NUTRITIONAL STATUS AND QUALITY OF LIFE OF PAEDIATRIC CANCER PATIENTS UNDERGOING CHEMOTHERAPY AT MOI TEACHING AND REFERRAL HOSPITAL ELDORET, KENYA

BY

OKEMWA JULIAN NYABOKE
(BSC. FOODS, NUTRITION & DIETETICS)
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FEBRUARY, 2017
DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

Signature: …………………… Date: ………………………

Okemwa Julian Nyaboke – H60/21210/2010

Supervisors: This thesis has been submitted for review with our approval as University supervisors:

1. Signature: ………………… Date: ………………………

   Prof. Judith Kimiywe,
   Department of Foods, Nutrition and Dietetics
   Kenyatta University.

2. Signature: ………………… Date: ………………………

   Prof. Beatrice Mugendi,
   Department of Food Science and Technology
   Dedan Kimathi University of Technology.

3. Signature: ………………… Date: ………………………

   Prof. Constance N. Tenge, M.Med. Paeds
   Department of Child Health/Paediatrics
   Moi University – School of Medicine
DEDICATION

I dedicate this work to my beloved husband Edwin Obwoge, our sons Lowell and Monsell.
ACKNOWLEDGEMENT

First and foremost I wish to thank the Almighty God for having led me this far in my studies, research, for giving me good health and financial provision throughout my study period. Secondly, I am very grateful to my family members and friends for their prayers, moral and financial support during the course of my study and research. I’m also grateful to Kenyatta University for having granted me the opportunity to further my studies and my supervisors Prof. Judith Kimiywe, Prof. Beatrice Mugendi and Prof. Constance N. Tenge for their continuous guidance, support and advice during every phase of this research, may God bless you abundantly. Thirdly, great appreciation goes to the staff of the cancer clinic at Moi Teaching and Referral Hospital (MTRH), Eldoret, Kenya for their cooperation and useful role played towards the collection of the required data for this research work. Last but not least, I thank all who by their means, advice, guidance and encouragement, helped me to complete this thesis research work, and to all, may our good Lord bless you abundantly.
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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ALL</td>
<td>Acute Lymphoblastic Leukemia</td>
</tr>
<tr>
<td>BMI</td>
<td>Body Mass Index</td>
</tr>
<tr>
<td>IREC</td>
<td>Institutional Research and Ethics Committee</td>
</tr>
<tr>
<td>KEMRI</td>
<td>Kenya Medical Research Institute</td>
</tr>
<tr>
<td>KNH</td>
<td>Kenyatta National Hospital</td>
</tr>
<tr>
<td>KUERC</td>
<td>Kenyatta University Ethics Review Committee</td>
</tr>
<tr>
<td>LoS</td>
<td>Length of Hospital Stay</td>
</tr>
<tr>
<td>MOH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>MTRH</td>
<td>Moi Teaching and Referral Hospital</td>
</tr>
<tr>
<td>MUAC</td>
<td>Mid Upper Arm Circumference</td>
</tr>
<tr>
<td>NCR</td>
<td>National Cancer Registry</td>
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<tr>
<td>NCST</td>
<td>National Council of Science and Technology</td>
</tr>
<tr>
<td>NHL</td>
<td>Non-Hodgkin Lymphoma</td>
</tr>
<tr>
<td>NIS</td>
<td>Nutrition Impact Symptoms</td>
</tr>
<tr>
<td>NRS</td>
<td>Nutrition Risk Score</td>
</tr>
<tr>
<td>PPS</td>
<td>Play Performance Status</td>
</tr>
<tr>
<td>QoL</td>
<td>Quality of Life</td>
</tr>
<tr>
<td>SD</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
</tr>
<tr>
<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>LPPS</td>
<td>Lansky Play Performance Scale</td>
</tr>
<tr>
<td>CT</td>
<td>Chemotherapy</td>
</tr>
</tbody>
</table>
LMI: Low and Middle - Income

PAC-QoL: Pediatric Advanced Care-Quality of Life

CMP-QoL: Cancer Module Peds-Quality of Life
DEFINITION OF TERMS

**Cachexia:** Progressive wasting syndrome evidenced by weakness and a marked and progressive loss of body weight, fat, and muscle.

**Cancer:** Disease that interferes with the normal growth and functioning of the cells.

**Chemotherapy:** Treatment of a disease using pharmaceutical preparations called cytotoxic drugs.

**Radiotherapy:** Use of radiation to damage actively dividing cells.

**Quality of life:** Quality of Life is a subjective multidimensional construct reflecting functional status, psychosocial wellbeing and the mental state of an individual.

OPERATIONAL DEFINITION OF TERMS

**Malnutrition:** Inadequate dietary intake.

**Nutrition-impact symptoms:** The symptoms that impede oral intake.

**Quality of life:** The study assessed for physical domain focusing on the physical domain by rating their usual play activities.
ABSTRACT

Malnutrition is a common problem among patients with cancer and ranges from 30% - 80% globally. In Kenya, cancer ranks third as a cause of death after infectious diseases and cardiovascular diseases. The aim of this research was to assess the nutritional status, the prevalence of nutrition-impact symptoms (NIS) at each disease stage and determine the relationship between nutritional status and quality of life (QoL) of the 52 children suffering from cancer on chemotherapy at Moi Teaching and Referral Hospital (MTRH) Eldoret, Kenya. The research adopted an across-sectional analytical design with which the interviewer administered the questionnaires to collect data on socio demographic, food consumption, nutrition management practices and the nutritional status from the respondents. Observational check list was also used to gather information on patient’s general appearance or any physical sign of malnutrition. Quality of life was assessed using Lansky scores while Nutritional Risk Screening (NRS-2002) was used to screen for any nutritional risk in the study population. Data was entered and analyzed using statistical package for social sciences (SPSS) version 21 and summarized using descriptive statistics such as frequencies, means and percentages. Anthropometric data was analyzed using WHO Anthro software (version 3.2.2) for children <5 years while WHO Anthro plus software (version 1.0.4) was used to analyze data for children above 5 years. Pearson correlation was done to test for the relationship between nutritional status and quality of life. A P value of < 0.05 was considered statistically significant. The study findings showed that 55.8% of the respondents were wasted, 34.6% stunted, while 29.4% were underweight. It was noted that 28.9% of the sample population were nutritionally at risk. Nutrition impact symptoms were more pronounced in the second and third stages of cancer where most of the respondents experienced vomiting (94.3%), decreased appetite (80.8%) and diarrhoea (69.2%). The study found a significant negative correlations between Quality of life and nutrition risk scores of the respondents ($r = -0.33$, $p = 0.02$) at a significant level of ($p < 0.05$). QoL correlated positively with nutritional status based on Body Mass Index-for-age Z-scores ($r = 0.41$, $p= 0.01$) with a significant level of ($p < 0.05$). QoL was also found to positively correlate with Height-for-Age Z-scores, ($r = 0.06$, $p = 0.72$) though the correlations were not statistically significant ($P > 0.05$). It can therefore be concluded that chemotherapy was associated with poor nutritional status and reduction in the quality of life ratings. The use of the Nutrition Impact Symptom (NIS) checklist in the paediatric oncology clinic/ward triggers more therapeutic interventions. The awareness for NIS will likely evoke more research in assessment, impact, and treatment.
CHAPTER ONE: INTRODUCTION

1.1 Background

Cancer, especially childhood cancer, is a major public health problem in the United States and many other parts of the world. Currently, 1 in 4 deaths in the United States is due to cancer (Jemal, Siegel & Ward, 2010). Globally, it is estimated that cancer kills over 7.9 million people every year with 13% of total deaths worldwide and 14 million new cases annually (WHO, 2014; Ministry Of Health (MOH), 2013). Childhood cancer is a leading cause of child mortality in developed countries as well as a recognized contributor to malnutrition and death in developing countries, in particular those of low socioeconomic status (Chukwu, Ezenwosu, Ukoha, Ikefuna & Emodi, 2016). One of the Millennium Development Goals, which were defined in 1990, is to reduce the global Under 5 Mortality Rate by two thirds by 2015 (UNICEF, 2008).

From the sparse data available, it appears that the epidemiology of some childhood cancer differs from place to place across the world. Burkitt lymphoma is relatively common in malaria prone places with Sub-Saharan Africa constituting up to 50% of all childhood cancers diagnosed in these regions. According to Pact Kenya Cancer Assessment in Africa and Asia (2010), about 80,000 cases of Cancer are diagnosed yearly.

In Kenya, cancer ranks third as a cause of death with 7% national mortality every year after infectious diseases and cardiovascular diseases. The country has no reliable data on the real cancer burden, but it is estimated that the annual incidence of cancer is
about 28,000 new cases with an annual mortality of 22,000 cases. Incidence of childhood cancers in Kenya is undetermined but Western countries have a rate of about 150 per million children therefore considering the under 15 population, the Kenyan incidence would be about 3000 new cases per year (MOH, 2013).

According to International Atomic Energy Agency (2010) and National cancer control strategy (2010-2016), the Cancer situation in Kenya is dire with a severe lack of Medical Practitioners and a large number of new Cancer cases being diagnosed annually. The Nairobi and Eldoret cancer registries have been providing data on cancer in Kenya but due to financial challenges the data is not reliable. The government is in the process of establishing a National Cancer Registry Programme to be run by KEMRI. There are more cancer cases being reported in Kenya now than 10 years ago (MOH, 2008). Sadly, most of the reported cancers are diagnosed at late stages, when very little can be achieved with therapeutic intervention. Increasingly, younger Kenyans seem to be more affected by cancer, unlike in the past, when it was considered a disease of the old (MOH, 2008).

Malnutrition is common among hospitalized patients (Schoeman, Dannhauser, & Kruger, 2010; Maciel, Pedrosa & Coelho, 2012). Patients with cancer suffer from protein energy malnutrition throughout the evolution of their disease with elevated basal energy requirements due to their inherent illness and decreased oral intake due to reduced gustatory senses (Schoeman et al., 2010). Adequate nutrition during cancer plays an important role in clinical outcome measures, such as treatment response, quality of life and cost of care (Khalil, El-Sharkawy, Gomaa & Zaghamir, 2013). The medical treatment of most cancer children is usually more emphasized than the
nutritional management although the two need to complement each other (Bauer, Jürgens & Frühwald, 2011).

The broad spectrum of impediments to oral nutritional intake can be conceptualized as nutrition impact symptoms (NIS) which seem to occur frequently in clinical care (Kubrak et al., 2010). A number of these symptoms are due to complications of advanced cancer, anticancer treatment, or medical co-morbidities (Blum et al., 2011). Some of these side effects include anorexia, taste changes, dysphagia, nausea, vomiting and diarrhea which may further compromise nutrition and functional ability (Kubrak et al., 2010; Mosby, Barr & Pencharz, 2009; Omlin et al., 2013). Many of these symptoms such as anorexia-cachexia, dysphagia and delirium could impair oral intake coupled with refractory cachexia, contribute to persistent weight loss and decreased quality of life (Hui, Dev & Bruera, 2015). Despite the impact they causes on oral nutritional intake, they have rarely been systematically assessed (Omlin et al., 2013).

Malnutrition has been associated with increased risk of prolonged length of hospital stay (LoS) and decreased quality of life (QoL) in cancer patients (Nourissat et al., 2008). Malnutrition globally impacts all cancer patient by increasing the risk of infection, delaying wound healing, increasing treatment toxicity, prolonging hospital stay and increasing health related costs. While it is already a proven fact that malnutrition is prevalent among cancer patients, its impact on the quality of life of patients has not been adequately studied (Vergara, Montoya, Luna, Amparo & Cristal-Luna, 2013).
1.2 Problem statement

In Kenya, cancer is currently the number three killer and doctors warn that it is just a matter of time before it takes the top spot. World Health Organization (WHO) and the Ministry of Health (MOH) report that Kenya is facing an epidemiological transition characterized by double burden of communicable diseases and non-communicable diseases including cancer. Although Kenya does not have a National cancer registry, data from Nairobi and Eldoret cancer registries show there has been a 200 per cent increase in childhood cancer cases and fairly large numbers being diagnosed and managed in other hospitals, therefore cancer in children cannot be termed rare (MOH, 2008).

Less emphasis on diet therapy has been found to be associated with increased morbidity and infections since the immunity of the children is weakened and they are not able to fight the disease effectively (Matonya et al., 2010). Adequate nutrition during cancer plays an important role in clinical outcome measures, such as treatment response, quality of life and cost of care. However, in a recent critical review of important aspects of nutrition in children with cancer it was found that the importance of nutrition in children and young adults with malignancies is still underestimated (Nieuwoudt, 2011; Brinksma et al., 2012). There is need for studies to reaffirm the need for proper nutrition management in children with malignancies. This study therefore aspires to investigate the nutritional status of children with cancer and determine the prevalence of nutrition impact symptoms after the commencement of chemotherapy and their QoL.
1.3 Purpose of the study

The study aimed at investigating the nutritional status of cancer children on chemotherapy aged (1-17) years attending the Hemato-oncology clinic in Moi Teaching and Referral Hospital (MTRH). It sought to assess the nutritional status of cancer children on chemotherapy, prevalence of nutrition impact symptoms after the commencement of the chemotherapy and quality of life of the patients.

1.4 Study objectives

1.4.1 General objective

To assess the nutritional status, the prevalence of nutrition-impact symptoms, their quality of life and the association that exist between nutritional status and quality of life of paediatric cancer patients undergoing chemotherapy in Moi Teaching and Referral Hospital Eldoret, Kenya.

1.4.2 Specific objectives

1. To assess the nutritional status of children with cancer aged (1-17) years undergoing chemotherapy in MTRH, Eldoret.

2. To determine the prevalence of nutrition-impact symptoms at different disease stages after the commencement of chemotherapy of cancer children aged (1-17) years in MTRH, Eldoret.

3. To assess the quality of life (QoL) of children with cancer aged (1-17) years undergoing chemotherapy in MTRH, Eldoret.
4. To determine the relationship between nutritional status and quality of life of children with cancer aged (1-17) years undergoing chemotherapy in MTRH, Eldoret.

1.4.3 Hypotheses

$H_01$: There is no significant relationship between quality of life and nutrition risk scores of children with cancer aged (1-17) years undergoing chemotherapy in MTRH, Eldoret.

$H_02$: There is no significant relationship between quality of life and wasting of children with cancer aged (1-17) years undergoing chemotherapy in MTRH, Eldoret.

$H_03$: There is no significant relationship between quality of life and stunting of children with cancer aged (1-17) years undergoing chemotherapy in MTRH, Eldoret.

$H_04$: There is no significant relationship between quality of life and underweight of children with cancer aged (1-17) years undergoing chemotherapy in MTRH, Eldoret.

1.5 Significance of the study

With the increasing incidence of childhood cancers, it is important that the children, their service providers, physicians and medical officers understand the effects of chemotherapy on nutrition status in-order to manage cancers properly. This will greatly improve the outcomes in survival and reduce the morbidity and mortality associated with late diagnosis. Determining the prevalence of nutrition-impact symptoms among children with cancer will further bolster the creation of a nutrition support group that will oversee nutrition screening and possible intervention among
this select group of patients in MTRH. The study findings will also contribute to the field of knowledge in nutrition and act as a basis for future research.

1.6 Delimitation of the study

The study was only carried out in MTRH and the results can only be generalized to other hospitals with patients of similar characteristics to this study.

1.7 Limitation of the study

The study was cross-sectional and therefore the assessment of QoL could not detect changes in QoL over time. In addition, the cross-sectional study design and small numbers of oncology patients on chemotherapy means that the time into the treatment and the treatment phases of the patients who participated in the study was not standardized. Therefore, data was collected from patients who had been on chemotherapy treatment for a period of at least 1 year and above.
1.8 Conceptual framework

**Figure 1.1. Relationship between chemotherapy and nutritional status**

A child diagnosed to have cancer and put on chemotherapy may experience various nutrition related side effects like taste changes, nausea and vomiting, due to cancer itself or chemotherapy leading to inadequate dietary intake as stated by (Pound et al., 2012; Krull, Hockenberry, Miketova, Carey & Moore, 2013; Rodgersa, Hookeb & Hockenberry, 2013). Inadequate dietary intake can cause weight loss or failure to grow in children, lowered immunity and mucosal damage which are the major mechanisms by which body defences are compromised. This leads to increased severity, incidence and duration of cancer which leads to increased infections, poor
nutritional status and poor quality of life leading to high mortality rates (Schoeman et al., 2010; Maciel et al., 2012). Therefore with the onset of treatment the side effects of chemotherapy should be dealt with in order to maintain the child in a sufficient good state of health so that the child undergoes chemotherapy effectively. Diet therapy aims at preventing cachexia and maintaining the child in a sufficiently good state of health (Bauer et al., 2011).
2.1 Cancer and Stages of Development

Cancer is a disease caused by an uncontrolled division of abnormal cells in a part of the body. Cancer as a disease is known to interfere with the normal growth and functioning of the cells. Its development takes place in certain stages which are clearly defined by medical professionals to maintain uniformity in diagnosis, help understand the growth of cancer and determine the correct treatment (Bailey & Skinner, 2010). In Stage I, the tumor is very small and its growth is restricted to the organ in which it originated. In Stage II, cancer is detected in the nearby lymph nodes, tissues or organs and the size and number of tumors might also increase. In Stage III, the size of the cancer tumor is significantly large and number of tumors has increased considerably and cancer usually spreads to nearby lymph nodes, organs or even to distant lymph nodes and organs. In Stage IV, cancer is detected in distant organs, becomes difficult to control the thus dealing with the very real probability of death (Almeida & Barry, 2010).

Cancers in children may be classified into leukemias (acute and chronic), lymphomas (Hodgkin’s ad Non-Hodgkin’s) and solid tumors. Among the commonest in the latter category are retinoblastoma, brain tumours, nephroblastoma, rhabdomyosarcoma, neuroblastoma and osteogenic sarcoma among others. In Kenya the most common acute leukaemia in childhood is acute lymphoblastic leukaemia (ALL) accounting for about 85% of the cases and the rest are acute myeloid leukaemia (MOH, 2013; Orgel et al., 2014).
2.2 Risk factors for childhood cancer

According to the Kenya Medical Research Institute (KEMRI), Cancer Incidence Report (2006), internal factors which may predispose one to cancer include inherited genetic mutations, hormone imbalances, Immune disorder conditions and some metabolic disorders. These Causative Factors may act together and/or in sequence trigger or promote the development of cancer after varying periods of time for different types of Cancers. The increased risk of childhood cancer associated with antenatal obstetric irradiation was discovered over 40 years ago. Since then, obstetric x-ray examination in pregnancy has been largely superseded by ultrasound examination. Worldwide, the most important examples of childhood cancers caused by infections are Burkitt’s lymphoma, Hodgkin lymphoma and nasopharyngeal carcinoma, liver carcinoma and Kaposi sarcoma but together these associations account for a very small proportion of childhood cancer in western countries (Parkins, 2006).

2.3 Chemotherapy treatment

Chemotherapy (CT) is a common cancer treatment modality and can affect the nutritional status of cancer patients. This effect may be due to the toxicity of the treatment, since traditional chemotherapeutic drugs are nonspecific, attacking healthy cells in addition to diseased cells, and setting off adverse effects that impact nutritional status (Nourssat et al., 2008). Route of administration can be any of the following Oral, injection intravenous, intra-arterial, intra-lesional, intra-peritoneal, and intra-thecal injection or topically (Jacobson et al., 2009 & Neuss et al., 2013). A
variety of factors, including the type and stage of cancer, determine the type of chemotherapy used (Raymond, 2007).

Children and adolescents experience many side effects related with chemotherapy treatment (Andersen, Adamsen & Moeller, 2006; Woodgate, 2008; Rodgersa et al., 2013). During this treatment, various symptoms including nausea and vomiting, appetite loss, anorexia, pain, fatigue, bone marrow suppression (anemia, leukopenia, and thrombocytopenia), alopecia, mucositis, skin problems, sleep problems and neurological problems are frequently reported. The treatment-related side effect depends on the characteristics of the drugs (Pound et al., 2012; Krull et al., 2013 & Rodgersa et al., 2013). These side effects can cause many physical and psychological effects that have an adverse impact on the quality of life of cancer patients (Savage, Riordan & Hughes, 2008; Kaleyias, Manley & Kothare, 2012). Furthermore, the inability to eat/drink and body image changes can result in emotional distress for patients and caregivers (Hui et al., 2015).

Some cancer drugs interfere with cancer-cell division or enzyme processes. However, they have serious side effects, attacking some healthy cells and reducing resistance to infection. Chemotherapy can cure some types of cancer. In some cases, it is used to slow the growth of cancer cells or to keep the cancer from spreading to other parts of the body. When cancer has been surgically removed, chemotherapy may be used to keep the cancer from coming back (adjuvant therapy). It is also helpful in reducing the tumor size prior to surgery (primary [neo-adjuvant] chemotherapy) (Bailey & Skinner, 2010). Chemotherapy can ease the symptoms of cancer, helping some patients have a better quality of life (Kubrak et al., 2009; Omlin et al., 2013).
2.4 Nutritional status of children with cancer

Nutritional status is an important consideration in paediatric oncology. In children with malignant diseases, malnutrition has been linked to increased morbidity and mortality (Borges, Paiva, Silveira, Assunção & Gonzalez, 2010; Bauer et al., 2011; Monyeki et al., 2015). Malnutrition has been recognized as an important component of adverse outcomes, including increased morbidity and mortality and decreased quality of life (Federico et al., 2008). Weight loss has been identified as an indicator of poor prognosis in cancer patients. Adequate nutrient intake can help cancer patients maintain weight and the body's nutrition stores, offering relief from nutrition impact symptoms and improving quality of life (Bauer et al., 2011). Inadequate nutrient intake, leads to under-nutrition, and can contribute to the incidence and severity of treatment side effects and increase the risk of infection, thereby reducing chances of survival (Steinbach et al., 2009; Malihi et al., 2013).

Adequate nutrition during cancer plays an important role in clinical outcome measures, such as treatment response, quality of life and cost of care however the importance of nutrition in children and young adults with malignancies is still underestimated (Nieuwoudt, 2011, Khalil et al., 2013). It has also been shown that the nutrition support decreases the time to bone marrow recovery, suggesting that it may help diminish the toxicity associated with chemotherapy (Linga, Shreedhara, Rau & Rau, 2012). Between 5 and 50% of children and young adults with cancer, experience malnutrition at diagnosis, depending on the diagnosis and the malnutrition criteria used (Bauer et al., 2011). Children are particularly vulnerable to malnutrition due to increased substrate needs related to the disease, treatment and limited reserves. At the same time, children have increased energy and nutrient requirements to attain
appropriate growth and development (Bauer et al., 2011, nieuwendit, 2011, Khalili et al., 2013).

Nutritional assessment is an integral part of patient care since nutritional status affects a patient’s response to illness (Zalina, Suzana, Rahman & Noor, 2009; Bauer et al., 2011). The assessment allows early detection of both nutrient deficiencies and excesses (Schoeman et al., 2010; Maciel et al., 2012). There is no single nutrition measurement that is best and therefore, a combination of different measures is required (Schoeman et al., 2010). The 2006 World Health Organization (WHO) growth charts are available to help with the assessment of growth One method of defining the nutritional status of paediatric patients begins by determining baseline anthropometric measurements (weight, height, mid upper arm circumference) and transport proteins prior to treatment (Zalina et al., 2009; Bauer et al., 2011). Anthropometric measurements are calculated using age standards from World Health Organization (WHO). Height-for-age, weight-for-height and weight-for-age are the three indices derived from anthropometric measurements and interpreted by determining the extent to which they deviate from those of the standard population of healthy well fed children. They measure stunting, wasting and underweight respectively. Children falling above -2SD (standard deviation) and above the median of the reference population are classified as being globally well nourished, below -3SD severely malnourished and between -3SD and -2SD moderately malnourished (WHO, 2006).
2.5 Dietary practices in children with cancer

Central nervous system-directed therapy (e.g., cranial irradiation therapy and/or intrathecal chemotherapy) can directly damage the hypothalamic-pituitary region, impairing signaling reception from hormones that regulate hunger, appetite, and body fat homeostasis, such as ghrelin and leptin (Samaan, Thabane, Burrow, Dillenburg, & Scheinemann, 2013). These hormonal changes may affect food intake and appetite control via food craving (Chao, Grilo, White, & Sinha, 2014; Yu et al., 2013; Marissa et al., 2015)

Marissa et al., (2015) indicates that food craving affects the eating behavior and that cancer patients diagnosed at an older age (>4.5 years) experienced higher frequencies of food craving than those diagnosed at a younger age (<4.5 years). However, the degree to which childhood cancer patients experience food craving has not been previously described in young cancer patients who are at high risk of malnutrition

2.6 Nutrition-impact symptoms in children with cancer

Children experience many side effects related with chemotherapy during cancer treatment (Woodgate, 2008; Arslan, Basbakkal, & Kantar, 2013; Rodgersa et al., 2013). Nutritional challenges during active therapy for cancer are; decreased appetite, early satiety and fatigue, swallowing difficulties, dry mouth, mouth sores, odor sensitivities, taste changes, diarrhea, constipation, nausea, and vomiting (Kubrak et al., 2009, Malihi et al., 2009; Patlan, 2009; Krull et al., 2013; Pound et al., 2012; Rodgersa et al., 2013). Symptoms can occur immediately or much later after chemotherapy administration and can last from several hours to days. (Malihi et al., 2009; Patlan, 2009; Krull et al., 2013)
Anorexia, the loss of appetite or desire to eat, is typically present in 15% to 25% of all cancer patients at diagnosis and may also occur as a side effect of treatments (Dy, Lorenz, Naeim, Sanati, Walling & Asch, 2008; Omlin et al., 2013). Anorexia can hasten the course of cachexia which is estimated to be the immediate cause of death in 20% to 40% of cancer patients; it can develop in individuals who appear to be eating adequate calories and protein but have primary cachexia whereby tumor-related factors prevent maintenance of fat and muscle (Bauer et al., 2011). Thus, the most prudent and advantageous approach to cachexia is the prevention of its initiation through nutrition monitoring and nutrition intervention (Mantovani et al., 2008).

Nausea is a troublesome and distressing symptom for patients receiving chemotherapy. While vomiting may be well controlled with current antiemetics, nausea is a more difficult symptom to manage (Philips et al., 2010, Aseeri Mukhtar, Al Khansa, Elimam, & Jastaniah, 2013; Farrell, Brearley, Pilling, & Molassiotis, 2013). Depression, loss of personal interests or hope, and anxious thoughts may be enough to bring about anorexia and result in Protein Calorie Malnutrition (Dy et al., 2008). Despite the impact they cause on oral nutritional intake, they have rarely been systematically assessed (Omlin et al., 2013).

2.7 Nutritional management of cancer patients undergoing chemotherapy

Adequate nutrition during cancer plays a decisive role in several clinical outcome measures, such as treatment response, quality of life, and cost of care. However, the importance of nutrition in children and young adults with malignancies is still an underestimated topic within pediatric oncology (Barr & Skinner, 2010). Children with cancer are particularly vulnerable to malnutrition, because they exhibit elevated
substrate needs due to the disease and its treatment. At the same time, children have increased requirements of nutrients to attain appropriate growth and neurodevelopment (Bauer et al., 2011).

Nutritional support is of great importance in managing children and young people with cancer. It may help to reverse malnutrition seen at diagnosis, prevent malnutrition associated with the cancer treatment and promote weight gain and growth. Nutritional support may be provided through parenteral nutrition or enteral nutrition (Shikuri, 2005). People with cancer have low levels of glutamine. Supplemental glutamine is often given to malnourished cancer patients undergoing chemotherapy or radiation treatments and sometimes used in patients undergoing bone marrow transplants. Glutamine seems to help reduce stomatitis caused by chemotherapy. Some studies, have suggested that taking glutamine orally may help reduce diarrhea associated with chemotherapy (Connie et al., 2005).

2.8 Quality of life in cancer patients

Quality of Life is a subjective multidimensional construct reflecting functional status, psychosocial wellbeing, health perception and disease- and treatment-related symptoms (Lis, Gupta, Lammersfeld, Markman & Vashi, 2012). According to Marín, Laviano & Pichard (2007), QoL assessment has been used as an important tool for studying the impact of disease, drawing up indicators of disease severity and course and predicting treatment efficiency. In oncology, the patient’s general health status directly impacts QoL, which, in turn, is influenced by a broad range of nutritional factors. Despite the suggested association between worse overall wellbeing, morbidity and nutritional deterioration, the interaction between nutrition and quality of life remains underestimated (Nourissat et al., 2008; Borges et al., 2010). The importance
of measuring the QoL in patients undergoing cancer treatment has been acknowledged, as information about it could contribute to improvements in management and further improve the quality of life. For example, knowledge about a patient’s QoL might influence decision-making regarding choices between alternative treatments, or initiating appropriate intervention if QoL is deteriorating. Quality of life has until recently, been underexplored in children with cancer (Malihi et al., 2013).

According to Meeske et al., (2004) quality of life assesses the performance status and attempts to quantify the general wellbeing of patients with cancer. This measure is used to determine whether they can receive chemotherapy, whether dose adjustment is necessary and as a measure for the required intensity of palliative care. It is also used in oncological randomized controlled trials as a measure of quality of life. The Lansky Play Performance Scale (LPPS) is among the most frequently used instruments to assess the functional performance capacity and wellbeing in paediatric oncology patients which is also recommended for use by WHO (Lansky, List, Lansky, Ritter-Sterr & Miller, 1987). The LPPS is designed to assess general quality of life and physical performance status in children through rating their usual play activity. It includes a spectrum of age-appropriate play described with varying participation in active and quiet activities, ranging from ‘unresponsive’ to ‘fully active, normal’ functioning. The maximum score is 100 (‘fully active, normal’) and the worst possible score is 0 (‘unresponsive’) Scores 0-40 is classified as poor QoL, 50-70 moderate QoL and those with a score 80 and above the QoL is rated as good (Lansky et al., 1987). Other most frequently used instruments to assess the functional performance capacity are; the pediatric advanced care-quality of life scale (PAC-QoL) (Cataudella
et al., 2014), pediatric cancer-specific quality-of-life (QoL) instrument (Anthony et al. 2013) and Cancer Module Peds-QL (Bariah, Roslee, Zahara, & Norazmir, 2011).

2.9 Summary
Cancer develops in stages and interferes with the normal growth and functioning of the cells. Adequate nutrition during cancer plays an important role in clinical outcome measures, such as treatment response, quality of life and cost of care however the importance of nutrition in children and adolescence with malignancies is still underestimated. Chemotherapy as a treatment has serious nutrition impact symptoms namely decreased appetite, early satiety, diarrhoea, constipation, nausea, vomiting among others which interferes with food intake leading to malnutrition which has been linked to increased morbidity and poor quality of life leading to high mortality rates. Despite the impact they cause on oral nutritional intake, they have rarely been systematically assessed. The importance of measuring the QoL in patients undergoing cancer treatment has been acknowledged, as information about it could influence decision-making regarding choices between alternative treatments, or initiating appropriate intervention if QoL is deteriorating but still quality of life has been underexplored in children with cancer. Despite the suggested association between worse overall wellbeing, morbidity and nutritional deterioration, the interaction between nutrition and quality of life remains underestimated.
CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research design

The study adopted a cross-sectional analytical method (Gravetter & Forzano, 2011) to assess the nutritional status and quality of life of paediatric cancer patients who were undergoing chemotherapy at MTRH, Kenya at a point in time.

3.2 Variables

Dependent variables were nutritional status and quality of life while independent variables were stage of cancer and nutrition-impact symptoms.

3.3 Study location

The study was carried out at the paediatric oncology ward in Moi Teaching and Referral Hospital. The hospital is located in Eldoret town a rural setting in the Western region of Kenya Uasin-Gishu county (Appendix M), about 320km North West of Nairobi. The hospital was purposively sampled, because it is one of the two national referral hospitals in Kenya. It provides cancer education, screening, diagnosis and treatment including palliative care. It is the only hospital with a public pathology laboratory serving the whole Uasin-Gishu county. It serves a population of about 13-15 million people and currently, it is grappling with acute congestion from referrals despite having increased its bed capacity to 1,000. With the new Cancer and Chronic Diseases Management Centre in place the bed capacity is likely to go even higher.
3.4 Study population

The study targeted children aged between (1-17) years on chemotherapy who attended the Hemato-oncology clinic in MTRH Uasin Gishu County.

3.4.1 Inclusion criteria

Eligibility criteria for recruitment for the study included paediatric oncology patients aged (1-17) years, those who had already been started on chemotherapy treatment for at least one year. Those in the company of a parent or legal guardian and those whose parents or guardian gave consent for participation in the study were also included in the study.

3.4.2 Exclusion criteria

The study excluded children with cancer on combined treatment therapy (chemotherapy with surgery or radiotherapy), those with other chronic diseases like diabetes, Hypertension, HIV positive etc. Children below 1, those above 17 years and those who met the inclusion criteria but for one reason or another couldn’t participate in the study were excluded.

3.5 Sampling Techniques

Purposive sampling was used to get the sample for the study. The pediatric oncology clinic was run weekly on every Wednesday and an average of 5 children on follow-up were seen on each clinic day. Given the small population (Approximately 20 patients per month) on chemotherapy, the study used all the eligible participants until the required sample size of 52 was obtained.
3.6 Sample size determination

Sample size was determined using the fisher formula: \( n = \frac{z^2p(1-p)}{\delta^2} \) which is recommended for use when the sample size is small.

Where; 
- \( z \) - Statistical constant (1.96)
- \( P \) - Prevalence of undetermined population (0.5)
- \( \delta \) - Error of margin (0.05)

After substitution, \( n = 384.16 \) (~384)

It was estimated that within the three months period of study on average only 60 participants on chemotherapy were expected. Using the finite population correction factor which was done to produce a sample size that is proportional to the population and therefore the sample size was calculated as; \( n_1 = \frac{n}{1+n/N} \) after substitution \( n_1 = 52 \)

3.7 Research Instruments

3.7.1 Research Instruments used in the present study

The researcher administered questionnaire (Appendix H) was used to collect data on socio demographic, food consumption, nutrition management practices and the nutritional status. It was developed step by step based on the four objectives. Simple questions were developed into a meaningful order and format with structured and unstructured questions with both closed and open-ended questions. The observational check list (Appendix I) was used to gather information on patients general appearance or any physical sign of malnutrition for example hair color, mouth, eyes, skin and teeth. Medical History form (Appendix J) was used to collect data on the date of
diagnosis, type of cancer and any other health complication that the respondent was having.

Nutritional risk form (NRS-2002) (Appendix K) was used to collect data on the stress factor, ability to eat/retain food, appetite and the weight of the respondent. If the respondent had an NRS score below three it meant that they were at risk of malnutrition and those who scored above three were not at any nutritional risk. Lansky scoring table (Appendix L) was used to rate their usual play activity. It included a spectrum of age-appropriate play described with varying participation in active and quiet activities, ranging from ‘unresponsive’ to ‘fully active, normal’ functioning. The maximum score is 100 (‘fully active, normal’) and the worst possible score is 0 (‘unresponsive’).

3.7.2 Pre-Testing of instruments

The questionnaires were pre-tested to check on the length, content, question wording and language. The questionnaire was administered to five respondents (10 percent of the sample size), in the paediatric oncology unit in Kenyatta National Hospital. This allowed modifications on the questionnaires by correcting mistakes and eliminating ambiguous questions to ensure clarity and to elicit the required information therefore enhancing reliability. The order of questions was changed to start with the more general ones so as to put the respondent at ease.
3.7.3 Standardization and reliability of the instruments

The weighing scale was calibrated at the beginning and at the end of each stand. After zeroing the scale properly, the researcher applied a random set of the standard weights daily to roughly check the accuracy of the weighing scale. The stadiometer, was checked every day by the researcher, to ensure that the upright bar and the attached tape measure were not damaged. These checks were noted in the Equipment Calibration Log. The horizontal bar had to be firmly attached to the upright sliding section and that the section had to operate smoothly. The length board was checked at the beginning of each stand that the attached tape measure had not been damaged.

3.7.4 Validity

Content validity was established by seeking the expertise of the research supervisors and experts in the field of clinical nutrition. A copy of the questionnaire was given to each supervisor and the research experts. Each of them ticked the questionnaire items which were relevant to the study objectives and also added some of the missing relevant variable. This was to ensure that correct variables relevant to the study were included in the questionnaire. The questionnaire was constructed and revised according to the instructions of the experts.

3.8 Data Collection procedures and techniques

Since the respondents were aged below 18 years, the researcher got a proxy consent (Appendix C) from a legal guardian or an authorized guardian in accordance to National Council for Science and Technology (2004) then administered the
questionnaire. If the child was young enough or very sick to respond to the questions then the parent or guardian could respond on his/her behalf, but if the child was old enough and was stable he/she responded with the help of the parent or guardian. The observational check list was used to gather information on patients general appearance or any physical sign of malnutrition for example hair color, mouth, eyes, skin and teeth.

Given the wide age gap the respondents were classified into subgroups (Kenya National Bureau of Statistics, ICF Macro, 2014; WHO, 2006). Body weight was measured using Salter weighing scale, and height taken using a stadiometer for those children above 24 months and a length board for those below 24 months or those unable to stand. Weight for age, height for age and weight for height were computed for children below 5 years and compared with the WHO standards for children below 5 years. The body mass index for age and height-for-Age was computed for children aged 5-17 years then compared with the WHO reference growth charts for children aged 5-19 years. Weight-for-Age was computed for children aged 5-10 years then compared with the WHO reference growth charts for children aged 5-10 years. Other variables like age, gender, the type, duration and stage of cancer were evaluated. Quality of life was assessed using Lansky scores while Nutritional Risk Screening (NRS-2002) was used to screen for any nutritional risk in the study population as recommended by the European Society for Clinical Nutrition and Metabolism (ESPEN).
3.9 Data analysis and presentation.

Completed questionnaires were checked on a daily basis for accuracy and completeness in recoding of responses. Editing and coding was done before data entry. Data was entered and analyzed using SPSS version 21. Anthropometric data was analyzed using WHO Anthro software (version 3.2.2) for children ≤5 years while WHO Anthro plus software (version 1.0.4) was used to analyze data for children above 5 years. Descriptive statistics such as frequencies and percentages for discrete data (non-continuous) and the mean values for continuous data were computed. Bivariate correlations for QoL and weight for height, weight for age, height for age, BMI for age and nutrition risk were done and Pearson correlation was done to test for relationship between these variables. A P value of < 0.05 was used as the criterion for statistical significance. Table 3.1 gives a summary of the study variables and the type of data analysis the variables were subjected to.

Table 3.1. Summary of variables and data analysis

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Variables</th>
<th>Instruments</th>
<th>Statistical test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Nutritional status: BMI for age, weight for age, weight for height, height for age Nutritional risk screening</td>
<td>-Researcher administered questionnaire -Observation checklist -NRS-2002</td>
<td>Frequencies,% Frequencies,% Frequencies,%</td>
<td></td>
</tr>
<tr>
<td>2 Nutritional impact symptoms: Taste changes, diarrhea, constipation, nausea, vomiting Disease stage: 1, 2, 3 &amp; 4</td>
<td>-Researcher administered questionnaire</td>
<td>Frequencies,% Frequencies,%</td>
<td></td>
</tr>
<tr>
<td>3 Quality of life Fully active (100), bedbound (30) to unresponsive (0).</td>
<td>- Lansky scoring table</td>
<td>Frequencies,%</td>
<td></td>
</tr>
<tr>
<td>4 Nutritional status vs. Quality of life:</td>
<td>-Researcher administered questionnaire -Lansky scoring table</td>
<td>Pearson correlation</td>
<td></td>
</tr>
</tbody>
</table>
3.10 Ethical and Logistical considerations

Permission was sought from the graduate school of Kenyatta University and approval to carry out the research was granted. Ethical clearance was obtained from Moi university/Moi Teaching and Referral Hospital- institutional Research and Ethics Committee (IREC/2013/28) (Appendix D) and an approval letter was given (Appendix E) with a formal approval number: FAN:IREC 000943. A research authorization letter (Appendix F) and a research permit (Appendix G) were obtained from the National Council of Science and Technology (NCST). The questionnaires were administered to the respondents upon obtaining an informed written or thumb print consent (Appendix B). Before consent was obtained, the researcher explained the purpose of the study and respondents were assured of confidentiality of the information they gave. To ensure privacy, names and other means of identity were not used during the data collection. The researcher ensured that all information obtained was kept in strict confidence and was only for purpose of the study.
CHAPTER FOUR: FINDINGS

4.0 Introduction

Presented in this chapter are the study findings as per the objectives as follows: To assess the nutritional status of children with cancer aged (1-17) years undergoing chemotherapy, to determine the prevalence of nutrition-impact symptoms at different disease stages after the commencement of chemotherapy of cancer children aged (1-17) years and to determine the relationship between nutritional status and quality of life (QoL) of children with cancer aged (1-17) years undergoing chemotherapy in MTRH Eldoret, Kenya. Data was presented in a bar chart and tables.

4.1 Demographic and economic profile of respondents

4.1.1 Age and gender distribution of the study population

The study recruited 52 respondents who were children. Of the study respondents, 32.7% (n=17) were aged below 5 years. Respondents who aged 48-59 months were seven (13.5%) among respondents who aged below 5 years. Respondents aged 5-17 years were 67.3 percent (n=35) and seventeen of them (32.7%) aged 5-10 years. Most of the respondents were male (n=29, 55.8%) where majority of them 37.9 percent (n=11) aged between 5-10 years. The female respondents were twenty three (44.2%) where majority of them (n=6) aged 5-10 years (26.1%) (Table 4.1).
Table 4.1. Age and gender distribution of the respondents

<table>
<thead>
<tr>
<th>AGE</th>
<th>FEMALE</th>
<th>MALE</th>
<th>TOTAL(n)</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents below 5 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-17 months</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>18-23 months</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>5.8</td>
</tr>
<tr>
<td>24-35 months</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1.9</td>
</tr>
<tr>
<td>36-47 months</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>11.5</td>
</tr>
<tr>
<td>48-59 months</td>
<td>2</td>
<td>3</td>
<td>7</td>
<td>13.5</td>
</tr>
<tr>
<td>Respondents 5 years &amp;above</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-10 years</td>
<td>6</td>
<td>11</td>
<td>17</td>
<td>32.7</td>
</tr>
<tr>
<td>11-15 years</td>
<td>5</td>
<td>7</td>
<td>12</td>
<td>23.1</td>
</tr>
<tr>
<td>Above15 years</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>11.5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>23(44.2%)</td>
<td>29(55.8%)</td>
<td>52(100%)</td>
<td>100%</td>
</tr>
</tbody>
</table>

4.1.2 Family monthly income for the respondents

Majority of the family monthly income for the study population lied between 8,001 and 10,000 (n=17, 32.70%). Only a small portion of the study population (n=5, 9.60%) earned a monthly salary of above Ksh.10,000. Generally the family monthly income of majority of the respondents (n=47, 90.4%) was below Ksh. 10,000 (Figure 4.1).
In this study, figure 4.2 shows that most of the respondents suffered from Acute lymphoblastic lymphoma (ALL), Hodgkins and Nephroblastoma. Almost a third of the respondents (36%, n=19) suffered from Acute lymphoblastic lymphoma (ALL), a quarter (27%, n=14) Hodgkins and a sixth (17%, n=9) suffered from Nephroblastoma (Figure 4.2).
Figure 4.2. Types of cancer of the respondents

4.2 Nutrition practices

4.2.1 Food cravings

In the current study most respondents experienced higher food craving frequencies for some specific foods. Some of the foods included carbonated drinks (23%), french fries (20%), sugary foods (19%) and other vegetables (18%) which included kales, spinach and other locally grown vegetables (Figure 4.3).
4.2.2 Number of meals per day

Respondents had irregular meal patterns where majority (61%) of them used to manage two meals, 21% three meals, 10% single meal and only 8% were able to manage more than three meals a day. More than three meals a day means that they were able to take some meals and snacks (Figure 4.4).

*Figure 4.3. Types of foods craved for by the respondents*
4.2.3 Other nutrition practices

Figure 4.5 shows other nutrition practices that could impact on the health status of the respondents. It shows that out of 52 respondents 50 reported to have received nutrition counseling and as result among the 50 received nutrition counseling 49 had complied with change of diet. Majority of the respondents (n=45) could be forced to eat due to reduced appetite.
4.3 Nutritional Status of the respondents

4.3.1 Nutritional status of respondents below 5 years

In this study, respondents below 5 years were seventeen (32.69%). Slightly less than half (n=7, 41.2%) of the respondents below 5 years were moderately wasted, an eighth (n=2, 11.8%) were severely wasted and slightly more than half (n=8, 47.10%) were well nourished (Table 4.2).
Table 4.2. Weight for Height Z-Scores of respondents below 5 years (Wasting)

<table>
<thead>
<tr>
<th>Age(months)</th>
<th>Severe wasting</th>
<th>Moderate wasting</th>
<th>Normal</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-17</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>18-23</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>24-35</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>36-47</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>48-59</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>2(11.8%)</td>
<td>7(41.2%)</td>
<td>8(47.1%)</td>
<td>17(100.0%)</td>
</tr>
</tbody>
</table>

In this study, among the seventeen respondents aged below 5 years, a quarter (n=4, 23.5%) were moderately underweight, one (5.9%) was severely underweight and twelve (70.6%) were well nourished (Table 4.3).

Table 4.3. Weight for Age Z-Scores for respondents below 5 years (Underweight)

<table>
<thead>
<tr>
<th>Age(months)</th>
<th>Severe underweight</th>
<th>Moderate underweight</th>
<th>Normal</th>
<th>Total (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-17</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>18-23</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>24-35</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>36-47</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>48-59</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>1(5.9%)</td>
<td>4(23.5%)</td>
<td>12(70.6%)</td>
<td>17(100.0%)</td>
</tr>
</tbody>
</table>

In this study, among the seventeen respondents aged below 5 years, slightly more than half of the respondents (n=9, 52.9%) had attained normal heights for their age, while more than a third (n=6, 35.3%) were mildly stunted. Only two (11.8%) of the respondents were moderately stunted. Among this subgroup none of the respondents was severely stunted (Table 4.4).
Table 4.4. Height for Age Z-Scores for respondents below 5 years (Stunting)

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Moderate stunting</th>
<th>Mild stunting</th>
<th>Normal</th>
<th>Total (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-17</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>18-23</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>24-35</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>36-47</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>48-59</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2 (11.8%)</strong></td>
<td><strong>6 (35.3%)</strong></td>
<td><strong>9 (52.9%)</strong></td>
<td><strong>17 (100%)</strong></td>
</tr>
</tbody>
</table>

4.3.2 Nutritional status of respondents aged 5 to 17 years

Of the total respondents, those aged 5 years and above were more (n=35, 67.31%) than those below 5 years (n=17, 32.69%). Among the respondents aged 5 years and above, three (8.6%) were severely wasted, half of the respondents (n=17, 48.6%) were moderately wasted and slightly below half (n=15, 42.9%) were well nourished.

Among the moderately wasted respondents, six (17.2%) were aged between 5-10 years while eight (22.9%) were aged between 11-15 years (Table 4.5).

Table 4.5. BMI-for-Age Z Scores for respondents aged 5 to 17 years (wasting)

<table>
<thead>
<tr>
<th>BMI-for-Age</th>
<th>AGE (years) (n=35)</th>
<th></th>
<th></th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5-10</td>
<td>11-15</td>
<td>&gt;15</td>
<td></td>
</tr>
<tr>
<td>Severe underweight</td>
<td>0(0.0)</td>
<td>1(2.8)</td>
<td>2(5.6)</td>
<td>3(8.6)</td>
</tr>
<tr>
<td>Moderate underweight</td>
<td>6(17.2)</td>
<td>8(22.9)</td>
<td>3(8.6)</td>
<td>17(48.6)</td>
</tr>
<tr>
<td>Normal</td>
<td>11(31.4)</td>
<td>3(8.6)</td>
<td>1(2.8)</td>
<td>15(42.9)</td>
</tr>
<tr>
<td><strong>Total (%)</strong></td>
<td><strong>17 (48.6)</strong></td>
<td><strong>12 (34.3)</strong></td>
<td><strong>6 (17.1)</strong></td>
<td><strong>35 (100)</strong></td>
</tr>
</tbody>
</table>

Among the respondents aged 5 years and above, three (8.6%) were severely stunted, while seven (20.0%) were moderately stunted. Another twenty five (71.4%) were well nourished.
nourished. Of the three respondents severely stunted two (5.6%) of them aged between 5-10 years while of those moderately stunted, four (11.4%) aged between 11-15 years (Table 4.6).

Table 4.6. Height-for-Age Z-Scores for respondents aged 5 to 17 years (Stunting)

<table>
<thead>
<tr>
<th>Height-for-Age</th>
<th>Age (years)</th>
<th>5-10</th>
<th>11-15</th>
<th>&gt;15</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe stunting</td>
<td></td>
<td>2(5.6)</td>
<td>0(0.0)</td>
<td>1(2.8)</td>
<td>3(8.6)</td>
</tr>
<tr>
<td>Moderate stunting</td>
<td></td>
<td>2(5.6)</td>
<td>4(11.4)</td>
<td>1(2.8)</td>
<td>7(20.0)</td>
</tr>
<tr>
<td>Normal</td>
<td></td>
<td>13(37.1)</td>
<td>8(22.9)</td>
<td>4(11.4)</td>
<td>25(71.4)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>17(48.6)</strong></td>
<td><strong>12(34.3)</strong></td>
<td><strong>6(17.1)</strong></td>
<td><strong>35(100)</strong></td>
</tr>
</tbody>
</table>

Respondents aged between 5 to 10 years were seventeen (48.6%) which almost constituted half of all the respondents who aged 5 years and above (n=35, 100%). A third of the respondents aged 5 years and above (n=5, 29.4%) were moderately underweight while three quarters (n=12, 70.6%) were well nourished. (Table 4.7).

Table 4.7. Weight-for-Age Z-Scores for respondents aged 5 to 10 years (underweight)

<table>
<thead>
<tr>
<th>Weight-for-Age</th>
<th>Age (n=17)</th>
<th>5-10 years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate underweight</td>
<td></td>
<td>5(29.4)</td>
<td>5(29.4)</td>
</tr>
<tr>
<td>Normal</td>
<td></td>
<td>12(70.6)</td>
<td>12(70.6)</td>
</tr>
<tr>
<td><strong>TOTAL</strong> (%)</td>
<td></td>
<td><strong>17(100)</strong></td>
<td><strong>17(100)</strong></td>
</tr>
</tbody>
</table>
4.3.3. Summary of the nutritional status by the nutritional indices

In this study, figure 4.6 shows that twenty nine of the respondents were wasted (55.8%) , eighteen (34.6%) were stunted and ten (29.4%) were underweight.

Figure 4.6. Summary of the nutritional status by the nutritional indices

4.3.4 Nutritional Risk Score of the respondents.

Cross tabulations were done to check on the proportion of respondents who were at any nutritional risk. It was found that slightly more than a quarter of the respondents (n=15, 28.9%) were at nutritional risk and majority of them being those aged between 5 and 10 years (n=6, 11.5%). The proportion of the respondents nutritionally at risk aged below 5 years and those aged 5 years and above was(n=6, 11.55%) and (n=9, 17.3%) respectively (Table 4.8).
### Table 4.8. Age versus Nutritional Risk Score of the respondents

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt;3(%)</th>
<th>&gt;3(%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents below 5 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-17 months</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>18-23 months</td>
<td>1(1.9)</td>
<td>2(3.8)</td>
<td>3(5.8)</td>
</tr>
<tr>
<td>24-35 months</td>
<td>0 (0.0)</td>
<td>1(1.9)</td>
<td>1(1.9)</td>
</tr>
<tr>
<td>36-47 months</td>
<td>3 (5.8)</td>
<td>3(5.8)</td>
<td>6(11.5)</td>
</tr>
<tr>
<td>48-59 months</td>
<td>2(3.8)</td>
<td>5(9.6)</td>
<td>7(13.5)</td>
</tr>
<tr>
<td>Respondents 5 years &amp; above</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-10 years</td>
<td>6(11.5)</td>
<td>11(21.2)</td>
<td>17(32.7)</td>
</tr>
<tr>
<td>11-15 years</td>
<td>2 (3.8)</td>
<td>10 (19.2)</td>
<td>12 (23.1)</td>
</tr>
<tr>
<td>Above15 years</td>
<td>1 (1.9)</td>
<td>5 (9.6)</td>
<td>6 (11.5)</td>
</tr>
<tr>
<td>Total (%)</td>
<td>15(28.9)</td>
<td>37(71.2)</td>
<td>52(100)</td>
</tr>
</tbody>
</table>

### 4.4. Nutritional Impact Symptoms and cancer stage of the respondents

#### 4.4.1. Respondents by cancer stages

Figure 4.7, shows cancer stages of the respondents where almost half (46%) were in cancer stage three, almost a third (38%) cancer stage two, five respondents in stage four and three in stage one.
Among the 52 respondents more than three quarters experienced decreased appetite (n=42) and vomiting (n=49). Two thirds experienced diarrhoea (n=36) while less than two thirds had nausea (n=30). Few of them (n=23) experienced taste changes (Figure 4.8).
4.4.3 Prevalence of Nutritional Impact Symptoms at different cancer stages of the respondents

Nutrition impact symptoms were more pronounced in the second and third stages of cancer. Most of the respondents experienced diarrhoea (n=36, 69.2%), decreased appetite (n=42, 80.8%) and vomiting (n=49, 94.3%). Majority of them were in the third stage of cancer (n=17, 47.2%), (n=20, 47.6%) and (n=21, 42.9%) respectively. Among the respondents who experienced taste changes (n=23, 44.2%), more than half of the respondents were in stage three (n=14, 60.9%). For those respondents who experienced nausea (n=30, 57.7%) slightly more than half (n=16, 53.3%) were in the third stage of cancer. Decreased appetite (n=17, 40.8%) had no significant difference when compared...
to vomiting (n=20, 40.8%) in stage two. On the same stage, twelve respondents experienced diarrhoea (33.3%). The prevalence of the nutrition impact symptoms generally increased from stage one to stage three but dropped in the final stage as shown in figure 4.9.

**Figure 4.9.** Nutrition impact symptoms at different cancer stages

### 4.5 Quality of Life (QoL) of the respondents

Majority of the respondents (n=20, 38.5%) had a lansky score of 60 while slightly more than a fifth (n=11, 21.2%) of the respondents had a lansky score of 50. One sixth (n=7, 13.5%) of the respondents had a lansky score of 70 and 40 each. Six (11.5%) respondents who aged above 15 years managed to score a lansky score of 80 which was the best score among the respondents. The lowest score (30) was scored by one respondent aged between 18-23 months (Table 4.9).
Table 4.9. Quality of life of the respondents

<table>
<thead>
<tr>
<th>Age</th>
<th>80.00</th>
<th>70.00</th>
<th>60.00</th>
<th>50.00</th>
<th>40.00</th>
<th>30.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents below 5 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-17 months</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>18-23 months</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>24-35 months</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>36-47 months</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>48-59 months</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6</td>
<td>7</td>
<td>20</td>
<td>11</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>(11.54%)</td>
<td>(13.46%)</td>
<td>(38.46%)</td>
<td>(21.15%)</td>
<td>(13.46%)</td>
<td>(1.92%)</td>
<td>(100%)</td>
</tr>
</tbody>
</table>

Respondents 5 years & above

<table>
<thead>
<tr>
<th>Age</th>
<th>80.00</th>
<th>70.00</th>
<th>60.00</th>
<th>50.00</th>
<th>40.00</th>
<th>30.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-10 years</td>
<td>3</td>
<td>2</td>
<td>8</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11-15 years</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Above 15 years</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6</td>
<td>7</td>
<td>20</td>
<td>11</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>(11.54%)</td>
<td>(13.46%)</td>
<td>(38.46%)</td>
<td>(21.15%)</td>
<td>(13.46%)</td>
<td>(1.92%)</td>
<td>(100%)</td>
</tr>
</tbody>
</table>

4.5.1 Relationship between nutritional status and quality of life of the respondents aged below 5 years

When Pearson correlation was done for respondents aged below 5 years, QoL was found to negatively correlate with nutritional status based on Weight-for-Height Z-scores ($r = -0.22$, $p= 0.40$) although the correlation was not statistically significant ($P > 0.05$). QoL was found to negatively correlate with nutritional status based on Weight-for-Age Z-scores ($r = -0.61$, $p= 0.01^*$) though the correlation was statistically significant ($P < 0.05$). Finally, QoL was found to negatively correlate with nutritional status based on Height-for-Age Z-scores ($r = -0.40$, $p= 0.11$) though the relationship was not significant ($p > 0.05$) (Table 4.10).
Table 4.10. Relationship between QoL and nutritional status of respondents aged below 5 years

<table>
<thead>
<tr>
<th></th>
<th>QoL</th>
<th>BMI-for-Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>QoL</td>
<td>Pearson Correlation</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>-0.22</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>17</td>
</tr>
<tr>
<td>Weight for height</td>
<td>Pearson Correlation</td>
<td>-0.22</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>QoL</th>
<th>Weight-for-Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>QoL</td>
<td>Pearson Correlation</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Weight-for-Age</td>
<td>Pearson Correlation</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>QoL</th>
<th>Height-for-Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>QoL</td>
<td>Pearson Correlation</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Height-for-Age</td>
<td>Pearson Correlation</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
</tbody>
</table>

*, Correlation is significant at the 0.01 level (2-tailed).

When Pearson correlation was done for respondents aged 5 years and above, there was a significant positive correlations between QoL and nutritional status based on BMI for age Z-scores (r = 0.41, p= 0.01*) with a significant level of (p <0.05). QoL was found to positively correlate with Height-for-Age Z-scores, (r = 0.06, p = 0.72) though the correlations were not statistically significant (P > 0.05). When the same correlation was done, QoL was found to negatively correlate with nutritional status based on Weight-for-Age Z-scores (r = -0.62, p = 0.52) with no significant relationship (p > 0.05) (Table 4.11).
Table 4.11. Relationship between QoL and nutritional status of respondents aged 5 years and above

<table>
<thead>
<tr>
<th></th>
<th>QoL</th>
<th>BMI-for-Age</th>
<th>Weight-for-Age</th>
<th>Height-for-Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>QoL</td>
<td>BMI-for-Age</td>
<td>Weight-for-Age</td>
<td>Height-for-Age</td>
</tr>
<tr>
<td>QoL</td>
<td>Pearson Correlation 1.000</td>
<td>0.41</td>
<td>1.000</td>
<td>-0.62</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.52</td>
<td>0.52</td>
<td>0.52</td>
<td>0.06</td>
</tr>
<tr>
<td>N</td>
<td>35</td>
<td>35</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>BMI-for-Age</td>
<td>Pearson Correlation 0.41</td>
<td>1.000</td>
<td>-0.62</td>
<td>0.06</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.01*</td>
<td>0.52</td>
<td>0.52</td>
<td>0.06</td>
</tr>
<tr>
<td>N</td>
<td>35</td>
<td>35</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Weight-for-Age</td>
<td>Pearson Correlation -0.62</td>
<td>1.000</td>
<td>0.06</td>
<td>1.000</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.52</td>
<td>0.52</td>
<td>0.52</td>
<td>0.06</td>
</tr>
<tr>
<td>N</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Height-for-Age</td>
<td>Pearson Correlation 0.06</td>
<td>1.000</td>
<td>-0.62</td>
<td>0.06</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.72</td>
<td>0.72</td>
<td>0.72</td>
<td>0.06</td>
</tr>
<tr>
<td>N</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
</tbody>
</table>

*. Correlation is significant at the 0.01 level (2-tailed).

When Pearson correlation was done, there was a significant negative correlations between Quality of life and nutrition risk scores of the respondents (r = -0.33, p = 0.02**) at a significant level of (p < 0.05) (Table 4.12).
Table 4.12. *Relationship between QoL and the nutrition risk score of the respondents*

<table>
<thead>
<tr>
<th></th>
<th>QoL</th>
<th>Nutrition risk score (NRS- 2002)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>QoL</strong></td>
<td>Pearson Correlation</td>
<td>-0.33</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td><strong>0.02</strong></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td><strong>NRS</strong></td>
<td>Pearson Correlation</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.02**</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>52</td>
<td>52</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.05 level (2-tailed).
CHAPTER FIVE: DISCUSSION

5.1 Nutritional Status

Nutritional status of children is a sensitive indicator of changes in the health status and food availability. In this study nutritional status was a useful tool as an early warning of distress and ill health within the cancer patients. It gave the current status of the child in terms of immediate (acute) factors such as inadequate intake of food and the cancer disease process leading to wasting, while the accumulated impact of chronic deprivation lead to stunting.

5.1.1 Nutritional Status for the respondents

From the current study it was observed that 55.8% (n=29) of the respondents were wasted based on the Weight for Height and BMI-for-Age indicators. The higher wasting cases could be attributed to the effect of the cytotoxic drugs which lead to nausea, vomiting and loss of appetite that consequently lead to weight loss and finally protein energy malnutrition as evident in the study where majority of the children experienced vomiting and anorexia. These results were alarming when compared with a study in Brazil that analyzed the nutritional status of children and adolescents with cancer and found that 23.9% were wasted (Maciel et al., 2012). A lower figure was reported in another study where 16.4% were reported to be wasted (Hijiya et al., 2015). The low prevalence in the other studies may probably be due to improved organization in basic care and promotion of access to health care facilities since both studies were done in the developed countries.
In the current study 34.6% were found to be stunted. A possible explanation for the higher stunting levels is that there are many factors that affect linear growth during cancer treatment, including the disease itself, chemotherapy, poor absorption and utilization of nutrients due to their disease states leading to poor nutrition status. Kamar et al., 2016 in a study to assess the growth in children treated for Acute Lymphoblastic Leukemia reports that survivors of childhood leukemia are at risk of impaired growth and short stature due to intensive combination chemotherapy and this is evident from the current study that majority of the respondents suffered from Acute lymphoblastic lymphoma (ALL). A study involving pediatric cancer patients admitted at a reference hospital in the east of Malawi, reported a very high stunting level of 44.5% (Israëls, Chirambo, Caron & Molyneux, 2008). In another study by Apprey, Annan, Arthur, Boateng & Animah, (2014), reported alarming stunting levels of 51.0%. The prevalence of stunting in the current study and the other studies (Ghana and Malawi) is high and this may not be surprising as the three countries are poor developing countries in Africa.

In the current study 29.4% of the respondents were underweight. The observed cases of underweight could be attributed to the prolonged use of chemotherapeutic drugs with reduced food intake. These children were given food and refused to eat, particularly if the nurses and the nutritionist were busy with the seriously ill children. Some of these children then ended up skipping meals especially those who had anorexia or lack of appetite. The parents/guardians of children who attended clinic reported that the children refused to eat or skipped a meal when their parents were at their places of work. In a study to assess and predict malnutrition in children suffering from cancer in Ghana, Apprey et al., (2014), reported higher levels (34.0%) whereas
Zalina et al., (2009), reported even higher (37.3%) rate of underweight in children with leukemia. In a study carried out involving pediatric cancer patients, Chukwu, Ezenwosu, Ukoha, Ikefuna & Emodi, (2016) observed a lower (12.2%) rate of underweight. The findings of the current study almost compares with that of Micheru, (2011) who reported that 28.3% of children with cancer in KNH were underweight. The comparison could be due to the fact that both KNH and MTRH are national referral hospitals in Kenya and with a likelihood of receiving similar referral cases. Khalili et al., 2013) reported that children are particularly vulnerable to malnutrition due to increased substrate needs related to cancer, treatment and limited reserves. At the same time, children have increased energy and nutrient requirements to attain appropriate growth and development.

5.1.2 Nutritional Risk Score assessment.

Nutritional risk score-2002 was used to assess for any nutritional risk among the study population. According to Kyle, Kossovsky, Karsegarg, & Pichard, (2006) those who had an NRS score below three were at risk of malnutrition and those with a score of above three are not at any nutritional risk. In the current study, it was observed that almost a quarter (n=15, 28.8%) of the respondents were nutritionally at risk. This is because children with cancer are vulnerable to malnutrition, as they exhibit elevated substrate needs due to the disease and its treatment. At the same time, children have increased requirements of nutrients to attain appropriate growth and neurodevelopment.

Burges et al., (2010), found that malnourished patients had poor quality of life and had a higher nutritional risk of 41.6%. The same study reported a significant
association between the presence of nutrition impact symptoms and increased nutritional risk (p<0.001). Additionally, there was a significant negative correlation between physical domain and nutritional risk scores, showing that quality of life increases as nutritional risk decreases. Nutritional risk is inversely associated with quality of life in cancer patients after chemotherapy. Early nutritional interventions could minimize the side effects of treatment with a positive impact on quality of life.

5.2 Prevalence of Nutritional Impact Symptoms verses stage of cancer.

The present study showed that the nutrition impact symptoms were more pronounced in respondents with advanced tumor stage II and III. This is because as treatment becomes more vigorous and as the disease advances the patients tend to develop more nutritional problems since their food intake is affected. This results contrast with those of a study by Omlin et al., (2013), who reported that nutrition impact symptom load in patients with advanced tumor stage III or IV is high and reported that taste alterations reach up to 50% which was higher than the findings of the current study (n=23, 44.23%). The possible reason for the contrast could be because most of the respondents happened to be in cancer stage 2 (38%) and three (46%).

Though vomiting nowadays is well controlled with antiemetics, it occurs in many of the patients (Philips et al., 2010; Aseeri et al., 2013; Farrel et al., 2013). In the present study almost all of the respondents (n=49, 94.2%) experienced vomiting. These figures are to those reported by Pietsch et al., (2000), who reported that vomiting occurred in the majority of the respondents (71%), which was associated with chemotherapy.
Anorexia, the loss of appetite or desire to eat, is typically present in 15% to 25% of all cancer patients at diagnosis and may also occur as a side effect of treatments (Dy et al., 2008; Omlin et al., 2013). In the current study, 80.8% of the respondents (n=42) experienced poor appetite. Poor appetite was more prevalent in those respondents in stage II (n=17, 40.8%) and III (n=20, 47.6%). Anorexia can hasten the course of cachexia which is estimated to be the immediate cause of death in 20% to 40% of cancer patients; it can develop in individuals who appear to be eating adequate calories and protein but have primary cachexia whereby tumor-related factors prevent maintenance of fat and muscle (Bauer et al., 2011). Thus, the most prudent and advantageous approach to cachexia is the prevention of its initiation through nutrition monitoring and nutrition intervention (Mantovani et al., 2008).

Cases of nausea were very serious in most patients. In the current study 57.7% (n=30) of the respondents experienced nausea. As acknowledged by many authors nausea is a troublesome and distressing symptom for patients receiving chemotherapy. Whereas vomiting can be well controlled with most antiemetics, nausea is a more difficult symptom to manage (Philips et al., 2010; Aseeri et al., 2013; Farrel et al., 2013). Many authors (Burges et al., 2010; Omlin et al., 2013) agree that early identification of chemotherapy-related side effects and their appropriate management may help to reduce their impact on the patient’s nutritional status. A study by Del et al., (2011) confirmed that the frequent occurrence of two to three nutrition impact symptoms per patient had an association with weight loss.

5.3 Quality of life of the respondents

Majority of the respondents had a lansky score of 60 which indicate moderate QoL which meant, moderate restrictions with varying amount of assistance was needed
especially in their involvement in active quieter activities. A study that analyzed the Quality of Life in children with cancer found a relatively similar mean value of QoL (62.3) for the whole group (Fawzy1, Saleh, El-Wakil, Monir & Eltahlawy, 2013). In the present study the worst score (30) was scored by a respondent aged between 18-23 months showing that he had poor QoL and therefore needed considerable assistance even for quiet play activities. The study conquer with that by Hamidah et al., 2011 who found that younger child age was associated with lower scores ($P=0.007$). Generally the current study found that the cancer children had poor QoL. This finding is supported by Batra, Kumar, Gomber & Bhatia, (2014) and Bansal, Sharma, Vatsa & Bakhshi (2013), who found that the overall QoL of children with cancer was significantly poor.

5.4 Relationship between nutritional status and quality of life of the respondents

The current study aimed at assessing the relationship between nutritional status and QoL in children suffering from cancer. The study reported a significant negative correlation between NRS and QoL ($r=-0.33$, $p=0.02$) which was significant at $p < 0.05$. This indicated that those respondents who were not at any nutrition risk had good quality of life scores while those respondents who were nutritionally at risk had poor quality of life scores. This was much evident during the study in the play room, where children whose nutrition status was good were active and could move up and around unlike those children whose nutritional status was poor who were mainly in bed and even needed assistance for quiet play. The findings of the current study compare with findings of a study that was done in Brazil that found the existence of a significant negative correlation between nutritional risk and QoL scores ($r = -0.18$, $p$=
0.03). Which showed that quality of life increases as nutritional risk decreases (Burges et al., 2010).

The current study found a significant positive correlation between QoL and nutritional status based on BMI-for-age Z-scores (wasting) ($r = 0.41$, $p = 0.01$) with a significant level of ($p<0.05$). This indicated that the increase in BMI value in children with cancer is associated with rising quality of life scores and that continuous loss of body weight will cause a decrease in quality of life which will interfere with the efficiency of treatment, delay wound healing and worsen the complications. These findings compare with the findings from a study by Bariah et al., (2011), who reported a significant positive correlation between QoL and body mass index ($r = 0.41$, $p = 0.02$). Similarly Gupta et al., (2006) reported lower QoL scores in malnourished patients mainly in the physical domains, as well as worst overall QoL and general health scores.

5.5 Hypotheses testing

The hypothesis one which stated that, “There is no significant relationship between quality of life and nutritional status based on NRS of children with cancer aged (1-17) years undergoing chemotherapy in MTRH, Eldoret” was rejected as there was significant positive associations between QoL and NRS. Hypothesis number two which stated that, “There is no significant relationship between quality of life and wasting of children with cancer aged (1-17) years undergoing chemotherapy in MTRH, Eldoret” was rejected as there was significant positive correlation between QoL and nutritional status based on BMI-for-age Z-scores.
The hypothesis number three which stated that, “There is no significant relationship between quality of life and stunting of children with cancer aged (1-17) years undergoing chemotherapy in MTRH, Eldoret” failed to be rejected as Pearson test showed a negative correlation between QoL and nutritional status based on Height-for-Age Z-scores that was not significant. Hypothesis number four which stated that, “There is no significant relationship between quality of life and underweight of children with cancer aged (1-17) years undergoing chemotherapy in MTRH, Eldoret” failed to be rejected as Pearson test showed a negative correlation between QoL and nutritional status based on Weight-for-Age Z-scores that was not significant.
CHAPTER SIX: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary of the research findings

Nutritional status among the children was poor. Wasting, stunting and underweight levels were high but more especially the wasting levels that were alarming. It was noted that apart from the effect of cancer disease itself, children refused to eat food due to decreased appetite resulting from chemotherapy. The only option that parents and guardians had was to force them to eat and at the end of the day they consumed very little food. When Nutritional Risk Score-2002 was used to assess for any nutritional risk in these children it was observed that almost a quarter of them were nutritionally at risk.

Nutrition impact symptoms were more pronounced in respondents with advanced tumor stage II and III. This is because as treatment becomes more vigorous and as the disease advances the patients tend to develop more nutritional problems since their food intake is affected and also most of the respondents were in cancer stage two and three. Vomiting, decreased appetite and diarrhoea were the more prevalent NIS among the cancer children.

The overall QoL of children with cancer was significantly poor. Majority of the respondents had a lansky score of sixty which indicated moderate QoL. This meant that they had moderate restrictions and little assistance was needed especially in their involvement in play activities. The worst score of thirty was scored by a respondent aged between 18-23 months showing that the respondent needed considerable assistance even for quiet play.
The study reported a significant negative correlation between NRS and QoL which showed that quality of life increases as nutritional risk decreases. This was much evident during the study in the play room, where children whose nutrition status was good were active and could move up and around unlike those children whose nutritional status was poor who were mainly in bed and even needed assistance for quiet play. A significant positive correlation was found between QoL and nutritional status based on BMI-for-age Z-scores. This indicated that the increase in BMI value in children with cancer is associated with rising quality of life scores and that continuous loss of body weight will cause a decrease in quality of life.

### 6.2 Conclusions

The poor nutritional status could be attributed to the effect of the disease itself, cytotoxic drugs which lead to nausea, vomiting and loss of appetite that consequently lead to weight loss and finally protein energy malnutrition. The low prevalence in the other studies may probably be due to improved organization in basic care and promotion of access to health care facilities. It can therefore be concluded that there is need to scale up interventions geared towards addressing nutrition status among paediatric cancer patients.

Most of the respondent’s food intake was affected when they were receiving chemotherapy treatment leading to loss of appetite, vomiting, nausea and mouth sores meaning that their nutritional status was affected whenever they were receiving treatment. Nutritional support could minimize the side effects of treatment and will go a long way to increase response to treatment.
The quality of life of the respondents was poor due to the patient’s general health status that was poor. Since adequate nutrition during cancer plays a decisive role in several clinical outcome measures like quality of life, then the importance of measuring the QoL should not be underestimated as the information about it could contribute to improvements in management and further improve the quality of life of these children.

There was significant positive correlation between Quality of life and nutritional status based on Body Mass Index-for-age Z-scores of the respondents which can be concluded that increase in these values also lead to an increase in quality of life. This simply means that QoL of children with cancer is dependent on the nutritional status of the children.

6.3 Recommendations

6.3.1 Recommendations for Policy

It is necessary to make all healthcare professionals aware of the opportunity to identify cancer patients at risk of malnutrition early in order to plan the best possible intervention and follow-up during cancer treatment and progression. For clinical nutritionist and in specific those attending to the oncology patients, nutrition assessment should be carried out daily to identify those at nutritional risk.
6.3.2 Recommendations for practice

From the study it’s evident that the nutritional status of majority of the children suffering from cancer was poor thus, a solution such as providing a variety of “tasty food” in the hospital setting is recommended in order to improve the food intake for children suffering from cancer. The individual’s food preferences and aversions should be considered and combinations of oral, enteral and parenteral nutrition be provided. In view of these findings, the study recommends that nutritionists should frequently carry out nutrition assessments in order to provide proper management to curb malnutrition.

Silent symptoms such as taste and smell alterations or even fatigue seem to be frequent but are not always brought forward by the patient or assessed by the oncologist. For symptoms with few therapeutic options, the oncologists might not ask the patient about it unless it is reported spontaneously. The early recognition and treatment of these silent symptoms may limit their contribution to the cachexia syndrome. The use of the NIS checklist in the paediatric oncology clinic/ward triggers more therapeutic interventions. The awareness for NIS will likely evoke more research in assessment, impact, and treatment.

6.3.3 Recommendations for Further Research

This research can be done in other hospitals with systematic sampling procedures. There is need to investigate the effect of chemotherapy on poor appetite because in the recent study three quarters (N=42, 80.77%) of the respondents experienced it. Intervention studies are also needed to evaluate the impact of interventional
management of NIS on improving nutritional intake. Further research should be conducted to assess nurses' knowledge about chemotherapy side effects, its management, prevention and management of pediatric nutritional disorders. It is worth recommending that social, physiological together with spiritual well-being of children with cancer be evaluated and appropriate care initiatives be implemented to improve their quality of life.
REFERENCES


International Atomic Energy Agency Study (2010)


APPENDICES

APPENDIX A: LETTER OF INTRODUCTION

Hello, I am Julian Okemwa a student at Kenyatta University School of applied human science, department of Foods Nutrition and Dietetics. I am undertaking a research entitled “Nutritional status and quality of life of paediatric cancer patients undergoing chemotherapy here in Moi Teaching and Referral Hospital. I am interested in learning about the nutritional status of children on chemotherapy, their food intake, quality of life and how malnutrition comes about in children suffering from cancer. I would be glad if you can spare a few minutes and answer a few questions. I will ask you questions about eating patterns, any complications that have arisen from the disease in relation to nutrition and how you are trying to manage the disease nutritionally. The findings may be used in formulating policies that will help improve nutrition status of children with cancer of all communities in the country. Whatever information you provide will be kept confidential and will not be shared with anyone other than my research Supervisors. I won’t write your name on any forms. I will use a research code number instead. This way, no one will be able to find out the information about you. Participation in this research is voluntary, and if we should come to any question you don’t want to answer, just let me know and I will go on to the next question; or you can stop the interview at any time, not participating in the interview will not interfere in any way with the services you receive in this hospital. In order for the child to participate, the parent/guardian has to provide permission. I would very much appreciate your participation in this research and hope that you will participate since your views are important.

Signature of interviewer: ………………………… Date: …………………………….. 
Contacts……………………….
APPENDIX B: INFORMED CONSENT

Study Procedures
In this study, I will ask you dietary, demographic and socio-economic questions that you will be required to answer as correctly as possible. The questionnaire will take between 45-60 minutes to complete. You will then be requested to stand or lie down depending on your health state or your age in order for us to take your body measurements.

Risks
**What are the risks involved in participating the study?**
There are no risks involved. The process requires your response to the questions I will ask you and I taking your weight and height which will not cause any much discomfort.

Benefits
**Are there any benefits to me for participating in the study?**
During this study there are no direct benefits to you for participating. However, the findings from the study may contribute to knowledge on cancer and child health care and may be used in formulating policies that will help improve nutrition status of children with cancer of all communities in the country

Ethical issues and Confidentiality
Whatever information you shall provide will be kept strictly confidential and will not be shown to any other persons. Participation in the study is voluntary and you can choose not to answer any individual question or all of the questions.

Ask the participant if they have any questions and address them before they sign the consent form.

You can contact the office of the chairman -ethics review committee at the addresses provided below if you have any concerns or complaints that have not been adequately addressed by the researcher.

OFFICE OF THE CHAIRMAN - ETHICS REVIEW COMMITTEE,
POST ADDRESS: P.O BOX 43844-00100,
NAIROBI, KENYA.
Letter of Consent for the child (English)

My name is --------------------------------------------------------- I am a residence of ------------------location, -------------------county. I have been informed about the research by the researcher and has informed me on the benefits (though not direct) involved. The information given in this research will assist in creation of a nutrition support group that will oversee nutrition screening and possible intervention among this select group of patients in MTRH. The study will also contribute to the field of knowledge in nutrition and act as a basis for future research. I have been assured of confidentiality on any information that will be given. Participation in this research is voluntary and failure to participate in the study will not interfere in any way with the services i receive in this hospital. I have willingly accepted to participate in the research.

Signature of interviewee: ......................... Date: .............................
Letter of consent for the child (Kiswahili)


Sahihi ya mhojiwa------------------------- Tarehe-----------------------
Letter of Consent to the parent/guardian

My name is --------------------------------------------------------------- I am a residence of --------------------------------------------location, --------------------------------------county. I have been informed about the research and the benefits involved. The information given in this research will assist in creation of a nutrition support group that will oversee nutrition screening and possible intervention among this select group of patients in MTRH. The study will also contribute to the field of knowledge in nutrition and act as a basis for future research. I have been assured of confidentiality on any information that will be given by my child. My child’s participation in this research is voluntary and failure to participate in the study will not interfere in any way with the services my child is receiving in this hospital. I have willingly accepted her/him to participate in the research.

Signature of guardian/parent: ...................... Date: ..............................
APPENDIX D: ETHICAL CLEARANCE

INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)
MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 3347119

MOI UNIVERSITY
SCHOOL OF MEDICINE
P.O. BOX 4596
ELDORET
Tel: 3347112

Reference: IREC/2013/28
Approval Number: 000943

Okemwa Julian Nyaboke,
School of Applied Human Sciences,
Kenyatta University,
P.O. Box 43844,
NAIROBI-KENYA.

Dear Ms. Okemwa,

RE: FORMAL APPROVAL

The Institutional Research and Ethics Committee has received your request for approval of your study titled:

"Nutrition Status and Quality of Life of Paediatric Cancer Patients Undergoing Chemotherapy at Moi Teaching and Referral Hospital, Eldoret, Kenya”.

On the basis of your study review and approval by the Kenyatta University – Ethics Review Committee (kueroc), IREC is glad to inform you that your study has been granted a Formal Approval Number: FAN: IREC 000943 on 28th February, 2013. You are therefore permitted to continue with your study.

Note that this approval is for 1 year; it will thus expire on 27th February, 2014. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date.

You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.

Yours Sincerely,

DR. W. ARUASA
VICE-CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc:
Director - MTRH
Principal - CHS
Dean - SOM
Dean - SPH
Dean - SOD
Dean - SON
APPENDIX E: RESEARCH APPROVAL

MOI TEACHING AND REFERRAL HOSPITAL

Telephone: 2033471/2/3/4
Fax: 61749
Email: director@mtrh.or.ke
Ref: ELD/MTRH/R.6/VOL.II/2008

Okemwa Julian Nyaboke,
School of Applied Human Sciences,
Kenyatta University,
P.O. Box 43844,
NAIROBI-KENYA.

P. O. Box 3
ELDORET
28th February, 2013

RE: APPROVAL TO CONDUCT RESEARCH AT MTRH

Upon obtaining approval from the Institutional Research and Ethics Committee (IREC) to conduct your research proposal titled:-

“Nutrition Status and Quality of Life of Paediatric Cancer Patients Undergoing Chemotherapy at Moi Teaching and Referral Hospital, Eldoret, Kenya.”

You are hereby permitted to commence your investigation at Moi Teaching and Referral Hospital.

DR. J. KIBOSIA
DIRECTOR
MOI TEACHING AND REFERRAL HOSPITAL

CC  -  Deputy Director (CS)
   -  Chief Nurse
   -  HOD, HRISM
APPENDIX F: RESEARCH AUTHORIZATION

REPUBLIC OF KENYA

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telephone: 254-020-2213471, 2241349, 254-020-2673550
Mobile: 0713 788 787, 0735 404 245
Fax: 254-020-2123215
When replying please quote
secretary@ncst.go.ke

P.O. Box 30623-00100
NAIROBI-KENYA
Website: www.ncst.go.ke

Our Ref: NCST/RCD/12A/013/24

Date: 13\textsuperscript{th} March, 2013

Julian Nyaboke Okemwa
Kenyatta University
P.O.Box 43844-00100
Nairobi.

RE: RESEARCH AUTHORIZATION

Following your application dated 22\textsuperscript{nd} February, 2013 for authority to carry out research on “Nutrition status and quality of life of paediatric cancer patients undergoing chemotherapy at Moi Teaching and Referral Hospital Eldoret, Kenya,” I am pleased to inform you that you have been authorized to undertake research in Uasin Gishu County for a period ending 31\textsuperscript{st} July, 2013.

You are advised to report to the Director, Moi Teaching and Referral Hospital before embarking on the research project.

On completion of the research, you are expected to submit two hard copies and one soft copy in pdf of the research report/thesis to our office.

DR M.K. RUGUTT, PhD, HSC
DEPUTY COUNCIL SECRETARY

Copy to:

The Director
Moi Teaching and Referral Hospital
Eldoret.

“The National Council for Science and Technology is Committed to the Promotion of Science and Technology for National Development.”
APPENDIX G: RESEARCH PERMIT

THIS IS TO CERTIFY THAT:
Prof./Dr./Mr./Mrs./Miss/Institution
Julian Nyaboke Okamwa
of (Address) Kenyatta University
P.O.Box 43844-00100, Nairobi
has been permitted to conduct research in
Location
Uasin Gishu
District
County
on the topic: Nutrition status and quality of life of pediatric cancer patients undergoing Chemotherapy at Moi Teaching and Referral Hospital Eldoret, Kenya

Research Permit No. NCST/RCD/12A/013/24
Date of issue 13th March, 2013
Fee received KSH. 1,000

Applicant’s Signature

Secretary National Council for Science & Technology
APPENDIX H: RESEARCHER ADMINISTERED QUESTIONNAIRE

Administrative détails

Questionnaire Code NO. .............................................

Name of the interviewer ..................................Code No. .................

Date of interview ................. Time started ................. Time finished ........

Socio-economic status

1. Age .......... a) below 5 years b) 5-10 years c) 11-17 years

2. Gender: male ........................................ Female ..........................

3. Place of birth of child: Home...........................Hospital......................

4. Date of birth of child ..........................................................

5. Total number of siblings ..................................................

6. Fathers Occupation ......................... Mothers Occupation ..................

   Age ........................................ Age ........................................

   Education level ........................... Education level ..........................

7. What is your family’s total monthly income (in K shs)?
   a. 0 – 2000  b. 2001 – 4000  c. 4001 – 600  
   d. 6000 – 8000  e. 80001 – 1000  f. over 10,000

8. Do you have any other source of income/livelihood? a. yes b. no

9. If yes which source
   a) Crop income
   b) Livestock income
   c) Both the above

Child anthropometry/nutritional status

1. Anthropometric measurements

<table>
<thead>
<tr>
<th>1st reading</th>
<th>2nd reading</th>
<th>average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (Kg)</td>
<td>............</td>
<td>...........</td>
</tr>
</tbody>
</table>
Height/length (cm)  .....  .....  .....

Then compute the following:

BMI (>5 years) = BMIAge

Weight/Age (underweight)

Height/Age (stunting)  

Weight/Height (wasting)

2. How has been the weight gain since diagnosis?
   a. Poor
   b. Fluctuating
   c. Slow
   d. Satisfactory
   e. Constant

**Nutritional management practices**

1. Is there history of cancer in your family?
   a. Yes (specify who)
   b. No
   c. Don’t know

2. Does the disease state/treatment given interfere with the child food intake?
   a. Yes
   b. No
   c. Sometimes

3. If yes or sometimes how does it interfere with the child’s intake of food
   a) Eat very little food
   b) Appetite problems
   c) Has nausea
   d) Vomiting
   e) Diarrhea
   f) Any other specify………………..

4. If b above how do you describe your child appetite now or most of the time?
   a. Good
   b. Moderate
   c. Poor
5. How many meals does your child take in a day?
   a. One
   b. Two
   c. Three
   d. More than 3 snacks + snacks
   e. Snacks only

6. In case of poor appetite is your child assisted to eat in hospital or at home
   a. Yes
   b. No
   c. Sometimes

7. (A) Are you encouraged to eat when your appetite is poor?
   a. Yes
   b. No

   (B) If yes how do you do it?
   a. Use a stick
   b. Prepare attractive food
   c. Serve small amount of food
   d. Others (specify)……………………………………………………………

   (C) If no, why?
   a. Lack of time
   b. Lack of patience
   c. Given up
   d. Specify others………………………………………………………………

8. (A). What attempts are being made by the hospital to improve your food intake?
   a. Give multivitamin to boost appetite
   b. Nutrition education
   c. Enteral /parenteral nutrition
   d. Nothing

   (B) Have they been successful?
   a. Yes
   b. No
Food consumption

1. List down the foods you like and those you disliked

<table>
<thead>
<tr>
<th>Food liked</th>
<th>Foods Disliked</th>
</tr>
</thead>
<tbody>
<tr>
<td>……………………………..</td>
<td>…………………………</td>
</tr>
<tr>
<td>……………………………..</td>
<td>…………………………</td>
</tr>
<tr>
<td>……………………………..</td>
<td>…………………………</td>
</tr>
</tbody>
</table>

2. (a) Do you crave for any particular foods?
   a. Yes
   b. No
(b). If yes list some of them
…………………………………………………………………………………………
…………………………………………………………………………………………
3. (a). Are there foods that your child does not eat completely?
   a. Yes
   b. No
(b) If yes which are some of these foods?
…………………………………………………………………………………………
4. (a) Have you been told to change your child’s diet since the doctor learnt he/she had cancer?
   a. Yes
   b. No
(b) If yes what was the reason given? …………………………………………………
(c) Have you yourself changed the diet?
   a. Yes
   b. No
(d) If no, Why? ………………………………………………………………………
(e) If yes how does your child follow the prescribed diet?
   a. Strict adherence
   b. Rarely
   c. Sometimes
   d. Never
(f) Do you agree that these foods are best for your child's disease state?
   a. Yes
b. No

5. What are some of the constraints you face in proper dietary planning for your child?
   a. Lack of time
   b. Lack of patience
   c. Given up
   d. Specify others…………………………………………………………………

………………………………………END………………………………………
APPENDIX I: OBSERVATION CHECKLIST

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Sometimes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the patient able to sit upright?</td>
<td>...........</td>
<td>...........</td>
<td>...........</td>
</tr>
<tr>
<td>Is the patient able to walk?</td>
<td>...........</td>
<td>...........</td>
<td>...........</td>
</tr>
<tr>
<td>Is the patient totally incapacitated?</td>
<td>...........</td>
<td>...........</td>
<td>...........</td>
</tr>
<tr>
<td>Can patient eat food without assistance?</td>
<td>...........</td>
<td>...........</td>
<td>...........</td>
</tr>
</tbody>
</table>

2. General conditions of the child
   a) child is dull   b) active   c) disinterested

3. Clinical signs of nutritional status

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>Rashes</td>
<td>rough skin</td>
<td>sores</td>
<td>normal</td>
</tr>
<tr>
<td>Hair</td>
<td>Sparse hair</td>
<td>silky hair</td>
<td>brown hair</td>
<td>black hair</td>
</tr>
<tr>
<td>Teeth</td>
<td>White</td>
<td>brown</td>
<td>molted</td>
<td>dental carries</td>
</tr>
<tr>
<td>Mouth</td>
<td>Sore mouth</td>
<td>dry mouth</td>
<td>unable to chew</td>
<td>normal</td>
</tr>
<tr>
<td>Eyes</td>
<td>Red eyes</td>
<td>swollen eyes</td>
<td>itchy eyes</td>
<td>normal</td>
</tr>
</tbody>
</table>
APPENDIX J: MEDICAL HISTORY FORM

This was filled from hospital records

1. Date of diagnosis………………………………………………………………
2. On diagnosis of disease
   Weight……………………………………………………………………
   Height/length…………………………………………………………
   MUAC………………………………………………………………
   BMI…………………………………………………………………
3. Date started on chemotherapy………………………………………………
4. Date of last visit………………………………………………………………
5. Anthropometric measurements in the last visit
   Weight ……………………………………………….………………….
   Height/Length …………………………………………………
   MUAC ………………………………………………..………………
   BMI …………………………………………………..………………
6. Which cancer does the child suffer from
   a. Acute Lymphoblastic Leukemia
   b. Kidney cancer
   c. Hodgkin’s disease
   d. Burkett’s Lymphoma
   e. Ewing sarcoma
   f. Any other specify ………………………………………
7. Major complications?
   ………………………………………
8. Any nutritional problem(s) from records
   ………………………………………
APPENDIX K: NUTRITIONAL RISK SCORE (NRS-2002)

PAEDIATRICS (0-204 months)

1. PATIENT WEIGHT

<table>
<thead>
<tr>
<th>Code No</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Expected weight for length</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>90 – 99% Of expected weight for length</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>80 – 89% Of expected weight for length</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>≤ 79% Of expected weight for length</td>
<td>3</td>
</tr>
</tbody>
</table>

2. APPETITE

- Good appetite manages most of 3 meals/day 0
- Poor appetite, poor intake 1
- Appetite nil unable to eat 2

3. ABILITY TO EAT/RETAIN FOOD

- No difficulties in eating Able to eat independently 0
- Problem holding food 1
- Difficulty swallowing regains modified consistency 2
- Unable to take food orally, severe vomiting and diarrhea 3

4. STRESS FACTOR

- No stress 0
- Mild minor surgery 1
- Moderate chronic disease major surgery, infections 2
- Severe multiple injuries, carcinoma/malignant diseases 3

TOTAL SCORES
APPENDIX L: Lansky Score

Children, who might have more trouble expressing their experienced quality of life, require a somewhat more observational scoring system:

100 – fully active, normal
90 – minor restrictions in strenuous physical activity
80 – active, but tired more quickly
70 – greater restriction of play and less time spent in play activity
60 – up and around, but active play minimal; keeps busy by being involved in quieter activities
50 – lying around much of the day, but gets dressed; no active playing participates in all quiet play and activities
40 – mainly in bed; participates in quiet activities
30 – bedbound; needing assistance even for quiet play
20 – sleeping often; play entirely limited to very passive activities
10 – doesn’t play; does not get out of bed
0 – unresponsive
APPENDIX M: MAP OF MTRH IN UASINGISHU COUNTY