

Research Article

Dietary Practices of Cancer Outpatients at Nyeri County Referral Hospital, Kenya; A Cross Sectional Survey

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Abstract

The global burden of non-communicable diseases remains unacceptably high and Kenya is among the countries experiencing an epidemiological transition from the communicable to non-communicable diseases. In Kenya, cancer is the second leading cause of non-communicable disease related mortalities after the cardiovascular diseases and Nyeri County is among the counties that are leading in this burden of non-communicable diseases. This study sought to assess the dietary practices of the cancer patients on chemotherapy at Nyeri County and Referral Hospital in comparison with the recommended dietary practices. Analytical cross-sectional study design was employed and the data on the dietary practices was collected using a 24-hour recall and a Food Frequency Questionnaire (FFQ). Sixty one percent of the respondents were female while 39% were male. Sixty one percent had acquired primary school education and half of the respondents survive on a monthly income of between 0-10,000. Breast cancer was the most common cancer type in the population (39%), followed by esophageal and throat cancer at 14.5% and gastric cancer at 14%. Prostate cancer was the most prevalent among the male respondents at 11%. The mean energy intake of the respondents was 1068± 520 Kcals which was not meeting the requirements as per the ESPEN clinical guidelines on cancer. The dietary patterns identified from the research were, excessive consumption of foods from the starchy foods and the fats category (65.1%) and less than half (41.9%) were not attaining the minimum daily requirements of the fruit's servings recommended by the World Health Organization (WHO). Nutrition education and counselling is key in improving the dietary practices among the cancer patients. However, 44.19% had not received nutrition education and counselling regarding the appropriate diet to consume in the course of their treatment. This study found out that the dietary practices of the cancer patients do not meet the recommended clinical guidelines on cancer nutrition and almost half of the population had not received nutrition education and counselling services. Social and behavior change is one of the possible strategies that could be adopted to deliver nutrition information to the population, to improve the knowledge, attitude and dietary practices of cancer patients in Kenya, which in turn will improve their nutrition outcomes.

Keywords

Dietary Practices, Nutrition Status, Food Frequency Questionnaire, 24-hour Recall, Body Mass Index, Malnutrition Risk

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1. Introduction

Cancer is the second leading cause of non-communicable related mortalities after the cardiovascular diseases in Kenya [1] and approximately 10-20% of these mortalities are due to cancer-related malnutrition and not as a result of the tumor [2]. The cancer burden in Kenya has been increasing with a reported incidence of 42,116 and a mortality of 27,092 cases in 2020 [3]. Besides the normal cancer pathogenesis, a huge percent (90%) of cancers cases develop as a result of lifestyle factors such as consumption of tobacco and alcohol, high levels of physical inactivity and sub-optimal diet, with the latter contributing to 5-10% of the total cases [4]. This therefore indicates that consuming a healthy diet and in adequate amounts helps in prevention of both the tumor itself and also malnutrition among the cancer patients [5-7].

A healthy diet has a role both in cancer prevention and management. Natural polyphenols have been well studied to examine their possible health effects especially defense against oxidative stress because they contain anticancer properties [8]. Long chain N-3 fatty acids or fish oils have been used as supplements for cancer patients on chemotherapy in order to stabilize or improve appetite [7]. Dietary fish and marine omega-3 PUFAs have also been associated with survival of cancer patients because of their anti-inflammatory activity [9].

A Mediterranean diet (MedDiet- a recommended cancer diet) is rich in complex carbohydrates, adequate amounts of fruits, vegetables and nuts. It also entails limited processed foods, red meats, poultry and dairy and it has been used in cancer management widely, although its uptake is still low in most countries [4]. Other nutrients that have been associated to cancer management because of their various functions in the body is Vitamin D and selenium [10].

The ESPEN guidelines states the Total Energy Expenditure (TEE) of a cancer patient is similar to that of a healthy individual which ranges from 25-30kcal/kg/day. The amount of protein considered adequate for the cancer patients is 1g/kg/day, and if possible, a cancer patient should consume 1.5g/kg/day of proteins. Vitamins and minerals are key in management of cancer patients. Their requirements are as per the RDA and there is need to supply them in adequate amounts to avoid instances of micronutrients deficiencies [7]. The Kenya cancer policy 2019-2030 outlines that 27% of Kenyans are overweight and obese while 94% of people do not consume fruits and vegetables [11].

A 2023 meta-analysis showed that dietary fish and marine omega-3 PUFAs were associated cancer patient's survival as a result of their anti-inflammatory activity. A consumption of about 300mg of the omega 3 PUFAs has a potential to reduce the mortalities of cancer patients by 13% [9]. This is similar to World Health recommendations of a healthy diet. The WHO outlines that a healthy diet should contain a minimum of 400g (5 servings) of fruits and vegetables in a day, adequate legumes such as beans, adequate nuts and complex carbohy-

drates, with less than 10% of total intake coming from free sugars [5]. A high protein intake especially plant-based origin lowers the risks of mortalities from cancer and other non-communicable diseases. Increasing the plant protein and also replacing the animal protein with plant protein would result in a healthier population [12].

The National cancer taskforce report released in 2022 on the cancer status in Kenya revealed that there is limited cancer research both in capacity and availability to inform policy [13]. On this basis, this study aimed at assessing the dietary practices of cancer patients on chemotherapy attending Nyeri County Referral Hospital.

2. Materials and Methods

2.1. Research Design

This study employed analytical cross-sectional study design to collect data on the sociodemographic and economic characteristics of the cancer patients and collect data on their dietary practices. A similar study in Korea on iodine status of among the thyroid cancer patients utilized a 24-hour recall and an FFQ to collect the dietary data, employing a cross sectional study design [14].

2.2. Study Area

This study was done in Nyeri County Referral Hospital in Nyeri County, Kenya. The county is experiencing a rise in the non-communicable diseases [15, 16]. The hospital has a bed capacity of 407 beds, providing both in- and out-patients care, serving a population of over 800,000 residents.

2.3. Sample Size Determination and Sampling Strategy

Fischer's formula [17] was used to estimate a sample size of 185 respondents at 95% Confidence Interval, 0.05 margins of error with an assumed malnutrition prevalence in Nyeri at 0.5 and an estimated non-response rate of 10%. The list of participants attending the clinic was used to select the sample using systematic random sampling. The first respondent was randomly selected using the table of random numbers generated from www.stattek.com to determine the starting point. Every second respondent was systematically drawn until 185 respondents were achieved. The research team interviewed the respondents during the two days of clinic visits for a period of three weeks.

2.4. Validity and Reliability

Pre-testing of the research instruments enhanced the validity and reliability of the research instruments and the meth-

odology. 10% of the total sample (18 respondents) was used in pre-testing the data collection tools at Meru County and Referral Hospital. Pre-testing aimed at evaluating the efficacy of the research instruments, sampling strategies and the method that the researcher had chosen for data analysis. It also aimed at enhancing the validity and reliability. Internal consistency (split half) method was used to indicate the degree of homogeneity of the items in the research instrument. The items on the instrument were divided into two. Reliability analysis was conducted on both sets of data and a reliability coefficient of 0.725 was generated, which is considered adequate for group studies [18].

2.5. Data Collection Procedure

There are a number of dietary assessment methods that can be used to collect dietary data. A prospective study in UK that aimed at assessing the dietary intake and colorectal cancer utilized a 24-hr recall and a food frequency questionnaire which are applicable in a cross-sectional study [19, 20]. The estimates acquired from the FFQ were used to identify dietary patterns, while the 24-hour recall was used to estimate the macro-and the micro- nutrient intakes of the cancer patients at NCRH. The food frequency questionnaire was designed guided by the National Guidelines for healthy diets and physical activity (2017) [5] and the Nutrition assessment and counselling (NACs) user guide, (2016). Nine food groups were included, with the consumption estimated as daily or weekly, and an average number of servings indicated. The 24-hour recall was adopted from the Nutrition assessment and

counselling (NACs) user guide, (2016).

2.6. Data Analysis

SPSS software version 27 was used to analyze the data. Nutri-survey 2007 was used to analyze the 24-hr recall data that collected individual nutrient intake. Parametric statistical tests were performed on the data, putting into consideration the assumptions of parametric tests. Measures of association (correlations) was performed to establish the strength of relationship between variables. Pearson moment correlation statistical tool was used to determine the correlation. Relationship between two categorical variables was investigated using Chi square tests. The statistical significance threshold was set at $\alpha=0.05$ (two tailed).

3. Results

3.1. Socio-Economic and Demographic Characteristics of the Study Population

The study had a 93% response rate which is within the acceptable range [21]. Sixty one percent were female while 39% of them were male. The mean (SD) age of the respondents was 65.9 for male and 55.8 for female. The youngest respondent in the population was 23 years old, with the oldest being 93 years old. Half of the respondents survive on a monthly income of between 0-10,000 Kenyan shillings and only 2.6% of the respondents earning more than Ksh. 50,000.

Table 1. Socio-economic and demographic characteristics of the study population.

Respondent's Characteristics	Frequency	Percent (%)
Respondents gender	N=172	
Male	67	39.0
Female	105	61.0
Religion		
Christianity	165	95.9
Muslim	7	4.1
Respondent's education level		
Primary	105	61.0
Secondary	50	29.1
College	16	9.3
University	1	.60
Marital Status of the respondents		
Married	125	72.7
Single	31	18.0

Respondent's Characteristics	Frequency	Percent (%)
Widowed/Deceased	16	9.3
Monthly Income		
0-10,000	86	50.0
10,000-20,000	49	28.5
20,000-50,000	32	18.6
50,000-100,000	5	2.9

There was a statistically significant association between education level and the monthly income of the respondents at $p < 0.05$ rejecting a null hypothesis that there is no association between education level and the monthly income of the respondents.

3.2. Clinical Diagnosis of Cancer

Various cancer types were reported by the respondents,

with the largest percentage of respondents having breast cancer (39%), followed by esophageal and throat cancer at (14.5%) and gastric cancer at 14%. Prostate cancer was the most prevalent among the male respondents at 11%. Other cancer cases reported included colon cancer (7%), ovarian cancer (2.3%), cervical cancer (2.9%) and bone marrow (1.2%).

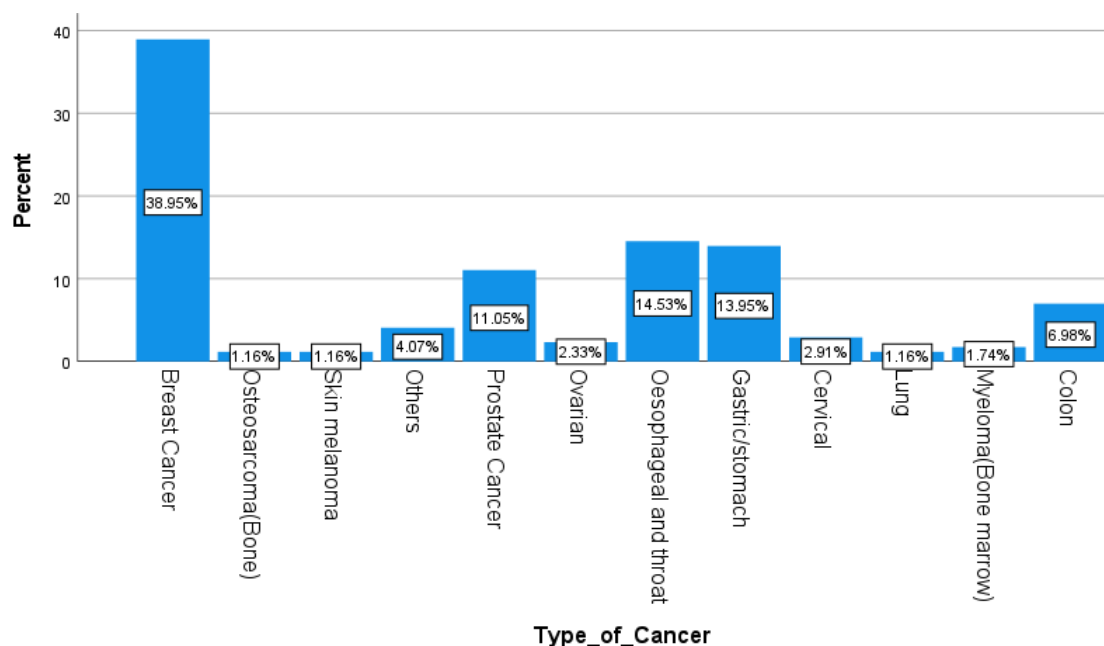


Figure 1. Distribution of the respondents by cancer types.

3.3. Nutritional Education and Counselling

A professional advice on nutrition is very key in cancer

patients on chemotherapy. In this study, 55.81% of the respondents had received a professional advice on dietary intake during chemotherapy compared to 44.19% who had not received any nutritional counselling.

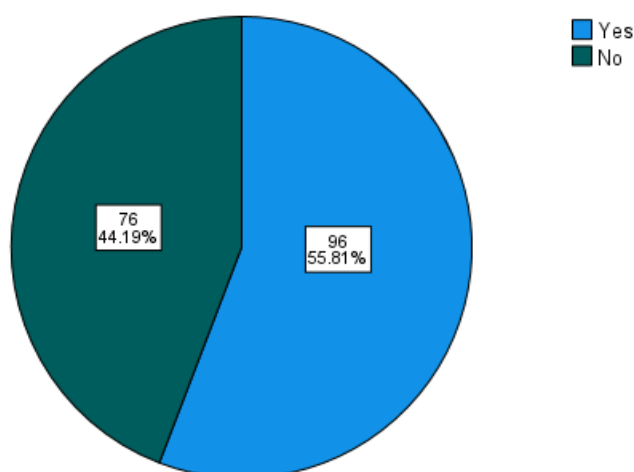


Figure 2. Nutrition education and counselling.

3.4. Individual Dietary Intake (24 Hour Recall)

The aim of the dietary assessment (24 hr. recall and FFQ) was to characterize the dietary patterns of the respondents. The quantified 24hr-recall allowed for the calculation of individual energy and nutrients intakes. The conversion of the household measures to meaningful weights was done using a food composition database (Nutrisurvey 2007).

The mean energy intake of the 172 respondents was 1068+-520 Kcals, 112+- 83g of carbohydrates, 46.8+-42g of protein and 27.1+-27 g of fats. Micronutrients are key in cancer care. 30-90% of cancer patients supplement their diets with micronutrients that support antioxidative process and immune-stabilizing roles. The commonly required micronutrients for cancer care are Vitamin C, Vitamin D and selenium for the antioxidative role.

Table 2. Mean dietary intakes.

	Minimum	Maximum	Mean	S. D
Energy	169.30	3283.30	1068.61	520.62639
Water	240.80	3288.00	959.365	361.86533
Protein	5.50	443.40	46.8308	42.66351
Fat	.00	154.80	27.1380	27.57125
Carbohydrate	2.20	434.50	112.922	83.49550
Dietary Fiber	3.10	68.40	20.6814	12.21267
Alcohol	.00	272.10	46.1819	77.37332
PFA	.00	102.00	9.8035	14.78217
Cholesterol	.00	1102.70	92.2727	210.72963
Vitamin A	.00	23858.30	1137.71	2846.01160
Carotene	.00	7595.60	595.959	1310.93351
Vitamin E	.00	643.50	32.0442	101.53486
Vitamin B1	.10	2942.00	278.205	646.14196
Vitamin B2	.00	5892.70	107.107	618.01408
Vitamin B6	.00	3.00	.5390	.64513
Folic Acid	.00	1213.80	187.581	239.61854
Vitamin C	.10	436.30	78.6814	79.17806
Sodium	.70	5551.00	911.995	1087.75025
Potassium	165.30	8290.50	2105.25	1083.95038
Calcium	28.00	1704.50	416.126	269.89709
Magnesium	32.00	623.70	224.268	95.84983
Phosphorus	98.00	3276.00	849.868	423.89742
Iron	1.20	41.50	10.6581	6.20451
Zinc	.90	28.30	6.2738	4.58614

3.5. Comorbidities

Based on the Charlson comorbidity index, most cancer patients at NCRH had hypertension (54.7%), followed by Dia-

betes Mellitus (22.1%) and obese cases were 11.6%. The figure 3 below is a representation of the distribution of the respondents by the comorbidities present.

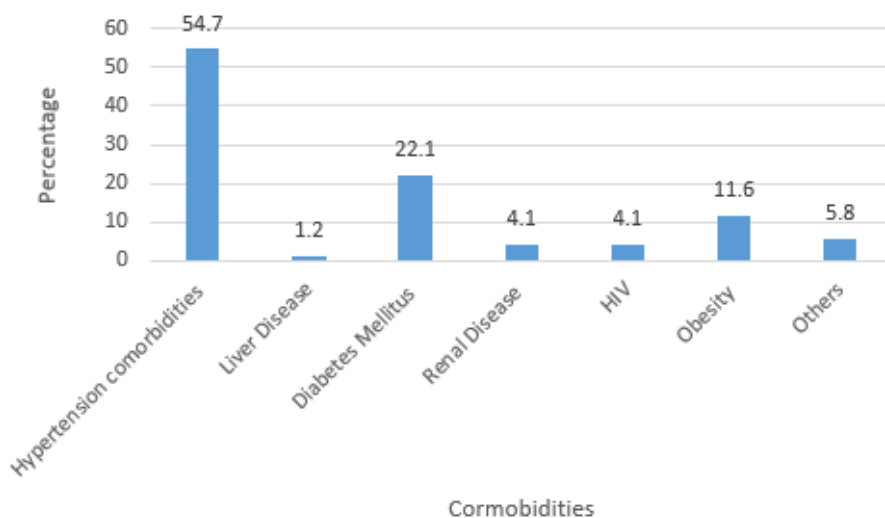


Figure 3. Distribution of respondents by the comorbidities.

3.6. Frequency Consumption of Various Foods by the Respondents (FFQ)

The starchy foods and the fats and oils category were the most consumed foods (65.1% respondents reporting to be taking them on a daily basis). Less than half (41.9%) were not

attaining the minimum daily requirements of the fruit's servings, with 2.3 % rarely consuming fruits at all. A very small percent of people (8.7%) incorporated nuts and seeds in their diets with the largest percentage consuming the minimum serving. Similarly, a small percentage (37.8%) of respondents consumed milk and milk products key in bone strengthening.

Table 3. Frequency consumption of various foods by the respondents.

% FREQUENCY (N=172)				
Food Group	Daily	Weekly	Rarely	Average Serving
Starchy foods	65.1	34.9	0	Large (65.1%)
Vegetables	57.6	42.4	0	Large (48.8%)
Fruits	41.9	55.8	2.3	Small (40.7%)
Legumes and pulses	60.5	37.8	1.7	Large (55.2%)
Nuts and seeds	8.7	44.2	47.1	Small (73.3%)
Meat, fish, animal protein	15.1	74.4	10.5	Small (61.1%)
Milk and milk products	37.8	43.0	19.2	Small (47.1%)
Fats and oils	65.1	27.9	7.0	Large (55.8%)
Sugar and sweets	33.1	33.7	33.1	Small (47.1%)
Condiments, spices and beverages	8.1	19.2	72.7	Small (83.7%)
Alcohol	2.3	2.9	94.8	Small (95.3%)

4. Discussion

4.1. Socio-Economic and Demographic Characteristics of the Respondents

Both men and women are affected by cancer non-selectively. More female (61%) had different types of cancer compared to male (39%), with the leading type of cancer among female being breast cancer (39%) and prostate cancer being the leading cancer type in men (11%). These findings agree with the 2020 global cancer statistics, where breast cancer surpassed the lung cancer incidence and was top of the commonly diagnosed cancers at 11.7% globally, and prostate was top leading male cancer at 7.3% [3]. However, this study reveals higher statistics compared to the global estimates, indicating that there may be gaps in the cancer reporting or that it is because this study focused on the cancer patients on chemotherapy only. The average age of the respondents was 65.9 for male and 55.8 for female. A previous study on the diagnostic assessments in various cancer centers in Kenya, found that the most frequent age for the males is 65 and females 55 [17], similar to what this study found.

Income inequality has been increasing worldwide, education is one of the markers of financial stability and there is clear evidence that the higher the education level, the greater the chances of securing a formal employment and a higher income in response [22]. Cancer care has been reportedly expensive and a big percent of the population requires to pay for some of the services since the National Health Insurance Fund does not comprehensively cover cancer treatment. In addition, the educated cancer patients have access to private care, improving their treatment outcomes. The significant association between education level and the monthly income of the respondents ($p < 0.05$) was confirmed by this study. This explains why most of the respondents (61%) who had the basic primary education level had limited ability to comprehensive health care.

Most of the respondents (72.7%) were married, 18% were single while 9.3% were either divorced or widowed. A study shows that cancer survival is poorer among the unmarried compared to its counterparts who are married [23]. Prognosis associated with cancer diagnosis is influenced by marital status. The explanation is unclear, but researchers have tried to associate this with married individuals having the ability to follow up course of therapy compared to their unmarried counterparts. Another attempt to explain this association is that the married partners seem to present with early tumors, unlike the unmarried, yet this explanation remains unclear [24].

4.2. Nutrition Education and Counselling

Nutrition education and counseling is very key in cancer care. This is because the non-communicable diseases such as

cancer, hypertension, and diabetes co-exist due to the fact that they have shared risk factors [25]. Co-morbidities that were present among the cancer patients at NCRH were hypertension, followed by Diabetes Mellitus and obesity. If a reduction in these chronic diseases has to be realized, the entire population requires nutrition education and counselling on how to prevent the non-communicable diseases through healthy lifestyle.

Despite the significant role played by nutrition education in improved nutrition outcomes, 44.19% of the respondents had not received any nutritional education in the course of their treatment. Almost thirty five percent of the respondents who had not received nutritional education reported that there are certain foods that they do not consume at all during treatment. Most of the reasons that they gave were not based on any scientific proof but was based on counsel from either relatives or village mates. One of the reported misconceptions that was reported is that, 'sugary foods acts as food for the tumor,' that is why most of them (9.3%) would avoid carbohydrates from their diets. This justifies the need for comprehensive nutrition education among the cancer patients.

4.3. Dietary Practices of Cancer Patients

Dietary patterns of the cancer patients are very pertinent and they need to be closely monitored to prevent cancer related malnutrition [26]. If cancer care has to attain the required standards, there is need to ensure nutrition and specifically dietary practices are monitored and the patients are guided accordingly. The American Cancer Society guidelines for a healthy diet recommends consumption of nutrient dense foods to maintain a healthy body weight for the cancer patients, consume adequate fruits and vegetables whole grains, limited use of red and processed meats, sugars and processed foods [26].

The mean energy intake of the 172 respondents was 1068 \pm 520 Kcals, 112 \pm 83g of carbohydrates, 46.8 \pm 42g of protein and 27.1 \pm 27 g of fats. The ESPEN practical guideline recommends that the total energy expenditure of the cancer patients should be between 25-30kg/kg/day and the mean weight of the respondents was 60.4kgs \pm 13.9. From the ESPEN guidelines, the minimum energy consumption of the respondents should be 25kcal*60.4 which gives 1510kcal. The mean energy consumption of this population is lower than the minimum recommended energy intake of the cancer patients according to the ESPEN clinical guidelines. This can be linked to the nutrition impact symptoms such as nausea, vomiting and diarrhea, which cancer patients experience while undergoing treatment [27] in addition, micronutrients are key in cancer care. 30-90% of cancer patients supplement their diets with micronutrients that support antioxidative process and immune-stabilizing roles. The commonly required micronutrients for cancer care are Vitamin C, Vitamin D and selenium for the antioxidative role [10].

Using the Food frequency questionnaire, starchy foods and the fatty foods categories were the most consumed with majority of the respondents reporting to be taking them on a daily basis. This may be because the highest percentage of the respondents (40.1%) are farmers and mostly the starchy foods are readily available. However, this poses nutritional risks to them. The non-communicable diseases risk factors are similar, the main one being obesity and diets rich in fats and starches. Obesity pathophysiology is also linked to fat deposition associated with excessive intake of fats and carbohydrates [28]. Whole grains for cancer care increase the bulkiness of stool. Bulky stools have an increased transit time which reduces the interaction between carcinogenic substances with normal cells [21]. It also limits the bacterial endotoxins which damages the cells from being absorbed. The whole grains are rich in fiber. During the digestion process, fiber breaks down into short chain fatty acids which are a source of energy that the cancer cells have the inability to utilize. This lowers the growth and development of the cancer cells [29].

Less than half (41.9%) were not attaining the minimum daily requirements of the fruit's servings, with 2.3 % rarely consuming fruits at all. The WHO recommends of 3-5 servings of fruits and vegetables per week which was not being met by 41.9% of the respondents. Fruits and vegetables are associated with antioxidants that are so important in management of cancer. The anti-oxidant properties of flavonoids, Vitamin C and E and carotenoids are mostly found in fruits and the dark green vegetables. A very small percent of people (8.7%) incorporated nuts and seeds in their diets with the largest percentage consuming the minimum serving. Nuts and seeds are important sources of poly-unsaturated fatty acids, and specifically omega 3 and omega 6 fatty acids. Omega 3 fatty acids have been associated with reduction in inflammation, reduced angiogenesis, and metastasis and reduced proliferation of cells [30].

A small percentage (37.8%) of respondents consumed milk and milk products, which are very high sources of calcium, key in bone strengthening. One of the common problems associated with chemotherapy treatment in cancer care is bone loss. Chemotherapy drugs such as doxorubicin and cisplatin reduce calcium levels in the body, leading to body loss, (MD Anderson, 2020). This must be supplied in adequate amounts together with Vitamin D rich foods because optimal levels of Vitamin D are necessary to enhance calcium absorption. This study reveals that a small percentage of the respondents consumed foods from the fish and meats categories, which is the main dietary source of Vitamin D.

5. Conclusions

Dietary assessment of cancer patients is key for revealing the dietary practices which have impact on their nutrition status. The findings from this study reveal inappropriate dietary practices among the cancer patients at Nyeri County and Referral Hospital. A 24-hour recall and a Food Frequency

Questionnaire are key dietary assessment tools which can be easily adopted for use in a hospital setting to determine the dietary adequacy and patterns of these patients which informs the specific nutrition interventions for the patients. In addition, Nutrition education on the appropriate diet during treatment is a potential strategy for improved dietary practices of the cancer patients. Social and behavior change approaches can be adopted to deliver the key nutrition messages for improved dietary practices of cancer patients in Kenya.

Abbreviations

ESPEN	European Society for Clinical Nutrition and Metabolism
BMI	Body Mass Index
NCRH	Nyeri County Referral Hospital
FFQ	Food Frequency Questionnaire

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Author Contributions

Dorothy Bundi: Conceptualization, Formal Analysis, Investigation, Methodology, Project administration, Software, Writing – original draft

Peter Chege: Conceptualization, Supervision, Writing – review & editing

Regina Kamuhu: Supervision, Writing – review & editing

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Data Availability Statement

The data supporting the outcome of this research work has been reported in this manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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Biography



Dorothy Kareainto Bundi is a Nutrition technologist at Dedan Kimathi University of Technology. She is a master's student at Kenyatta University and holds a Bachelor's degree from Egerton University, (2015).



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Research Field

Dorothy Kareainto Bundi: Non-communicable diseases and nutrition, Child and maternal nutrition

Peter Chege: Agri-nutrition, Community nutrition, Food security, Micronutrients, Livelihood studies

Regina Kamuhu: HIV dyslipidaemia, Utilization of groundnuts/peanut in treatment of lipid disorders in HIV and diabetes.