical and continuous variables. Exp (B) estimates greater than 1.00 indicate decreased $B_n X_n$ likelihood of the outcome. A summary of data analysis is shown in Appendix 3.

3.9.2 Analysis Qualitative Data

For analysis of the key informants' interview the following was done; first at the end of each interview a summary sheet was made where information about the informant's reason for inclusion, position, points made and any ideas that the respondent had. Secondly descriptive codes were developed according to the specific objectives and hypothesis. Thirdly using the computer software of Ms Word the information was typed and organized according to each

specific objective and hypothesis. Lastly the information was used to explain certain situation in the discussion section.

3.10 ETHICAL CONSIDERATIONS

Approval of the research was sought from research committee at Kenyatta National Hospital/University of Nairobi (KNH/UON-ERC). Informed consent was sought from patients where the procedure of answering questions was explained to them. Confidentiality of the information was maintained by ensuring that no names are made known or written in the questionnaires.

After completion of data collection the data was used to write a dissertation which is intended to be published. Furthermore a report of findings was forwarded to Kenyatta National Hospital. Moreover the expected results might be used to inform making of public policy on cancer management also the may contribute to future research on cancer patients and nutrition thus increasing the pool of knowledge in this area. This research will also benefit the cancer patients by the policies that might be made to increase nutrition education in the oncology setting.

CHAPTER FOUR: RESULTS

4.1 SOCIAL DEMOGRAPHIC CHARACTERISTICS

The study which was carried out involved a total of 132 patients attending the cancer treatment center. Most (75%) of the patients were females. The study population included (40%) having reached up to secondary education and (68%) of the patients were married. Most of the patients were middle aged (58%). The average age of the patients attending the CTC was 50 years with the youngest being 16 years and the oldest being 82 years. Almost all (98%) of the patients were Christians. Over half (67%) of the patients at the CTC were receiving chemotherapy as Table 1 shows.

Table 1: Social demographic characteristics study population

Demographic Characteristics	Frequency	Percentage
Gender of patients	N=132	
Male	33	25
Female	99	75
Level of education of patients		
Tertiary education	45	34
Secondary education	53	40
Primary education	12	9
Non	22	17
Marital status of patients		
Married	90	68
Single	24	18
Separated	4	3
Windowed	14	11
Age of patients		
Youth 15-35yrs	18	14
Middle-age 36-59yrs	76	58
Elderly 60 ⁺	38	29
Religion of patients		
Christian	129	98
Muslim	3	2
Treatment receiving		
Chemotherapy	89	67
Radiotherapy	4	3
Surgery	3	2
chemoradio	21	16
Chemo-surgery	12	9
Chemoradio-surgery	3	2

4.1.1 Type of Cancer

The patients who were interviewed at the CTC clinic had various forms of cancer most were carcinomas. Out of the 33 males, 21% had prostate cancer followed by nasal esophagus cancer at 18%. Colorectal, Lung, Tongue, Thyroid, Pancreatic, Spinal and Neuroendocrine had one patient each who had been diagnosed, hence was combined and put in the bar of others as shown in Figure 2. Some patients (9%) though were not aware of the type of cancer they had.

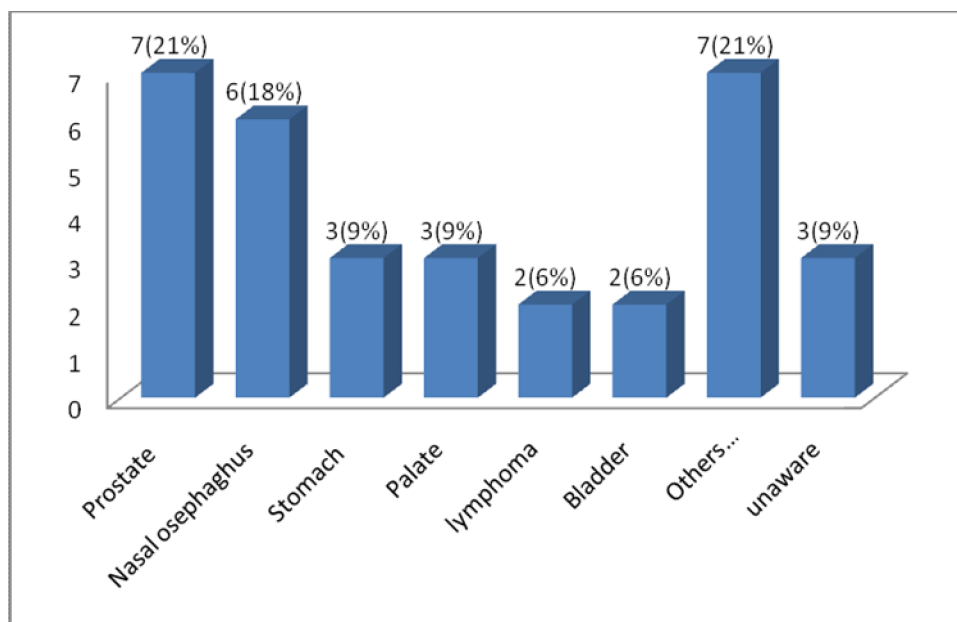


Figure 2: Distribution of male patients by type of cancer

Out of the 99 females, 54% had breast cancers followed by cervical cancer (17%). Nasal esophagus, Sarcoma, Uterus, Bladder, palate, tonsil, spinal and pancreatic cancer and one patient each hence combined to form a column (others) as shown Figure 3.

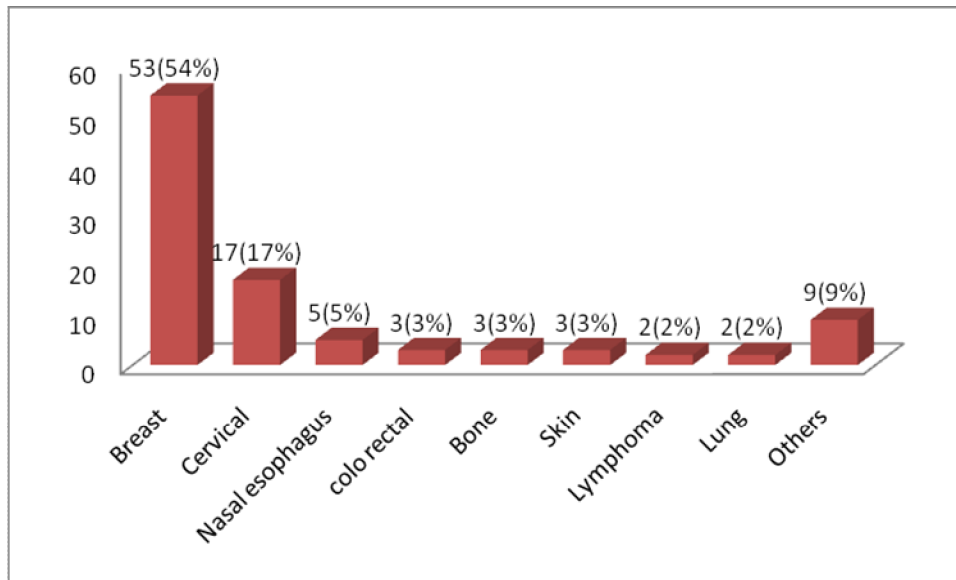


Figure 3: Distribution of female patients by type of cancer

4.1.2 Years since Diagnosis

The average number of years patients had been diagnosed with cancer was 2 years and 5 months. Some patients had just been diagnosed 2 months before the study others had been diagnosed 17 yrs before. Most of the patients at the clinic were diagnosed less than a year before this study began as shown in Figure 4.

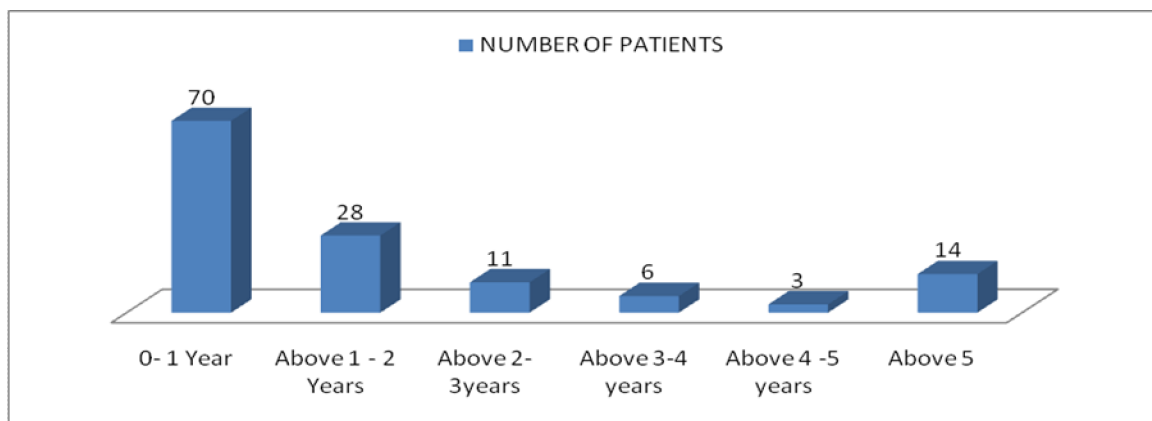


Figure 4: Distribution of patients by Year of Diagnosis

4.2 SOCIO- ECONOMIC CHARATERISTICS

To show the distribution of economic status of the cancer patients, both occupation and income was used. Out of the 132 cancer patients, 33% were unemployed and 27% were farmers. Social worker, caterer, hairdresser, pastor, carpenter and nurse had a frequency of 1 patient each and were all included in the column of others as shown in Figure 5.

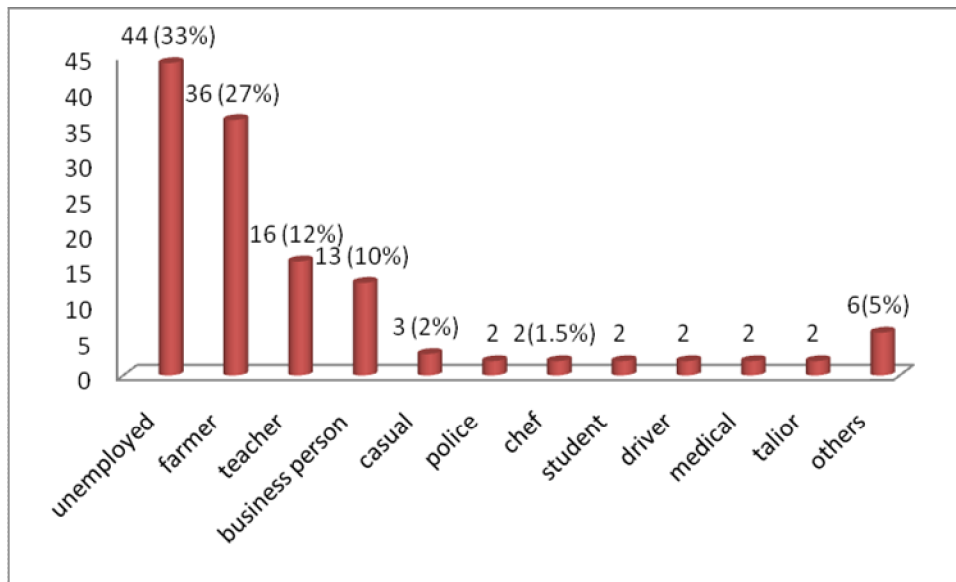


Figure 5: Distribution of occupation among patients attending the CTC

The average income among the patients was Kshs $9,111 \pm 5,819$ with a minimum of Kshs 0 and maximum of Kshs 50,000. Using exploratory data analysis outliers were removed. The median was Kshs 9,000.

4.3 NUTRITION KNOWLEDGE

The results on nutrition knowledge section are divided in to four sections as follows: the advice score, the food group score, the food choice score and the diet-disease relationship score. The advice category had a minimum score of 0 and a maximum score of 100%. The food group

category had a minimum score of 0 and maximum score of 84.4%. The food choice category had a minimum score of 0 and a maximum score of 100%. The diet-disease relationship had a minimum score of 0 and a maximum score of 91.67%. The outliers were indentified and excluded in the calculation of mean, median and standard deviation as shown in Table 2.

Table 2: Nutrition knowledge scores of the patients

Categories(Number of questions)	n	Mean Score	Median score	SD
Advice score(12)	123	54.2%	55.6%	2.3
Food groups score(32)	120	45.5%	50%	2.2
Food choice score(4)	123	58.6%	50%	2.5
Diet –disease relationship(12)	122	38.4%	41.7%	2.9
Total nutritional knowledge score (57)	125	45.9%	52.6%	2.0

The association between the patients' level of education and nutritional knowledge score was found to be statistically significant at $P < 0.05$. This rejects the null hypothesis that there is no significant association between nutritional knowledge and education level of a patient as shown in Table 3.

Table 3: Association between Total Nutritional Knowledge and Education level of patient

Level of education	Categories of Total Nutritional Knowledge Score			Fisher's Exact Test
	Below average	Average	Above average	
Non	17	5	0	$\chi^2(6) = 24.9,$ $P=0.000^{**}$
Primary education	23	18	4	
Secondary education	13	31	9	

4.4 DIETARY PRATICE

The study used food frequency questionnaire and dietary diversity score as indicators of dietary practice.

4.4.1 Food Frequency

The frequency table of foods listed was based on the foods recommended by the American Cancer Society. The foods were divided according to their function in the body which involved antioxidants, phytochemical, fats, fiber, vitamins, trace elements red meat, white meat and alcohol as shown in Table 4.

The most frequently consumed food in the antioxidant category was the green leafy vegetables (74.1% of patient consuming them more than once a day to 3-6times per week) this could be due to the fact that they are easily available and accessible in the market. Lemons (63.4% of patients have never consumed it) though they have quite a high quality antioxidants were least taken due to the level of acidity.

Under photochemical, beans were the most consumed and this could be due to the availability of the food and also recognizing that about 27% of the patients were farmers and they could have the food without necessarily buying it. The least consumed was soybeans (71.8% of patients have never consumed it), because it is a new food in the market it is quite expensive compared to beans, peas or lentils.

On fats half of the patients did not use liquid oil mostly due to the cost. Milk farmers were using ghee instead to reduce on cost. Fiber was mostly taken in form of fruits and leafy vegetables.

Vitamins mostly found in fruits were least eaten in grape fruit. In trace elements such as

selenium were least consumed in fish. In alcohol most patients had avoided alcohol only a few were drinking it once in a while.

Table 4: Frequency of consumption of various foods by respondents
Frequencies in percentages (N=132)

Food item	More than once per day (%)	Once per day (%)	3-6 times per week (%)	Once or twice per week (%)	Twice per month or less (%)	Never (%)
Antioxidants	10.7	29.8	21.4	18.3	10.7	9.2
Oranges						
Lettuce	6.1	14.4	27.3	18.9	5.3	28.0
Green leafy vegetables	9.9	23.7	40.5	16.0	3.8	6.1
Lemons,	3.8	3.8	6.1	6.9	16.0	63.4
Raw carrots	5.4	24.0	19.4	21.7	7.0	22.5
Bananas,	6.9	23.8	27.7	26.2	7.7	7.7
Garlic	3.0	11.4	9.1	9.8	22.0	44.7
Photochemical						
Peas	0.0	6.9	16.8	31.3	24.4	20.6
Lentils/ green grams	1.6	4.7	17.8	41.1	21.7	13.2
Beans	3.1	14.5	40.5	32.1	4.6	5.3
Soybeans	2.3	12.2	4.6	5.3	3.8	71.8
Polysaturated and monounsaturated						
Liquid oil	25.4	16.9	3.1	2.3	2.3	50.0
Avocado.	7.7	12.3	23.1	36.2	9.2	11.5
Fiber:	17.6	48.1	21.4	11.5	0.8	0.8
Fruit,						
whole grains,	7.1	11.1	38.9	26.2	11.1	5.6
wholemeal porridge,	17.1	46.5	8.5	14.7	4.7	8.5
Seeds;	0	2.5	5.0	23.1	15.7	48.8
Leafy green vegetables	0	18.1	42.5	28.3	7.9	3.1
carrots	10.2	43.3	18.9	14.2	8.7	4.7
Vitamins:						
Pawpaw,	2.3	13.0	20.6	34.4	18.3	11.5
Mango,	5.3	19.8	13.7	26.0	18.3	16.8
Grape fruit,	0.8	1.5	2.3	6.9	13.1	75.4
Trace elements zinc, selenium, copper, Calcium:						
Meat,	0	8.6	20.3	45.3	14.1	11.7
Cereals,	6.2	32.6	33.3	23.3	2.3	2.3
Fish,	0.8	4.6	6.1	32.8	29.0	26.7
Milk	16.5	53.5	15.7	6.3	1.6	6.3
yoghurt	0.8	2.4	6.3	13.5	28.6	48.4
Red meat:						
Beef	1.5	8.4	9.9	42.0	26.0	12.2
Mutton	0	2.3	1.6	4.7	20.2	71.3
Pork.	0	0.8	0.8	4.7	14.7	79.1
White meat:						
Chicken	0	0.8	6.9	27.5	50.4	14.5
Alcohol:						
Wine	0	0	1.5	3.8	3.1	90.8
Beer	0	0.8	1.5	0.8	1.5	95.4

Vodka	0	0.8	0.8	0.8	0.8	96.9
Whisky	0	0	0.8	0.8	0.8	96.9

4.4.2 Dietary Diversity

Dietary diversity was used to evaluate the dietary practice in terms of quality and adequacy.

Dietary diversity score was then calculated as being the number of food groups consumed over a period of 24 hours. The food groups as classified by FAO (1997) were consumed as shown in figure 6 in terms of percentage. The mean score for dietary diversity was 4 ± 1 . Starchy staples had the highest consumption with 92% of the patients having eaten. The least consumed food group was organ meat with only 9% of the patient consuming it as shown in Figure 6.

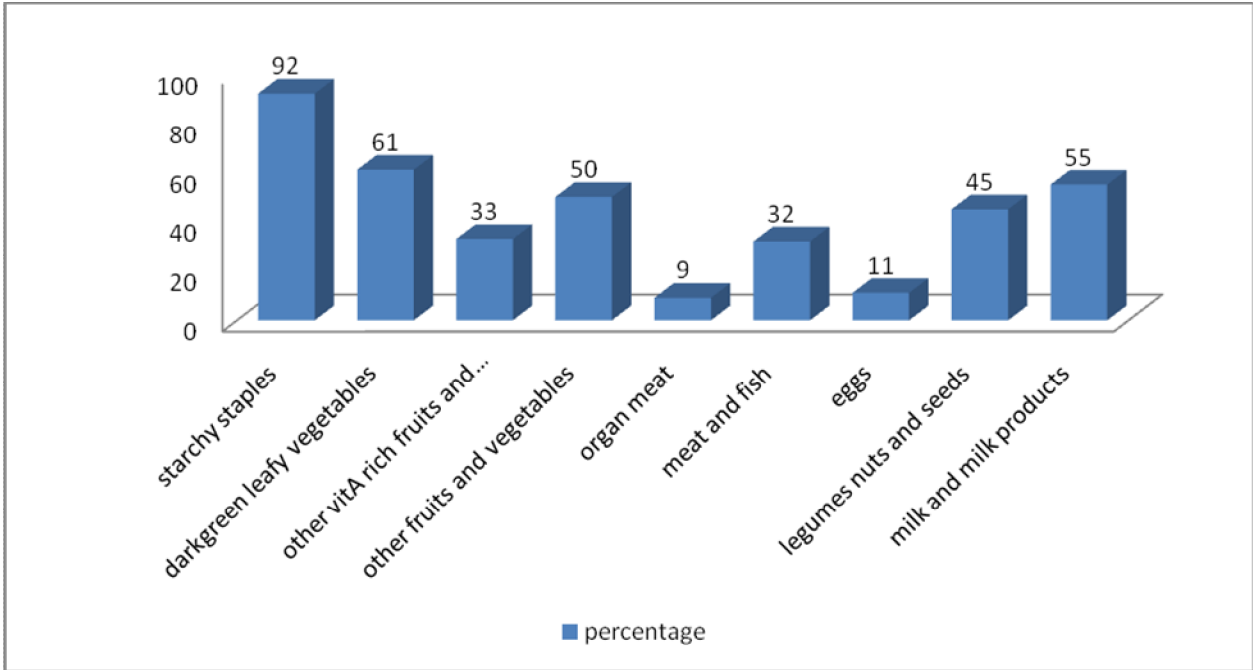


Figure 6: Distribution of food groups as consumed by the patients

The FAO (1997) cut off points were used to classify Dietary Diversity Scores (DDS). Most (62.3%) of the patient had adequate DDS (Table 5). This indicates that majority of patients had adequate intake of micronutrients. Only one patient had DDS of 8 and above

Table 5: Distribution of patients by dietary diversity scores

Dietary Diversity Score		Number of patients N=130	Percentage
(1-3)	Low	48	36.9%
(4-7)	Moderate	81	62.3%
(8 and above)	High	1	0.7%

4.5 ASSOCIATION BETWEEN NUTRITIONALKNOWLEDGE AND DIETARY PRATICE

4.5.1 Association between Nutrition Knowledge and Dietary Diversity Scores

To show association between nutrition knowledge (NK) and practice (Table 6) a linear regression was done between NK and DDS. The r (0.183) indicates a significant ($P < 0.05$) weak positive correlation between NK and DDS. The analysis shows that only 0.033 or 3% of the DDS can be explained by NK. A prediction on dietary diversity score from total nutrition knowledge score could be modeled as indicated in equation 1.

Table 6: Linear regression strength of coefficient of Nutritional Knowledge on DDS

	β	r	r^2	Sig	Lower CI(β)	Upper CI (β)
Constant	3.462			0.000	3.016	3.908
Nutrition Knowledge score	0.009	0.183	0.033	0.037*	0.001	0.018

β- Regression coefficient

r- Correlation coefficient

Sig- significance level

DDS= 3.462+ 0.009(Knowledge score)í í í í í í í í í í í í í í equation 1

4.5.2 Association between Nutritional Knowledge and Food Frequency

Chi-square test was used to show association between the nutritional knowledge of patients and their dietary frequency of eating foods aimed at boosting their immune system. Similarly a risk test (odds ratio) was also done.

As Table 6 shows there is no significant relationship between the nutritional knowledge and frequency of consuming peas. Patients having high nutritional knowledge were 1.4 times more likely to consume peas than those with low nutritional knowledge.

Meat being an important source of protein and iron, there is no significant relationship between nutritional knowledge and frequency of eating meat. Patient having high nutritional knowledge were less probable to consume meat than those with low nutrition knowledge as shown Table 7.

For vegetables, fisher's exact test was used due to some cells having less than 5. There was a significant association between the nutritional knowledge of patient and the frequency of consuming vegetables. Patients with high nutritional knowledge were 4.1 times more probable to consume vegetables than patients with low nutritional knowledge.

Table 7: Association between nutritional knowledge and food frequency

FOOD	NUTRITIONAL KNOWLEDGE	Number of patients with Food frequency (more than once per day-3-6times per week) High frequency	Number of patients with food frequency (once per week-never) Low frequency	Chi square (²) Test statistic	Df (degrees of freedom)	p- Value	Odds ratio (OR) and CI (confidence interval)
PEAS	Nutritional knowledge score above average (HIGH)	20	57	0.001	1	0.972	1.372(CI 0.595-3.163)
	Nutritional knowledge score below average (LOW)	11	43				
MEAT	HIGH	19	55	0.891	1	0.345	0.691,(0.320-1.491)
	LOW	18	36				
FRUIT	HIGH	66	10	0.005	1	0.942	0.962,(0.342-2.709)
	LOW	48	7				
BEANS	HIGH	45	32	0.014	1	0.906	1.043, (0.516-2.111)
	LOW	31	23				
VEGETABLES	HIGH	70	4	5.706(Fisher's exact)	1	0.017*	4.070, (13.787-0.780)
	LOW	43	10				

4.5.3 Relationship between Frequency of food consumption and nutrition knowledge, Socio-economic and Socio-demographic characteristics of Patients

Logistic regression was used to show relationship between the frequency of food consumption and NK, income, age, sex and year since diagnosis. The frequency of consuming peas by the

patient is statistically significant ($P < 0.05$) to the NK of the patient (Table 8). The Exp (B) indicates that, patients with low nutrition knowledge were 8.087 times more likely to consume peas as compared to those with high nutrition knowledge. The independent variables income, age, sex and YOD were not statistically significantly. The equation (2) was used to determine an outcome (frequency of consuming peas) using the explanatory variables (NK and socioeconomic and socio-demographic variables).

Table 8: Relationship between frequency of consuming peas with nutrition knowledge, Socio-economic and Socio-demographic characteristics of Patients

Predictors N= 80	B	Wald	Sig	Exp(B)
Knowledge(low)	2.090	5.759	0.016*	8.087
Income(low)	-0.359	0.634	0.571	0.698
Age				
Age (Youth)	1.968	2.347	0.126	7.159
Age (Middle age)	0.936	1.356	0.244	2.551
Sex(Male)	-0.110	.0000	0.990	0.989
Year of diagnosis(Below 5yrs since diagnosis)	0.510	0.482	0.487	1.665

*Significant at $P < 0.05$
 B- Regression coefficient
 Wald- Wald statistic
 Sig ó significance level
 Exp (B) - Odds ratio

$$\text{Frequency of eating peas} = -0.283 + 2.090(\text{low knowledge}) - 0.359(\text{low income}) + 1.968(\text{Youth}) + 0.936(\text{middle-age}) + 0.510(\text{Below 5yrs}) - 0.011(\text{male}) \text{ ----- Equation 2}$$

The frequency of consuming meat was not statistically significant with any independent variable except for age (Table9). The youthful patients (15-35yrs) were 10.794 times more likely to consume meat than the elderly. The middle-aged patients (36-59yrs) were 3.991 times more

likely to consume meat than the elderly. An increase on the income of a patient would lead to a 2.187 times increase in frequency of meat consumption. Equation 3 summarizes the relationship between frequency of consuming meat and the independent variables.

Table 9: Relationship between frequency of consuming meat with nutrition knowledge, Socio-economic and Socio-demographic characteristics of Patients

Predictors N=81	B	Wald	Sig	Exp(B)
Knowledge (low)	-0.369	0.415	0.519	0.691
Income (low)	0.783	1.887	0.170	2.187
Age				
Age (youth)	2.379	5.361	0.021	10.794
Age(middle)	1.384	0.701	0.048	3.991
Sex(male)	-0.241	0.648	0.710	0.786
YOD(below 5yrs of diagnosis)	-0.810	1.004	0.316	0.445

*Significant at P<0.05

B- Regression coefficient

Wald- Wald statistic

Sig ó significance level

Exp (B) - Odds ratio

$$\text{Frequency of patients consuming meat is} = -0.184 -0.369(\text{knowledge}) +0.783(\text{income}) +2.379(\text{youth}) +1.384(\text{middle})-0.241(\text{sex}) -0.810(\text{YOD}) \text{-----Equation 3}$$

Fruits are highly encouraged especially to boost the immune system. The frequency of consuming fruits had a significant relationship with NK at P<0.05 as shown in Table 10. Those with low NK were 0.119 times likely to consume fruits as compared to those with high NK. Gender of the patient also had a significant relationship with frequency of consuming fruits. Males were 0.331 times likely to consume fruits than females. Income and years since diagnosis

had Exp (B) at 3 and 7 respectively. Patients who had below five years since diagnosis were 7 times likely to have a low consumption of fruits than those who had above five years since diagnosis. Patients with high income (below average) were 3 times likely to have a high consumption of fruits as compared to those with low income (above average). The frequency of consuming fruits can be determined using independent variables as shown in Equation 4.

Table 10: Relationship between frequency of consuming fruits with nutrition knowledge, Socio-economic and Socio-demographic characteristics of Patients

Predictors N=81	B	Wald	Sig	Exp(B)
Knowledge(low)	-2.129	5.029	0.025*	0.119
Income(below average)	1.158	2.040	0.153	3.183
Age				
Age(Youth)	21.475	0.000	0.998	0.000
Age(Middle age)	-1.276	2.025	0.155	0.279
Sex(Male)	2.040	0.936	0.029*	0.331
YOD(below 5yr since diagnosis)	-0.343	1.772	0.183	7.693

*Significant at P<0.05
 B- Regression coefficient
 Wald- Wald statistic
 Sig ó significance level
 Exp(B) - Odds ratio

$$\text{Frequency of consuming fruits} = -21.028 - 2.129(\text{knowledge}) + 1.58(\text{income}) - 21.475(\text{youth}) - 1.276(\text{middle-age}) + 20.24(\text{YOD}) + 2.040(\text{Sex}) \text{-----Equation 4}$$

A significant relationship exists between the consumption beans and NK of a patient as shown in Table 11. Patients with low NK were 3.4 times likely to consume beans than those with high NK. None of the other independent variables had statistically significant relationship with the

frequency of consumption of beans. Using the independent variables the consumption of beans was determined as shown in Equation 5.

Table 11: Relationship between frequency of consuming beans with nutrition knowledge, Socio-economic and Socio-demographic characteristics of Patients

Predictors N=81	B	Wald	Sig	Exp(B)
Knowledge(low)	1.222	5.178	0.023	3.395
Income(low)	-0.213	0.175	0.675	0.808
Age	0.283	0.105	0.745	1.328
Sex(Male)	-0.591	0.926	0.336	0.554
YOD(below 5 yrs since diagnosis)	0.289	0.195	0.659	1.335

*Significant at P<0.05
 B- Regression coefficient
 Wald- Wald statistic
 Sig ó significance level
 Exp(B) - Odds ratio

Therefore the frequency of consuming beans = -1.239+1.222(knowledge) - 0.213(income) +0.283(youth) +0.787(middle-age)-0.591(sex) +0.289(YOD) -----Equation 5

CHAPTER FIVE: DISCUSSION

5.1 SOCIAL DEMOGRAPHIC AND ECONOMIC CHARATERISTICS

Cancer affects both men and women indiscriminately. Women though are predisposed to more inherent risks such as hormonal imbalances as compared to lifestyle risks in men. From the study prostate cancer was leading. This agrees with other research finding showing that prostate was the leading site of cancer incidence in men while in women the leading site of cancer was the breast (Greenlee et al., 2000). The second leading cancer incidence site among men attending the cancer center was nasal esophageal which could mostly be attributed to a history alcohol drinking and cigarette smoking. Stomach and colon rectal were the third and fourth respectively. Among women the second most common type of cancer was cervical cancer. Cervical cancer is due to the Human Papilloma Virus (HPV) (Xavier et al., 2012). Cervical cancer can be prevented through vaccination, many women are not aware of this until it too late. Stomach and colon-rectal cancer were third and fourth respectively.

It has been generally accepted that cancer incidence is strongly influenced by a person's social position (Dalton, 2008). Education is one of the indicators of the social position, and the higher the education the more a patient is able to navigate within the health system enabling timely and better care (Pukkala, 2010). In addition to this more educated patients may have better financial resources to obtain additional care from the private sector. Most patients, who participated in the study, were primary school drop outs or did not receive any form of formal education thus indicating most patients were dependent on what they learnt from experience or taught by the community.

Most (68%) of the patients were married and the unmarried (32%) of the total patients interviewed. A study shows a relationship between the marital status of a patient, treatment, diagnosis and survival. Where the unmarried have poor survival rates and diagnosed at a later stage than the counterparts who are married (Goodwin et al., 1987).

The mean age of the patients attending the treatment center was 50 ± 47.5 years with the age group having majority of patients being the middle age (36-59 years) at 58%. From a study done in the developed world, cancer incidence is more frequent among the elderly (Jemal, 2009). This could be attributed to people tending to adopt 'westernized lifestyles' like taking excessive alcohol, smoking, consumption of highly processed foods and low physical activity which all have been studied and shown to increase incidence of cancer.

Almost all patients were Christians which is reflective from the county Kenya which is 80% Christians. Majority (68%) of the patients were receiving chemotherapy. Chemotherapy is used

mostly during the advanced stage of the disease while surgery is done during the early stages. This indicates that patients had an advanced form of cancer.

In the world today the socioeconomic status of people varies from the poor to the rich and the gap between the two seem to be widening every passing day (Kogevinas et al., 1997). Patients who suffer chronic illness are known to be shunned by the community. This could be the probable reason why about 33% of the patients are unemployed and 37% are self-employed. These accounts to employers do not like employees who are sickly and would affect their profit margin.

The average income was Kshs $9,111 \pm 5,819$ of the patients per month which is insufficient to cater for the cost treatment. Hence most could not afford the treatment cost and had to rely on friends, family and sponsors. If the fight against cancer is to make progress, treatment should be made available to everyone regardless of their economic situation.

5.2 NUTRITION KNOWLEDGE

Cancer patients are vulnerable to under nutrition which in turn contributes to a poor response to treatment. Providing good nutrition counseling for cancer patients improves their quality of life and increases survival. Most cancer patient report little support from health professionals on nutrition matters. (Garcia et al., 2012)

The study showed that the overall mean score percentage for the nutrition knowledge section was $46\% \pm 2.0$. The food choice category had the highest mean score which indicates that the patients

are generally able to make good choice in regard to food they were taking. Patients had adequate knowledge of what they were recommended to eat in terms of recommended dietary intake. The section that showed the poorest results was the diet-disease section. This indicated that the patients did not have adequate knowledge on the effect of diet on health.

Nutritional knowledge of cancer patients was significantly associated with their education level. This indicated that those with high level of education had also high nutritional knowledge and vice versa.

5.3 DIETARY PRACTICE

5.3.1 Food Frequency

Food frequency in this study was based on the American Cancer Society guidelines. The foods were listed in to antioxidants, phytochemicals, fats, fiber, vitamins, trace elements, red meat, white meat and alcohol.

Antioxidants are either enzymes or chemicals which protect a biomolecule from damage by free radicals by ending an oxidative chain reaction which is the way to ageing or cancer. Including antioxidants in the diet can reduce cancer occurrence. Antioxidants such as enzyme catalase can be synthesized by the body or can be provided for by the diet such as Vitamin C, Vitamin E and beta-carotene (Singh et al., 2012).

Oranges were the most consumed source of antioxidants each day. This could be due to its availability during season that the study was conducted. Spinach and kales were consumed vegetables more frequently due to their availability and cost. Garlic and lemons were the least

consumed antioxidants. This could be due to its limited availability and also due to its inherent sulfurs that irritate the gastro mucosa especially to patients undergoing chemotherapy.

A healthy dietary practice does not only inhibit tumor genesis but also have a major impact in the progression of cancer and also survival. Phytochemicals are among the natural substances that modulate gene expression this in turn have a beneficial effect on metastasis suppressor genes. Table 3 on food frequency, shows that peas were mainly consumed once a week, beans were eaten 3-6 times per week, lentils were eaten once per week while soya beans was not eaten by majority of the patients. One of the reasons for the low intake of phytochemicals was that the foods are expensive. For those farmers who are growing such types of crops would prefer to sell them instead of consuming them since they had a high return.

Fats can be of various forms, saturated, polyunsaturated and monounsaturated. The eicosapentaenoic acid in fish oils can inhibit formation of prostaglandins derived from linoleic acid. Reduction in dietary fat intake decreases the risk of developing cancer and might even help to delay or prevent development of metastases in cancer patients (Carroll et al., 2006).

From this study it is seen that 50% of the patients were not taking any form of polyunsaturated fat. This was mostly due to cost of the oils which is to their advantage since most of the polyunsaturated oils in the country are vegetable oils high in the linoleic acid. This includes corn oil, sunflower oil soy oil and many others. Avocado contains a high content of phytochemicals and also has an inhibitory effect to cancer growth. The patients' consumption of avocados was high with 59% of them consuming either once per week or 3-6 times per week.

For the normal functioning of the body vitamins play the essential role of being enzymes and coenzymes in human metabolism (Mamede et al., 2011). Vitamin C also known as ascorbic acid acts as an antioxidant whereby it removes potentially damaging free radicals produced through extra and intracellular reactions.

Pawpaws were eaten more frequently than grapes because grapes are expensive and not easily available. Fiber has an impact on aggressiveness of cancers such as colorectal cancer. Frequent consumption of dietary fiber reduces the progression of cancer while less of it aggravates the situation (Tabung et al., 2012).

From the results fiber is seen to be highly consumed by patients because it is easily available. Furthermore, considering that 27% of the patients were subsistence farmers hence had access to foods such as whole-grains which had most patients consuming 3-6 times a week at 39%, 48% of the patient were consuming fruits every day. Seeds such as pumpkin seeds were not eaten by most of the patients due to lack of knowledge of its palatability. Most of the patients who had consumed seeds had done so by default such as the watermelon seeds where a patient would confess that they do not bother removing the seeds while eating a watermelon.

Trace elements are defined as those elements that are needed in the body in minute quantities and are toxic in high concentrations. Selenium is one of trace elements and is found in meat, fish vegetables and fruits. Selenium compounds have a mechanism in which they prevent cellular transformation and are known to induce cell death in human cancer cells (Badawi and Ahmes, 2012).

Zinc, Calcium and magnesium are other trace element of interest in tumor growth because they function as an antioxidant and anti-inflammatory agents (Badawi and Ahmes, 2012). The most consumed food in the group of trace elements was milk as most patients with farms were able to keep either one or two cows which provided milk at least once per day. Cereals were also consumed highly at least once per day. Fish was mostly consumed either once per week or once or twice per month. Meat was mostly consumed once per week while yoghurt was the least consumed by patients. This was because yoghurt was mostly viewed as a luxury food which they could not afford.

A study by Ferguson (2010) indicates that high intake of meat; especially red meat and processed meat may increase risk of cancers. However, there is no conclusive evidence to show it. Cancers associated with high meat consumption may be reduced by modification of preparation methods. (Ferguson, 2010) Meat contains potential anticarcinogens, including omega-3 polyunsaturated fatty acids, and conjugated linoleic acid (CLA). Red meat is an important source of micronutrients such as selenium, vitamin B6 and B12, and vitamin D.

The patients attending the treatment centre were taking beef as the main form of red meat at least once every week while fish was the commonest form of white meat was fish which was consumed at least once per week, chicken was consumed once or twice per month. The main reason is that beef is more pocket friendly and easily available as compared to either fish or chicken.

It has been shown that a relationship exists between alcohol consumption and cancers of the oral cavity, pharynx, larynx, esophagus, liver, colon, rectum, and, in women, breast (Boffeta and

Hashibe, 2006). Majority of the patients did not take any form of alcohol due to the treatment they were going through but some patients had consumed it that one point in their life they had taken alcohol in excessive amounts. Those who were taking alcohol most of them were taking wine at least once a week since they some information that wine especially red wine was a source of antioxidants.

5.3.2 Dietary Diversity

Starchy staples were the most consumed food group, due to the easy availability of cereals. Moreover considering that most of the patients were farmers and the most planted crop in Kenya is maize, cassava and sorghum. Dark green vegetables such as kales were also consumed in plenty due to their availability. Milk and milk products were highly consumed too; this could be to the probable routine that individuals take either tea coffee or cocoa in combination with milk. The foods groups that were least consumed were organ meats, fish, eggs and meat and fish. Since most of the patients had to rely on outside help to cater for treatment cost most would probably sell their livestock and livestock products to get some money.

The mean dietary diversity score was 4 ± 1 . According to FAO (1997), a DDS of 4 shows moderate intake of micronutrients, since Individual dietary diversity scores aim to reflect nutrient adequacy then most patients were taking adequate nutrients.

5.4 ASSOCIATION BETWEEN NUTRITIONAL KNOWLEDGE AND DIETARY PRACTICE

A Pearson's correlation coefficient was computed to assess the relationship between nutrition knowledge and dietary diversity score. There was a weak positive correlation between nutrition

knowledge and dietary diversity score. The relationship between these two variables such that when knowledge increases the diversity score also increases. The significance (2 tailed) value is 0.037 which indicates that there is statistically significance correlation between nutrition knowledge and dietary diversity score.

To show association between nutrition knowledge and frequency of food consumption a fisher's exact test was carried out. Out of the five foods (peas, beans, meat, fruits and vegetables) only vegetables had a significant association. This finding indicates that there is a relationship between the level of nutritional knowledge and the frequency of consuming vegetables.

Logistic regression in this study was used to predict the values frequency consumption of a food, based on the values of independent variables (NK, Income, age, sex and year since diagnosis).

The result of a regression is usually an equation (model) which summarizes the relationship between the dependent and independent variables.

Patients with more nutritional knowledge were less frequently eating peas and beans as compared to those who had low nutritional knowledge. This could be attributed to the fact that peas have a high fiber content that could lead to indigestion. This would cause diarrhea especially in patients who have undergone chemotherapy.

Fruits are essential to both cancer treatment and prevention. Fruits help patients gain appetite and eliminate some side effects of chemotherapy such as nausea. Using logistic regression as shown in table 8, there was a relationship between the frequencies of eating fruits with nutrition knowledge. A patient with high nutrition knowledge was shown to take fruits more frequently as compared to one without low nutrition knowledge. This shows that nutrition knowledge is

essential for cancer patients. Fruits generally help in booting immunity and protect the body from other infections.

The relationship between frequency of eating meat and nutrition knowledge was not statistically significant. Hence indicating that there was no relationship between the frequency of a patient eating meat and the level of his/her nutrition knowledge. On the other hand age seems to be the major factor when predicting the frequency of meat intake. The youthful patients are many times more likely to eat meat frequently as compared to middle-aged patients. This could be attributed to the fact that most young people don't have many commitments hence and their money could mostly be spent on foods that they like such as meat. Moreover the youthful patients may be depending on their relatives for support the middle-aged are more committed and money might be spent on other things including treatment. The elderly are limited to eating foods like meat which require chewing as most may have teeth problems. Therefore eat meat less frequently as compared to other age groups.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

The study shows that majority of patients are middle-aged patients. Breast cancer is the most common type cancer among the females attending the CTC clinic. Prostate is the most common type of cancer among males. Most patients are secondary school graduates. Most patients had spouses and were at their middle-ages. Majority of the patients are Christians and are undergoing chemotherapy as their major form of treatment. The income of patients is relatively low compared to the cost of treatment.

The overall nutrition knowledge of patients attending the Cancer Treatment Centre (CTC) is relatively adequate. However, patients do not have adequate knowledge on the effects of poor dietary practices on their health. Nutritional knowledge is associated with the level of education.

On dietary practice, foods that are consumed at least once per day include: oranges for antioxidants, beans for phytochemical, liquid oil for fat, fruits for fiber and milk for trace-elements. The most consumed foods in the diversity score are starchy staples. Organ meat and eggs are the least consumed foods.

There is a significant positive correlation between the dietary diversity score and the nutrition knowledge of a patient. The frequency of consuming fruits increases with increase in nutritional knowledge. The frequency of eating peas and beans decreases with increase in nutrition knowledge among cancer patients. Frequency consuming meat decreases as age of the patient increases. Lastly the frequency of consuming vegetables increases with increase in NK.

5.2 RECOMMENDATIONS

The study recommends the following:

The government should subsidize the treatment cost of cancer patients since income levels of the patients are small in relation to the cost of treatment. The cancer awareness campaigns should mainly target the middle-aged (36-59 yrs) individuals since they are the most affected by the disease.

The government should give a provision policy on nutritional knowledge among cancer patient. The information provided in the policy should focus on diet-disease relationship since it is what the patients are most inadequate in.

The frequency of consumption of fruits and vegetables is positively related with nutritional knowledge. This trend should be encouraged by the hospitals that manage cancer patients.

REFERENCES

- Aceves, C.,** Anguiano, A. and Delgado, G., (2005). "Is iodine a gatekeeper of the integrity of the mammary gland?" *Journal of Mammary Gland Biology and Neoplasia* 10 (2):89-96.
- Albano, J.,** Brinton, L. and Calle, E., (2007) Breast cancer facts and figures. *American Cancer Society* 1(1): 1-25.

Alberg, J. and Samet, J., (2003). Epidemiology of Lung Cancer. *Journal of Chest Physicians* 123(1): 21-49.

Alwan, A., (2011). Global Status Report on non-communicable diseases 2010. (PDF) Switzerland: World Health Organization press. Available at: Google scholar <Google scholar.com> (Accessed 4, December 2012):1-176.

Argilés, J.M., (2005). Cancer-associated malnutrition. *European Journal of Oncology Nursing*, 9 (2): 39-50.

Badawi, A. and Ahemed, S., (2012) . The role of selenium in chemoprevention of carcinogenesis in: Important facts about cancer prevention 1st edition (e-book) USA: by Trafford publishing USA: Available at Google Scholar < Google scholar> Accessed 2, March 2013):98-146.

Barrera, R., (2002). Nutritional support in cancer patients. *Journal of Parenteral and Enteral Nutrition* 26(1): 63671.

Boffeta, P. and Hashibe, M., (2006). Alcohol and cancer. *Lancet Oncology Journal* 7(1): 149-156.

Bozzetti, F., (2005). Nutritional Support in patients with Cancer. *Clinical Nutrition*. Eds, M. J.Gidney, M. Ella, O. Ljungqvist and J. Dowsett.3rd edition. Blackwell Publishing Company. Oxford: 346-377.

Brown, J.K., Byers, T., Doyle, C., Courneya, K.S., Wahnefried, W., Kushi, L.H., McTiernan, A. Rock, L.C., Noreen Aziz, N., Bloch, S.A., Eldridge, B., Hamilton, K., Katzin, C., Amy Koonce, A., Julie Main, J., Mobley, C., Morra, E.M., Pierce, S.M. Sawyer, A.K., (2003). Nutrition and physical activity during and after cancer treatment: An American cancer society guide for informed choices. *A cancer journal for clinicians* 53(5): 268-291.

Bukusuba, J., Kikafunda, J.K. and Whitehead, R.G., (2010) Nutritional Knowledge, Attitudes, and Practices of Women Living with HIV in Eastern Uganda. *J Health Popul Nutr* 28(2): 1826-188.

Byrd, C., Moe, G., Beshgatoor, D. and Berning, J., (2009). Medical perspective: on the relationship between diet nutrients and cancer. Chapter 15: Trace minerals in perceptives in nutrition 8th Edition published by McGraw-hill New York: 564-567.

Carroll, K., Braden, L., Bell, J. and Kalamegham, R., (2006). Fat and Cancer. *Journal of Cancer* 58(1): 1818-1825.

Dallongeville, J., Marecaux, N., Cottel, D., Bingham, A. and Amouye, P., (2000). Association between nutrition knowledge and nutritional intake in middle aged men from Northern France. *Journal of Public Health Nutrition* 4(1): 27-33.

Dalton S., Schuz J., Johansen C., Kjaer S., Engholm G., Storm H., Olsen J., (eds) (2008) CANULI ó Social inequality on cancer incidence and survival in Denmark. *Eur J Cancer* 44: 193362085

Donson, S., Viekie, E., Aminimal, S., Evans, W., Dalton, T., Steiner, S., (2011) Muscle wasting in cancer cachexia. Clinical implications, diagnosis and emerging treatment strategies. Annual Reviews 62(1): 265-279.

FAO Corporate Document Repository, (1997). Food, Nutrients and Diets- Food Groups. Agriculture Food and Nutrition for Africa. A resource book for teachers of agriculture (e-book). Rome: by Publishing Management Group FAO. Available at <Google Scholar> (Accessed 5 July 2012): 105-181.

Fearon, K. and Moses, A., (2002). Cancer cachexia. International Journal of Cardiology.85(1): 73681.

Ferguson, L., (2010). Meat and cancer. Journal of Meat science. 84(2): 308-313.

Garcia, A., Combet, E., Gerasimids, K., Provan, D., Edwards, C., (2012). Evaluation of an on-line educational programme: Nutritional Care of People Affected by Cancer in: Proceedings of the Nutrition Society. Translational nutrition: integrating research, practice and policy. Summer Meeting hosted by the Irish Section, 16-19 July 2012, 71 (OCE2),

Gina, K., Ballard, T., and Claude, P., (2010). Guidelines for Measuring Household and Individual Dietary Diversity. Food and Agriculture Organisation. Viale delle Terme di Caracalla, Rome, Italy: 1-60

Goodwin, J.S., Hunt, C.W., Key, C.R., Samet, and J.M., (1987) .The Effect of Marital Status on Stage, Treatment, and Survival of Cancer Patients in: The Journal of the American Medical Association 258(21): 3125-3130.

Greenlee, T., Murray, T., Bolden, S. and Wingo, A., (2000). Cancer Statistics, 2000. In C A: Cancer Journal for Clinicians 50(1): 7-33.

Gyung-Ah, W., Yeong-Ah, C., So-Young, K. Jae-Moon, B. and Hyojee, J., (2010). Prevalence and risk factors of malnutrition among cancer patients according to tumor location and stage in the national cancer center in Korea. Journal of nutrition 26(3): 263-268.

Hawkins, A., Berkowitz, Z., Peipins, A., (2010). What does the public know about preventing cancer? Results from the health information National trends survey. Health education and behavior 37(4): 490-503.

Inui, A., (1999). Cancer anorexia-cachexia syndrome: Are neuropeptides the key? Cancer Research 59(1): 449364501.

Jemal, A., Bray, F., Melissa, M., Ferlay, J., Ward, E. and Forman, D. (2011) Global Cancer Statics. Cancer Journal for Clinicians 61(2): 69-90.

Jemal, A., Siegel, R., Ward, E., Hao, Y., Xu, J., Thun, M.J., (2009). Cancer Statistics, 2009CA. Cancer Journal for Clinicians 59: 225-249.

Key, J., Verkasalo, P. K. and Banks, E., (2001). Epidemiology of breast cancer. The Lancet Oncology Journal 2 (3): 133-140.

Kogevinas, M., Pearce, N., Susser, M. and Boffetta, P., (1997) Social Inequalities and Cancer in: International Agency for Research on Cancer, Lyon, IARC Scientific Publications No. 138.

Legare, F., Stacey, D. and Pouliot, S., (2011). Interprofessionalism and shared decision making in primary care: a stepwise approach. *Journal of professional care* 25(1): 18-25.

Lewis, N., Martinez, L., Freres, D., Schwatz, J., Armstrong, K., Gray, S., Fraez,T., Nagler, R. and Bourrgoin, A., (2012). Seeking cancer-related information from media and family friends increases fruit and vegetable consumption among cancer patients. *Journal Health communication* 127 (4): 1-20

Mamede, A., Tavares, S., Abrantes, A., Trindade, J., Manuel, J. and Botelho M., (2011). The Role of Vitamins in Cancer: A Review, *Nutrition and Cancer* 63(4): 479-494.

May, P., Wang, F, Yang, J, Liu, Z, Qin, H., (2011). "Association between vitamin D and risk of colorectal cancer: a systematic review of prospective studies". *Journal of the American Society of Clinical Oncology* 29 (28): 3775-3782.

McGrath, P. and Bsocwk, A., (2002). Reflections on Nutritional Issues Associated with Cancer Therapy. *Journal of oncology and radiotherapy* 10(2): 94-101.

Mckinlay, W., (2004). Nutritional support in patient with advanced cancer permission to fall out? *proceeding of the nutrition society* 63(1): 431-435.

Meiji, B., Langius, A., Smith, F., Spreeuwenberg, D., Blomberg, M., Heijboer, C., Marius, A., Leeuwen, M., (2010). Oral nutritional supplements containing (n-3) polyunsaturated fatty acid affect the nutritional status of patients with stage 3 non small cell lung cancer during multimodal treatment *journal of nutrition* 140: 1774-1780.

Moertel, C.G., (1994). Chemotherapy for colorectal Cancer. *New England Journal of Medicine*. 1(1): 1136-1142.

Moery, C.M., Synder, D.C., Sloane, R., Cohen, J.H., Peterson, B., Hartman, T.J., Miller, P., Mitchell, D.C. and Wahnerfried, D.W. (2009). Effects of home based diet exercise on functional outcomes among older overweight long-term cancer survivors. *American Medical Association* . 30(18): 1883-1891

Moscow, J.A., Cowan K.H. (2007). Biology of cancer. In: Goldman L, Ausiello D, eds. *Cecil Medicine*. 23rd ed. Philadelphia, Pa: Saunders Elsevier chapter 187.

Nehama, L., Martinez, L., Freres, D., Schwatz, S., Armstrong, K., Gray, S., Frazee, T., Nagler, R., Bourgoin, A. and Hornik, R.C., (2012). Seeking cancer- related information from media and family/friends increases fruit and vegetable consumption among cancer patients. *Journal Health communication* 27(1): 380-388.

Nitenberg, G. and Raynard, B., (2000) Nutritional support of the cancer patient: issues and dilemmas. *Crit Rev Oncol Hematol* 34(1): 137-168.

Noeres, D., Vongarmissen, A., Neises, M., Siegfried, G., (2011) Differences in illness-related knowledge of breast cancer patients according to their involvement in self help groups. *Journal of psychosomatic obstetrics and gynecology* 32(3): 147-153.

Opiyo, A., Maina, W., Mutuma, G., Ochiba, L., Njuguna, E., Kiptui, D., Makumi, D., Joyce Nato. and Odongo, I., (2011). *Kenya National Cancer Control Strategy 2011-2016*. National

Cancer Control Strategy ministry of public health and sanitation and ministry of medical services.

Orrerall, Y., Tishelman, C., Permert, J. and Lundsrom, S., (2013) National observational study of the prevalence and use of enteral tube feeding, parenteral nutrition and intravenous glucose in cancer patients enrolled in specialized palliative care. *Nutrients Journal* 5(1): 267-282

Paige E., Samuel M., Joshua E., Philip L. and Terry J. (2010). Dietary practices and Colorectal Adenoma and cancer risk: A review of the epidemiological evidence. *Journal of Nutrition and Cancer* 62(4): 413-424.

Parmenter, K. and Wardely, J., (1999). Development of a nutrition knowledge questionnaire for adults. *European Journal of clinical Nutrition* 53(1): 298-308.

Pukkala, E., Rautalahti, M., Seppa, K. and Hakulien, T., (2010). Education, survival and avoidable death in cancer patients in Finland. In *British Journal of Cancer* 103: 1109-1114.

Ralph, S.J., Enríquezb, S.R., Neuzilc, J., Saavedrab, E. and Sánchezb, R.M., (2010). The causes of cancer revisited: Mitochondrial malignancy and ROS-induced oncogenic transformation Why mitochondria are targets for cancer therapy. *Molecular Aspects of Medicine* 31(2): 145-170.

Raymond, W., (2007). Characteristics of human cancer in *Cancer biology* Oxford university press Madison avenue New York: 3-14.

Razes, M. and Dop, M., (2011). Guidelines for Measuring Dietary diversity a simple tool for developing and evaluating food and nutrition security interventions. AGN Seminar 26/10/2011.

Reifel, L., (2000). Prostate Cancer Treatment: Quality care for oncologic conditions and HIV. Review of literature and Quality indicators. Eds Steven M. Asch, Eve A. Kerr, Eric G. Hamilton, Jennifer L. Reifel, Elizabeth A. McGlynn 1: 189-204

Reilly, M., Martineau, K. and Moran, A., (1995). Nutritional screening - Evaluation and implementation of a simple Nutrition Risk Score. *Clinical Nutrition* 14 (5): 269-273.

Riboli E., Hunt, K. J., Slimani, N., Ferrari, P., Norat, T., Fahey, M., Charrondière, U. R., Hémon, B., Casagrande, C., Vignat, J., Overvad, K., Tjønneland, A., Clavel-Chapelon, F., Thiébaud, A., Wahrendorf, J., Boeing, H., Trichopoulos, D., Trichopoulou, A., Vineis, P., Palli, D., Bueno-De-Mesquita, H. B., Peeters, P.H., Lund, E., Engeset, D., González, C. A., Barricarte, A., Berglund, G., Hallmans, G., Day, N. E., Key, T. J., Kaaks, R. and Saracci, R., (2002). European Prospective Investigation into cancer and nutrition (EPIC): Study New England Population Journal and data collection. *Journal of public Health Nutrition* 5(6): 1113-24.

Robert, L., Jean W., Bette J., Barbara B., Rowan T., Margery L. Gassf, T., Andrea Z., Dorothy L., Joseph L., Karen L., Amy E., Gloria E., Mara Z. and Robert B. (2011). The effect of calcium plus vitamin D on risk for invasive cancer: Results of the women's Health Initiative (WHI) calcium plus vitamin D randomized clinical trial. *Journal of nutrition and cancer* 63(6): 827-841.

Sanchez-larak, K., Sosa-Sanchez, R., Renner, G., (2011) Influence of taste disorders on dietary behaviours in cancer patients under chemotherapy, *Nutritional journal* 4: 401-410.

Schattner, M., (2003) Enteral nutritional support of the patient with cancer: route and role. *Journal of Clinical Gastroenterology* 36(1) 297-302.

Schroöder, F., Hugosson, J., Roobol, M.J., Tammela, T.L.J., Ciatto, S., Nelen, V., Kwiatkowski M, Lujan, M., Lilja H, Zappa M, Denis LJ, Recker F, Berenguer A, Ma`a`tta`nen L, Bangma CH, Aus G, Villers A, Rebillard X, van der Kwast T, Blijenberg BG, Moss SM, de Koning HJ, Auvinen A, (2009) ERSPC Investigators Screening and prostate-cancer mortality in a randomized European study. *N Eng J Med* 360: 13216 1328.

Singh, M., Divya, S. and Raosaheb, K., (2012). Antioxidant Potential of *Asparagus adscendens* in: INTECH. 1st Edition: 324-342.

Soto, A. and Sonnenschein, C., (2010) Environmental causes of cancer: endocrine disruptors as carcinogens. *Nature Reviews Endocrinology* 6(1): 363-370.

Stacey, S., Sulem, P., Oskar, J., Agnar, H., Julius, G., Jelena, K., Kristleifur, K., Thora, J., Helgi, S., Jon, H., Jakob, J., Thorarinn, S., Gardar, M., Hlynur, N. G., Jon, T. B., Laufey, T. A., Jeffrey, R. G., Unnur, T., Augustine, K., and Kari, S., (2006). The BARD1 Cys557Ser Variant and Breast Cancer Risk in Iceland. *Journal of PLoS Med* 3(7): e217.

Stein, J., Lieskovsky, G., Cote, R., Groshen, S., Feng, A., Boyd, F., Skinner, E., Bochner, B., Thangathurai, D., Mikhail, M., Raghavan, D. and Skinner, D., (2001). Radical Cystectomy in the Treatment of Invasive Bladder Cancer: Long-Term Results in 1,054 Patient *19* (3): 666-675.

Subar, A., Thompson, F. E., Kipnis, V., Midthune, D., Hurwitz, H., McNutt, S., McIntosh, A. and Rosenfeld, S., (2001). Comparative validation of the Block, Willet and National Cancer Institute Food frequency Questionnaires. *American Journal of Epidemiology* 154 (12): 1090-1099.

Sylla , B.S. and Wild, C.P., (2012). Cancer burden in Africa in 2030: invest today and save tomorrow .Journal Africa Cancer 4(1): 1-2.

Tabung, F., Steck, S., Su, J., Mohler, J., Fontham, E., Bensen, J., Hebert, J., Zhang, H. and Arab, L., (2012). Intake of Grains and Dietary Fiber and Prostate Cancer Aggressiveness by Race. Journal of Prostate cancer 20(1): 1-10.

Temel, J., Joseph,M., Greer, A., Muzikansky, A., Emily,M.A., Gallagher, R., Sonal R.N., Admane, M.B., B.S., M.P.H., Vicki A. Jackson, M.D., M.P.H., Constance M. Dahlin, A.P.N., Craig D. Blinderman, M.D., Juliet Jacobsen, M.D., William F. Pirl, M.D., M.P.H., J. Andrew Billings, M.D., (2010). Early palliative care for patients with metastatic non-small cell lung cancer. The New England journal of medicine 363(1): 733-742.

Tienboon, P., (2012) Diet and cancer. Chalang mai medical journal 23(4): 262-265.

Wardle, J., Parmenter, K. and Waller, J., (2000). Nutrition knowledge and food intake. Appetite 34 (3): 269-275.

WHO International Agency for Research on Cancer 2002 "Tobacco Smoke and Involuntary Smokingö. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans 83: 1-5.

Willett, W.C., (1995). Diet, nutrition, and avoidable cancer. Environ Health Perspective 103 (8): 165-170.

Xavier, C., Bruni, L., Alemany, L., Diaz, M., Sanjose, S. and Bosch, X., (2012). Epidemiology of Cervical Cancer. Journal of HPV and Cervical Cancer 1: 63-83.

APPENDIX 1: QUESTIONNAIRES

REF NO.....

INTRODUCTION AND CONSENT FORM FOR A STUDY ON “NUTRITIONAL KNOWLEDGE AND ASSOCIATION WITH DIETARY PRACTICES AMONG CANCER PATIENTS: A CASE STUDY OF KNH CANCER TREATMENT CENTER”.

Hello. My name is Caroline Muthike and I am from University Of Nairobi, Department of Food Science, Nutrition and Technology, Applied Human Nutrition Programme. I am conducting research survey that seeks to find the association between Nutrition knowledge, diet and cancer. I would very much appreciate your participation in this survey.

The information you provide will be only used to shed light on your nutrition knowledge and how it has affected your dietary practice. The interview may take about one hour. I will ask questions on

Some Personal Details in social and demographic section.

Your nutrition Knowledge.

How frequently you take the listed foods

Your 24h dietary diversity recall.

Information given will be kept confidential and used to prepare a dissertation which will not include any specific name. Reference numbers will be used to connect your name and your answers without identifying you.

Your Participation in this study is voluntary, and also if you have any issue concerning the study that you don't wish to raise with me you can contact KNH/UON-ERC. However, I hope that you will participate in this survey since your view is important.

The benefits of this study include information that will be collected could be important in targeting nutrition interventions for you and other patients attending the cancer treatment center. The main risk is that you may get tired during the process of the interview. At this time, do you want to ask me anything about the survey?

By Signing or approving this consent indicates that you understand what will be expected of you and are willing to participate in this survey.

May I begin the interview now?

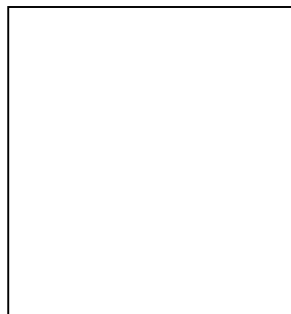
Signature of respondent (for literate patients): í í í í í í í í í í í í í í í í .

Signature of interviewer í .

Date: í .

Signature of witness í .

Thump print for illiterate patients.



This study has been ethically approved by KNH/UON-ERC, Email: uonknh_erc@unobi.ac.ke the study will run for duration of one month.

Contact of researcher: Muthike Caroline Wakuthie

Mobile phone: 0713817478. Email: muthikec@yahoo.com

A STUDY ON “NUTRITIONAL KNOWLEDGE AND ASSOCIATION WITH DIETARY PRACTICES AMONG CANCER PATIENTS: A CASE STUDY OF KNH CANCER TREATMENT CENTER”.

SECTION A: DEMOGRAPHIC AND SOCIO-ECONOMIC CHARATERISTICS

REF NO.....

Identification

Place of residence í ..

Sex/ Gender í

Date of interview í

Date of birth í

Year diagnosed with cancer í

Which type of cancer were you diagnosed with í ..

How much income do you earn each month in your household í í í í í í í í í í í í í

Religion í ..

Marital Status í .

Level of Education í .

Main Occupation í

Have you ever smoked? í .

Do you still smoke? í ..

What type of treatment are you receiving (e.g. surgery, chemotherapy, Radiotherapy)
í

SECTION B: NUTRITIONAL KNOWLEDGE

REF NO.....

This section will help identify dietary advice that people find confusing hence if don't the answer please mark not sure

Part 1: Advice given by experts.

Do you think health experts recommend that people should be eating more, the same amount, or less of these foods? (Tick one box per food).

Food	More	Same	Less	Not sure
Vegetables				
Sugary foods				
Meat				
Starchy foods				
Fatty foods				
Fruits				
Salty foods				

How many servings of fruit and vegetables a day do you think experts are advising people to eat? (One serving could be, for example, an apple or a handful of chopped carrots) í .

Which fat do experts say is most important for people to cut down on? (Tick one)

Monounsaturated fat	
Polyunsaturated fat	
Saturated fat	
Not sure	

Part 2: Food groups

Do you think these are high or low in added sugar? (tick one box per food).

Food	High	Low	Not sure
Bananas			
Unflavored yoghurt			

Ice cream			
Orange squash			
Tomato Sauce			
Natural orange juice			

Do you think these are high or low in fat? (tick one box per food).

Food	High	Low	Not sure
Egg			
Bread			
Meat			
chapati			
Nuts			
Margarine			

Do you think experts put these in the starchy foods group? (Tick one box per food)

Food	Yes	No	Not sure
Ugali			
Rice			
Chapati			
Porridge			

Do you think these are high or low in salt? (Tick one box per food)

Food	High	Low	Not sure
Sausage			
Smokies			
Red meat			
Vegetables			

Do you think these are high or low in protein? (Tick one box per food).

Foods	High	Low	Not sure
Beans			

Chicken			
Fish			
Fruit			
Margarine			

Do you think these are high or low in fiber /roughage? (Tick one box per food)

Food	High	Low	Not sure
Banana			
Eggs			
Potatoes			
Beans			
Chicken			

Do you think these fatty foods are high or low in saturated fat? (Tick one box per food)

Food	High	Low	Not sure
Red meat			
Chocolate			

PART 3 FOOD CHOICES

Which would be the best choice for a low fat, high fibre snack? (Tick one)

Food	
Fruit	
Yoghurt	
Chips	

Which would be the best choice for a low fat, high fiber light meal? (Tick one)

Beans and rice

Chapatti and beef

Githeri

If a person felt like something sweet, but was trying to cut down on sugar, which would be the best choice? (Tick one).

Honey

Biscuit

Soda

Banana

If a person wanted to reduce the amount of salt in their diet, which would be the best choice? (Tick one).

Vegetables

Pineapple

Smokie

Part 4: Health Problems

Are you aware of any major health problems or diseases that are related to a low intake of fruit and vegetables?

Yes

No

Not sure

If yes which diseases are related to low intake of fruits and vegetables?

í í

Are you aware of any health problems or diseases that are related to how much sugar people eat?

Yes

No

Not sure

If yes which diseases are related to low intake of fruits and vegetables?

í í

Are you aware of any major health problems or diseases that are related to the amount of fat people eat?

Yes

No

Not sure

If yes, what diseases or health problems do you think are related to fat?

í í

Do you think these help to reduce the chances of getting certain kinds of cancer? (Answer each one)

Food	Yes	No	Not sure
Eating more fiber			
Eating less fruit			
Eating less salt			
Eating more fruit and vegetable			
Eating less preservatives/ additives			

Which one of these is more likely to raise people's blood cholesterol level? (Tick one).

Antioxidants

Polyunsaturated fats

Saturated fats

Cholesterol in the diet

Not sure

SECTIONC: FOOD FREQUENCY

REF NO.....

For each food item, indicate with a checkmark the category that best describes the frequency with which you usually eat that particular food item.

Food item	More than once per day	Once per day	3-6 times per week	Once or twice per week	Twice per month or less	Never
Antioxidants						
Oranges						
Lettuce						
Spinach						
Lemons,						
Raw carrots						
Bananas,						
Garlic						
Phytochemicals						
Peas						
Lentils						
Beans						
Soybeans						

Polyunsaturated fats and monosaturated Elianto oil,						
Rina oil,						
Avocado.						
Olive oil,						
Soya oil						
Fiber: Fruit,						
beans,						
peas,						
whole grains,						
wholemeal porridge,						
Seeds;						
Leafy green vegetables						
carrots						
Vitamins:						
Pawpaw,						
Mango,						
Grapes,						
Trace elements zinc, selenium, copper, Calcium:						
Meat,						
Cearals,						
Fish,						
Milk						
yoghurt						
Red meat:						
Beef						
Mutton						
Pork.						
White meat:						
Chicken						
Fish						
Alcohol:						
Wine						
Beer						
Vodka						
Whisky						

SECTION D: DIETARY DIVERSITY

REF NO:

Was yesterday a normal day (i.e. not a feast day). If it was please fill in the following by ticking the food you ate from yesterday morning until night.

<p>Food group consumed:</p>	<p>Please indicate the source of the food item you ate using the following codes.</p> <p>1=own production</p> <p>2=Purchase</p> <p>3=Gift</p> <p>4=Food Aid</p> <p>5= others(specify)</p>
<p>Type of food</p>	
<p>Cereals and cereal products (<i>e.g. sorghum, maize, spaghetti, pasta, caanjera, bread</i>)?</p>	
<p>Vitamin A rich vegetables and tubers: Pumpkins, carrots, orange sweet potatoes</p>	
<p>White tubers and roots: White potatoes, white yams, cassava, or foods made from roots</p>	
<p>Dark green leafy vegetables: Dark green leafy vegetables, including wild ones + locally available vitamin A rich leaves such as cassava leaves etc.</p>	
<p>Other vegetables (<i>e.g. tomatoes, egg plant, onions</i>)?</p>	
<p>Vitamin A rich fruits: Ripe mangoes, papayas + other locally available vitamin A rich fruits</p>	
<p>Other fruits</p>	
<p>Organ meat (iron rich): Liver, kidney, heart or other organ meats or blood based foods</p>	
<p>Flesh meats and offals: Meat, poultry, offal (<i>e.g. goat/camel meat, beef; chicken/poultry</i>)?</p>	
<p>Eggs</p>	
<p>Fish: Fresh or dries fish or shellfish</p>	

Pulses/legumes, nuts (e.g. beans, lentils, green grams, cowpeas)?		
Milk and milk products (e.g. goat/camel/fermented milk, milk powder)?		
Oils/fats (e.g. cooking fat or oil, butter, ghee, margarine)?		
Sweets: Sugar, honey, sweetened soda or sugary foods such as chocolates, sweets or candies		
Condiments, spices and beverages:		

SECTION E: QUESTION GUIDE FOR KEY INFORMANTS

REF NO.....

Thank you for accepting to participate in this study as one of my interviewee. Any information you give will be highly appreciated. This interview intends to take about thirty minutes and will help show the argument whether there is an association between association between nutrition knowledge and dietary practices among cancer patients. Your answers are completely confidential and will be coded and recorded without names.

Are the diets of cancer patients especially those who are nutritionally at risk monitored outside the hospital, how?

As a professional in the oncology setting do you think getting nutrition education is an important item to consider as patients are undergoing treatment and why?

Lastly, In your opinion does nutritional education given to patients translate to knowledge and influence their day to day food choices?

APPENDIX 2: TRAINING MODULE

Training Module for Assessing the Association between Nutrition Knowledge and Dietary Practices among Cancer Patients at Kenyatta National Hospital Cancer Treatment Centre

Trainer/ Investigators Guide

Training Objectives

The training objectives are the following:

To enlighten the aims and objectives of the study to enumerators

To familiarize the recruited enumerators with the survey protocols

To explain data collection techniques

To train enumerators on how to address the study questionnaire including the key informant interview guide

To equip the enumerators with interview technique and persuasive skills

To provide orientation on ethical procedures to keep the interests of the respondents first during each interview and maintain the confidentiality of the information obtained.

Assumptions

The successful implementation of the study depends on a number of assumptions about the use of the survey protocols and about the background of the enumerators.

General Assumption

The survey protocol designed for this study will not be used as a general or standard assessment tool on nutrition among cancer patients as it deals specifically with issues that are pertinent to the objectives of the proposed study.

Assumptions about trainees

The trainees have basic knowledge of nutrition, but not necessarily have previously engaged in nutrition surveys.

The trainees are already familiar in working with patients but not necessarily with specifically cancer patients.

Preparation

For successful completion of the training according to the schedule, it is important that the trainer to spend preparing the session in order to tailor the materials to fit the skills that the enumerators need to acquire before starting the actual data collection.

Preparation to be done by trainer

Arrange a suitable hall for the training to take place. This can be done through the pre-training informal discussions with enumerators.

Decide on the activities to include within each session. The session's plans are sub-divided into activities with times for each activity estimated. Decision to include activities depend on what the trainer think are the needs of the enumerators for this particular study

Prepare teaching materials (photocopying questionnaire etc)

Put in order the training materials and teaching tools for each session

If necessary, make plans for practice during training session

Preparation to be done by trainees

Become familiar with the questionnaire

Do required pre- reading

Coverage

This training will cover the activities outlined under the training objectives. Any issues that might arise from the training throughout the training session will be entertained to stimulate their participation.

Methods of training

The training methods include lectures, discussions where the trainees will actively talk to each other about the objectives. The approach used will be dialogue-Socratic type. Another method that will be used is role play where the trainees act a part in events before and after the situation.

Session planning

Each activity has specific objective or aim. The sessions vary in length. The approximate time for each activity to complete is specified. These are purely guide lines for time as the activity may take longer or shorter depending on the training participants' speed of learning. In addition, the trainer will need to spend 5-10 minutes winding up the session at the end by going over the objectives and main messages

Table 5: Table Showing the Training Scheme

Objective/Aim	Activity	Time	Materials
To give brief explanation on the overall objective of the study	Lecture	20 minutes	Sample questionnaire Flip chart
To make recruited enumerators familiar with the survey protocols	Distribution of copy of the protocol to each trainee	20 minutes	Variety of colored marker pens Note books
To explain data collection procedures	Discussion & role play	2.5 hours	Pens, Pencils. File folders
To equip them with interview technique and persuasive skills	Discussion & role play	1 hour	
To discuss practical constraints during implementation of the study	Discussion	30 minutes	
To provide orientation on ethical procedures to keep the interest of respondents first and maintain the confidentiality of the information obtained	Lecture Discussion	30 minutes	
Summing up	Review of the activity, receiving feedback from trainees and clearing up the place	30- minutes	

APPENDIX 3: DATA ANALYSIS MATRIX

Table 12: Data analysis matrix for qualitative data

Variables	Description	Type of data	Scale of measurement	Descriptive statistics	Inferential statistics
Dependent variable Dietary practice					
Food Frequency	Frequency of a food	categorical	Nominal scale	Percentage	Logistic regression between the food frequency and nutrition knowledge, income, age, sex, YOD
Dietary diversity	Dietary diversity	Discrete	Ratio scale	mean	Linear regression between

	score(DDS)				nutrition knowledge score and dietary diversity
⌘	Classify into low, moderate and high DDS	Categorical	Ordinal scale	Frequency	Fischer's exact test between DDS and Sex of patient
Independent Variable					
Nutritional Knowledge					
Knowledge	Knowledge score	continuous	Ratio scale	Measures of central tendency and dispersion	Correlation between YOD and nutrition knowledge
	Knowledge scores above 50% and Scores Above 50%	categorical	Binary scale	Frequency and Proportion	Fisher's exact test between level of education and nutrition knowledge
Socio economic and demographic characteristics					
Income	Amount of money received in a month	Continuous	Ratio scale	Measures of central tendency and dispersion	Correlation between income and nutrition knowledge
Occupation	Type of occupation	nominal	Nominal scale	Frequency and Proportions	
Year of diagnosis	Number of years lived as a cancer survivor	continuous	Ratio Scale	Measures of central tendency and dispersion	
Age	Number of years lived	Continuous	Ratio scale	Measures of central tendency and dispersion	
„	Categories of age i.e. youth, middle-age and elderly.	Categorical	Nominal scale	Frequency	Chi-square test between age category of patients and nutrition knowledge
Sex	Whether male	categorical	Nominal Scale	Frequency and	

	or female			proportions	
Marital status	Married, Single, Widowed, divorced	categorical	Nominal scale	Frequency and proportions	



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5th June, 2012

TO WHOM IT MAY CONCERN

RE: CAROLINE WAKUTHIE - A56/69085/11

Ms. Wakuthie is our 1st year student pursuing an M.Sc. Degree in Applied Human Nutrition, in the Department of Food Science, Nutrition and Technology.

Ms. Wakuthie has completed her course work in May, 2012 and as part of the degree requirements, she has to conduct research and prepare a dissertation. For this purpose, Ms. Wakuthie would like to conduct a study on *“Nutritional Knowledge and Dietary Practices of Cancer Patients at Kenyatta National Hospital Cancer Treatment Center”*.

Kindly grant Ms. Wakuthie any assistance she may need towards this course.

Yours faithfully,

 **HEAD
APPLIED HUMAN NUTRITION**

DR. ALICE M. MWANGI
HEAD
APPLIED NUTRITION PROGRAMME

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 8th October 2012

Muthike Caroline Wakuthie
 Reg. A56/69085/2011
 Dept. of Food Science, Nutrition and Technology
 University of Nairobi



Dear Caroline

RESEARCH PROPOSAL: "NUTRITIONAL KNOWLEDGE AND ASSOCIATION WITH DIETARY PRACTICES AMONG CANCER PATIENTS: A CASE STUDY OF KENYATTA NATIONAL HOSPITAL CANCER TREATMENT CENTER, NAIROBI"
(P324/06/2012)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above revised proposal. The approval periods are 8th October 2012 to 7th October 2013.

This approval is subject to compliance with the following requirements:

- a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
- c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
- d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
- e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
- f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
- g) Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website www.uonbi.ac.ke/activities/KNHUoN



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RE: KNH/CTC/14/3


DATE: 15TH October, 2012

All Staff
CTC
KNH

RESEARCH PROJECT IN CANCER TREATMENT CENTRE

This is to inform you that Muthike Caroline Wakuthie has been granted authority to carry out a research titled "Nutritional Knowledge and Association with Dietary Practices among Cancer Patients: A case Study of Kenyatta Hospital Cancer Treatment Centre".

Kindly accord them her the necessary support.


DR. ANSELMY OPIYO
HEAD
CANCER TREATMENT CENTRE