

**NUTRITIONAL KNOWLEDGE AND DIETARY DIVERSITY OF CANCER  
PATIENTS AT THE CANCER TREATMENT CENTRE, KENYATTA  
NATIONAL HOSPITAL, KENYA**

**Muthike CW<sup>1</sup>, Imungi J<sup>1</sup> and G Muchemi<sup>2</sup>**



**Caroline Wakuthie Muthike**

\*Corresponding author email: [muthikec@yahoo.com](mailto:muthikec@yahoo.com)

<sup>1</sup>Institutional address: University of Nairobi- Department of Food Science, Nutrition and Technology

<sup>2</sup>Institutional address: University of Nairobi- Department of Public Health Pharmacology and Toxicology P.O Box 29053-00625 Nairobi- Kenya

## ABSTRACT

Cancer cases are on the increase in Kenya and have become one of the leading public health issues. This increase is possibly attributed to change in behavior and adoption of predisposing factors such as increase in environmental carcinogens and unhealthy lifestyles. Cancer patients undergo treatment regimes such as chemotherapy and radiotherapy. The treatment regimes are aggressive and result in side effects that lead to cancer cachexia. However, cancer patients are not equipped with the necessary information to handle these side effects in the required way to ensure a good nutrition status as treatment progresses. The purpose of the study was to show the relationship between nutritional knowledge and dietary diversity among cancer patients. Dietary diversity was used as an indicator of dietary practice. A cross sectional study was done on 132 patients selected through simple random sampling technique, attending the cancer treatment centre clinic at Kenyatta National Hospital from October to November 2012. Patients interviewed were either undergoing chemotherapy or radiotherapy. Interviewer administered questionnaires were administered voluntarily to the patients. Each questionnaire captured information on the patient's socio-demographic and economic status, type of cancer, nutritional knowledge, and dietary diversity. The data was analyzed using SPSS Version 16.0 (2007) statistical software. The patients were predominantly middle-aged (36-59yrs) with cancer most prevalent being breast cancer (55%) among women and prostate cancer among men (21%). The mean of total nutrition knowledge score among the cancer patients was  $46 \pm 2\%$ . The average dietary diversity score was  $4 \pm 1$ . The Pearson's correlation coefficient between nutrition knowledge and Dietary Diversity Score (DDS) was 0.15 ( $P > 0.05$ ). The patient's nutritional knowledge was positively correlated with the dietary diversity score. This meant that patients with good nutrition knowledge had more diverse diets. However, the correlation was not statistically significant. Therefore, nutrition knowledge should be included during dietary counseling of patients to enable them improve their dietary practice.

**Key words:** Nutritional knowledge, Dietary diversity, Cancer, Dietary behavior, Cachexia

## List of Abbreviations

CTC- Cancer Treatment Centre

NK- Nutrition Knowledge

KNH- Kenyatta National Hospital

DDS- Dietary Diversity Score

ARV- Antiretroviral Therapy



## BACKGROUND

Cancer is a global concern with an estimated incidence of 12.7 million and 7.6 million deaths from cancer in year 2008. In Africa approximately 715,000 new cases were diagnosed with 542,000 deaths occurring in 2008 [1]. Nutrition and cancer have been shown to be associated since the 20th century [2]. For instance, a prospective study has shown evidence that caloric restriction slows growth rates for breast cancer [3]. Red meat on the other hand, has been shown to have a causative role for development of colon and prostate cancer [4]. The relationship between nutrition knowledge and dietary practice is agreeable as indicated by two studies: one of the studies indicates that nutrition knowledge is an important factor in determining food choices, and hence practice [5], and the other study of middle aged men in France showed that the nutrition knowledge was associated with specific patterns of food choice and nutrient intake, thus concluding that nutrition knowledge influenced the men's dietary behavior [6].

Cancer survival trends in the developing countries are worrying due to a combination of late stage diagnosis and limited access to treatment [7]. Due to the effects of nutrition on cancer dietitians play a critical role. However, this role is usually underutilized in the oncology setting [8]. Giving optimum nutrition knowledge to patients enables them to make right choices in selecting their diet [9]. This in turn results in optimal nutritional status, which results in positive prognosis and prevents cancer recurrence [9].

As a way of combating cancer, Kenya and Africa as a whole have to develop effective strategies to cope with the problem of cancer by including education and information so as to raise the profile of cancer and promote focus on prevention. Cancer patients who practice proper dietary habits may have reduced risk for disease recurrence and functional decline [9]. A study has shown that dietary counseling based on regular foods improved the dietary behavior of cancer patients, resulting in an improved nutritional status and lessened morbidities [10]. This study sought to establish whether patients possess the required nutritional knowledge and if the knowledge translates into their dietary diversity.

Dietary diversity is normally used to evaluate the dietary practice in terms of quality and adequacy [11]. A study done on obese women in Iran showed that dietary diversity score was associated with a lower risk of obesity [11]. This shows that there is a possible relationship between a disease condition and dietary diversity score.

## METHODOLOGY

### Study Design

This study adopted the descriptive cross-sectional design and used a structured questionnaire to get quantitative information. The participants enrolled in the study comprised of cancer patients attending the Kenyatta National Hospital Cancer Treatment Centre (CTC) located in Upper Hill area in Nairobi, Kenya.

### **Study population**

The study population consisted of 132 consenting cancer patients attending CTC between October and November 2012.

### **Inclusion and exclusion criteria**

The study included ages of 15 years and above excluding those patients who were critically ill hence incapable of responding to questions. Those below 14 years were attending the pediatric section.

### **Sampling**

The Kenyatta Hospital CTC normally receives about 40-50 patients per week. The study took 3 weeks and (3×40) 120 patients. The three weeks was appropriate since each round of chemotherapy and radiotherapy took 3 weeks. Patients in the clinic were selected through simple random sampling as per the nurse register and were requested to participate in the study voluntarily. A total of 132 patients were interviewed from October to November 2012.

A structured questionnaire was developed to determine dietary diversity and nutrition knowledge of patients attending the CTC. The questionnaire was divided into three sections: the first part was designed to obtain information on socio-demographic and socio-economic status, the second part was to evaluate the nutrition knowledge and the last part was to obtain information on dietary diversity of patients. The nutrition knowledge section was based on Parmenter and Wardle nutrition knowledge questionnaire [5] while the dietary diversity questionnaire was based on the developed Food Agriculture Organization (FAO) food groups for individuals [12].

### **Pretesting of the questionnaire**

Fourteen patients from the cervical cancer ward at KNH were voluntarily interviewed during pretesting of the questionnaire. Modifications were made on the clarity of questions and repetitions that were occurring. The patients used in the pretest did not form part of the study sample.

### **Data collection**

Data collection included both qualitative and quantitative methods. The quantitative approach was used to provide actual statistics on nutritional knowledge status while qualitative research methodologies offered explanations of dietary practices of cancer patients. The questionnaire was interviewer administered.

### **Social Demographic and Economic Characteristics**

The information sought in the questionnaire included gender, age, and level of education, type of cancer, income and occupation. This information was obtained by inquiring from the respondents.

### **Nutritional Knowledge**

To determine the nutritional knowledge, assessment and scores was based on the tool by Parmenter and Wardle [5]. The nutritional knowledge tool was a questionnaire divided in to four sections. The first section involved questions on recommended

intakes of food. The second section had questions which focused on the patients' knowledge on food groups. Patients were asked about nutrients contained in particular foods for example "are nuts a source of fat?" The third section was on assessment of food choices. The questions were designed in such a way that the patient chose according to his/her knowledge the best option and not according to his/her likes or dislikes for example "which would be the best choice for low fat high fiber snack?" The fourth section sought to determine the knowledge of patients on diet related diseases for example asking "are you aware of any disease that is related to how much sugar people eat?" Later, the responses were marked; for every correct response one mark was given, for every wrong response no mark was given. A compiled score from all the sections was used to give a total nutritional knowledge score. The nutritional knowledge was rated on percentages. Respondents' scores were graded using three cutoff points based on normal distribution curve scale. Low Nutritional Knowledge – less than 34%; Adequate Nutritional Knowledge – between 34% -66%; High Nutritional Knowledge- Above 66%.

### **Dietary diversity of cancer patients**

Dietary diversity of the patients was calculated by summing 16 food groups consumed by the individual respondent over the 24-hour recall period. The following steps were followed in creating the IDDS (Individual Dietary Diversity Score): new food group variables for those food groups that need to be aggregated were created to form a total of nine food groups.

### **Data Analysis**

Data entry templates were developed using SPSS v.16 software. Quantitative data was explored to check for outliers (extreme values too high above the mean value or too low below the mean value). Where outliers were found, they were deleted. Categorical variables (nominal variables, example-. male and female) were analyzed using frequencies and proportions while measure of central tendency and dispersion was used for continuous variables. To examine the relationship between dietary diversity and nutrition knowledge of patients, cross tabulation and correlation was done. This was done in order to examine the association between nutritional knowledge and dietary practices. A P-value that is less than alpha ( $P < 0.05$ ) was considered to be statistically significant.

### **Ethical approval**

Approval to carry out this research was granted by Kenyatta National Hospital/University of Nairobi Ethical Research Committee (KNH/UON-ERC). Informed consent was sought from patients and the procedure of answering questions was explained to them. Confidentiality of the information was maintained.

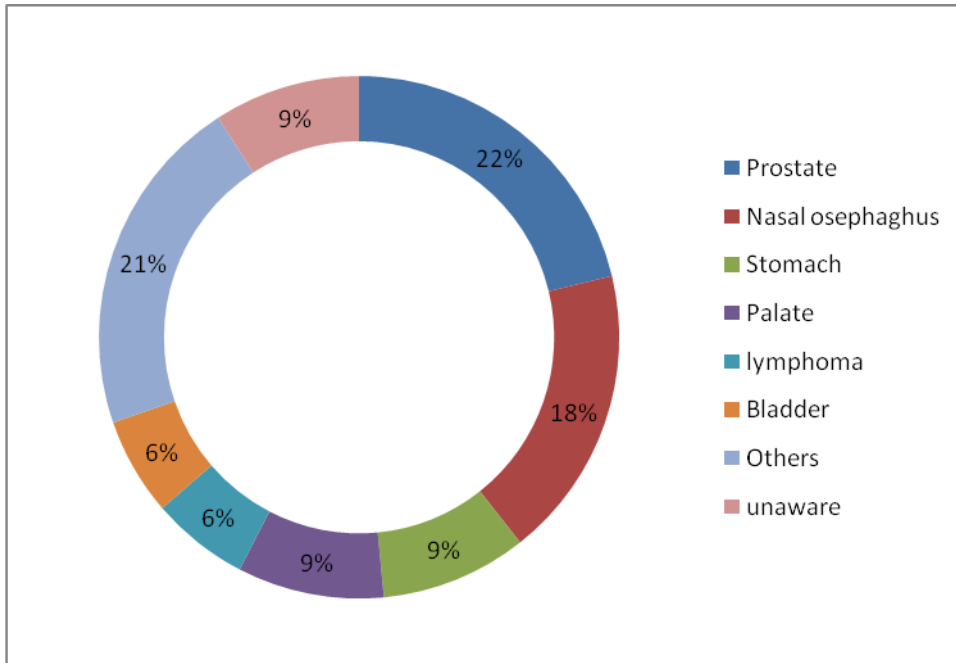
## **RESULTS**

### **Socio-Demographic Characteristics**

Majority (75%) of the patients were female, 40% had secondary education and 68% were married. About half (58%) were middle aged with mean age of 50 years (Table 1).

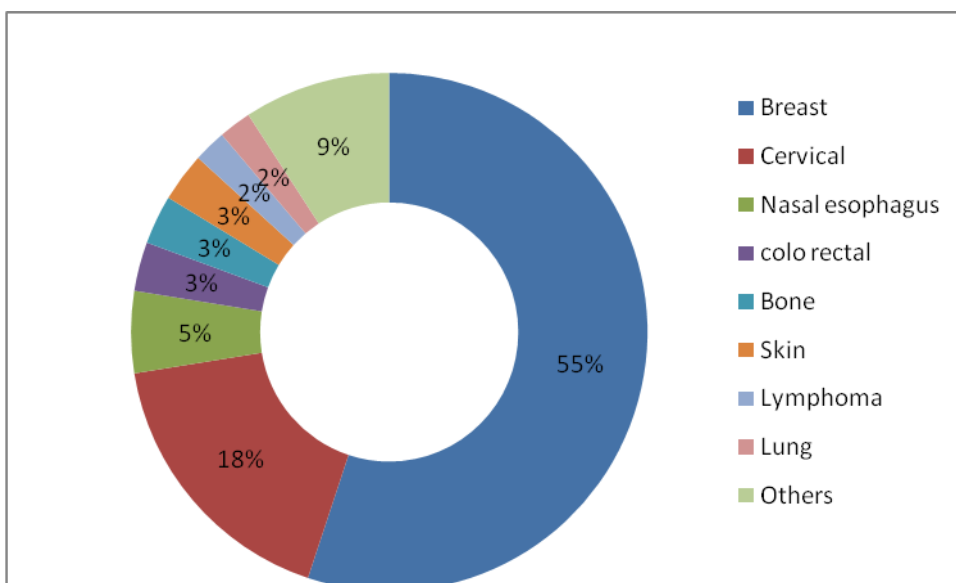
**Type of Cancer**

The patients had various forms of cancer and most were carcinomas. Out of the 33 males, 22% had prostate cancer followed by 18% nasal esophagus cancer. Colorectal, lung, tongue, thyroid, pancreatic, spinal and neuroendocrine all had one diagnosed patient each, hence was combined and put in one bar labelled “others” as shown in Figure 1. Some patients (9%) were not aware of the type of cancer they had.



**Figure 1: Distribution of male patients by type of cancer**

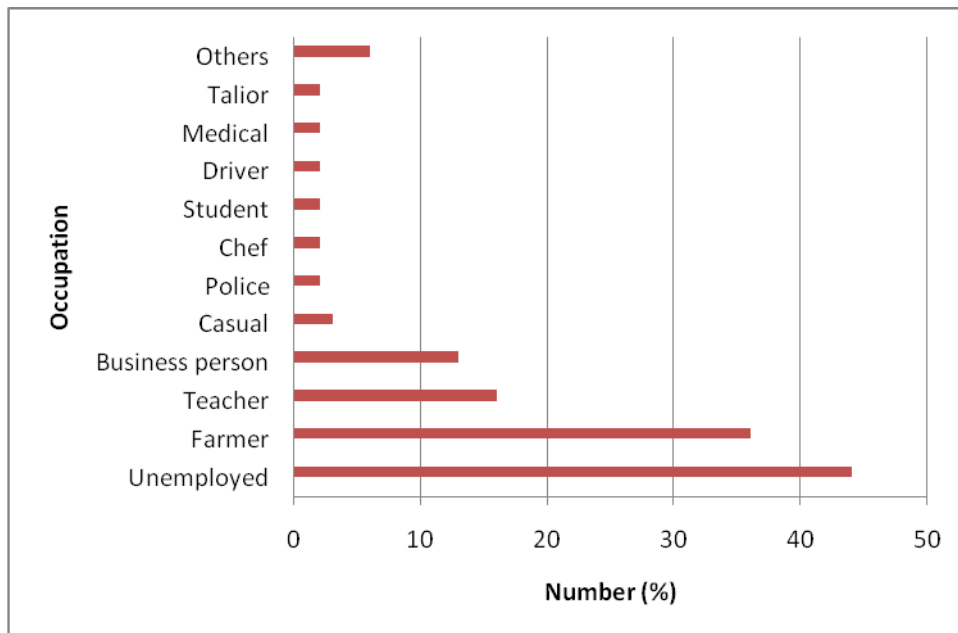
Out of the 99 females, 55% had breast cancers followed by cervical cancer (18%). Nasal esophagus, sarcoma, uterus, bladder, palate, tonsil, spinal and pancreatic cancer had one patient each hence combined to form a column (others) as shown Figure 2.



**Figure 2: Distribution of female patients by type of cancer**

### Socio- Economic Characteristics

To show the distribution of economic status of the cancer patients, both occupation and income were used. Out of the 132 cancer patients, 44% were unemployed and 36% were farmers. Social worker, caterer, hairdresser, pastor, carpenter and nurse had a frequency of 1 patient each and were all included in the column labeled “others” Figure 3. The average income among the patients was Kshs 9,111± 5,819 (USD 87±55) ranging from patients who were dependants to those who were earning Kshs 50,000 (USD 476). Using exploratory data analysis outliers were removed. The median was Kshs 9,000 (USD 86).



**Figure 3: Distribution of occupation among patients attending the CTC**

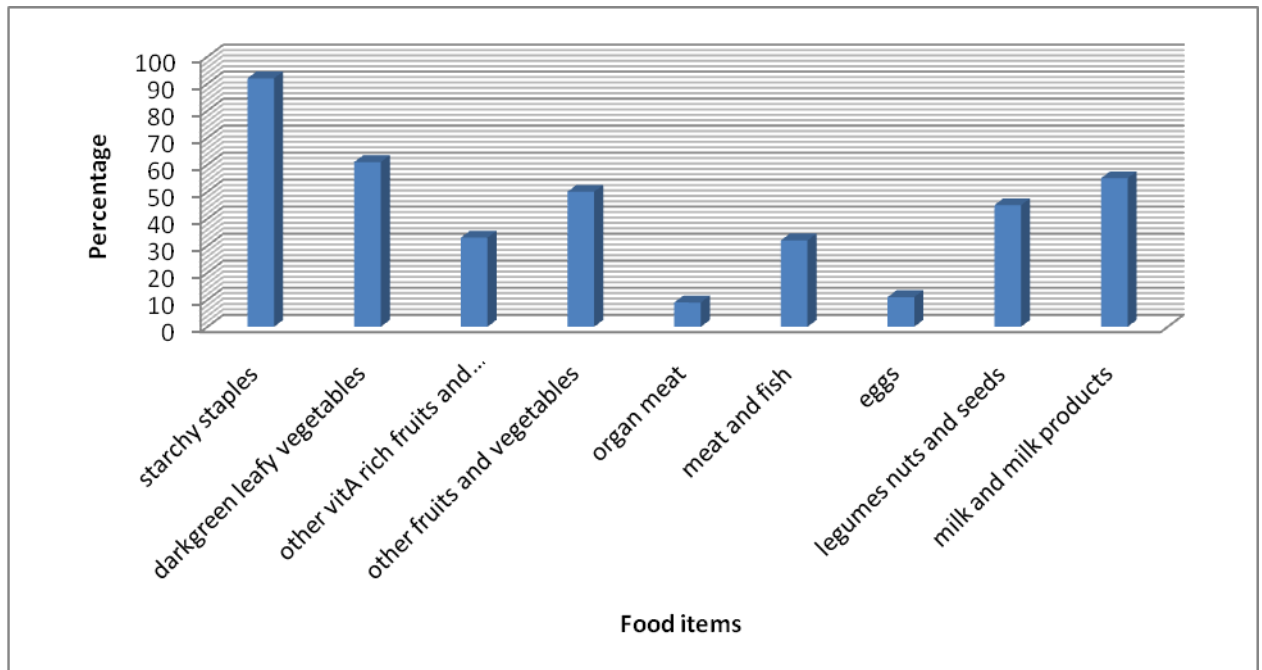
### Nutritional Knowledge

The advice category and food choice category had scores ranging from 0 to 100%. The food group category had scores ranging from 0 to 84.4%. The diet-disease relationship had scores ranging from 0 to 91.7%. The outliers were identified and excluded in the calculation of mean, median and standard deviation as shown in Table 2.

The association between the patients' level of education and nutritional knowledge score was found to be statistically significant at  $P \leq 0.05$  as shown in Table 3.

### Dietary Diversity

The mean score for dietary diversity was  $4 \pm 1$ . Starchy staples had the highest consumption (92%). The least consumed food group was organ meat (9%) as shown in Figure 4.



**Figure 4: Distribution of food groups as consumed by the patients**

The FAO cutoff points were used to classify Dietary Diversity Scores (DDS) [12]. The Individual DDS consisted of a total of nine food groups. A DDS score ranging 1-3 was considered low, 4-7 was considered moderate and  $\geq 8$  as high. Two thirds (62.3%) of the patients had adequate DDS (Table 4). Only one patient had DDS of 8.

#### **Association between Nutrition Knowledge and Dietary Diversity Scores**

A cross tabulation between nutrition knowledge (NK) and Dietary Diversity (Table 5) indicated a  $P > 0.05$ . Thus, there was no statistically significant association between nutrition knowledge and dietary diversity. A Pearson correlation between the two variables was assessed and the  $r$  (0.131,  $N = 128$ ,  $P \leq 0.05$ ).

## **DISCUSSION**

Prostate cancer was the leading type of cancer among male patients interviewed, similar to prevalence estimates across the world [13]. Among the women the leading type of cancer was breast cancer. Both of these cancers are mostly associated with high intake of saturated lipids and trans-fats [14]. The second leading cancer incidence among men attending the cancer treatment center was nasal esophagus cancer which could mostly be attributed to a history of alcohol drinking and cigarette smoking [4]. Among women the second most common type of cancer was cervical cancer which is majorly due to the human papillomavirus which has been shown to be the main cause of cervical cancer [15].

Education is one of the indicators of the social position, and the higher the education level, the more a patient is able to navigate within the health system enabling timely and better care [16]. In addition to this, more educated patients have better financial



resources to obtain additional care from the private sector [16]. There is a relationship between nutrition knowledge and level of education, indicating that most of the nutrition knowledge the patients have is basically from what they are taught in school.

The average income of the patients was about Kshs 9,111 per month which is very low compared to the cost of treatment they were receiving. It is estimated that a dose of medication cost Kshs 6,000. There was also a significant positive correlation between income and years since diagnosis. This could be due to the fact that those patients who earned more had better access to treatment and nutrition hence better prognosis [17].

The mean age of the patients attending the treatment center was a  $50 \pm 14$  years. This could be attributed to adoption of unhealthy lifestyle that has been shown to increase risk of developing cancer [18]. The basic nutritional knowledge of patients was average. However, patients had little knowledge on diet –disease relationship which showed the patients could not create a link between what they eat and their health status. This was crucial because these patients were undergoing aggressive treatment and it was necessary they maintain a good nutritional status. Healthy dietary practice does not only inhibit tumor growth but also has a major impact in the progression of cancer. This is due to the improving of both physical and functional well being of the patient [9,19].

During cancer treatment food intake is doubly affected by treatment and disease [20]. Cereals and pulses were the most consumed food group due to easy availability and they are easily digested by the body as compared to proteins and fats. Moreover, taste disorders affect both food preference and food intake of patients [21]. Organ meats and eggs were the least consumed due to affordability and poor management of symptoms such as nausea and vomiting [21]. This results in patients avoiding nutritious foods that could improve their quality of life [21]. It is, therefore, prudent to monitor diet compliance and to provide timely management of symptoms among cancer patients. The correlation between nutrition knowledge score and dietary diversity was not statistically significant. This relates with other studies which showed a weak positive association due to confounding factors that include food accessibility and the metabolic state of the body [22]. The metabolic state can be justified by the fact that cancer patients have increased levels of tumor necrosis factor  $\alpha$  [23]. Tumor necrosis factor in turn increases the levels of leptin hormone [24]. Leptin hormone has the role of inhibiting appetite [25]. Thus despite the nutrition knowledge of the individual the diet quality and quantity of the patient might still be low.

## CONCLUSION

This study revealed that most of the patients attending the clinic were middle aged, in the low income group. The nutrition knowledge of patients is positively associated with their dietary diversity though not statistically significant due to confounding factors such as food accessibility and metabolic disruptions due to the disease status.

## RECOMMENDATIONS

The health stakeholders could inculcate nutrition education in the cancer treatment process by involving qualified nutritionists to counsel patients even at the clinic level. Hospital nutritionists counseling cancer patients on diet should consider the affordability of food they are recommending. Moreover, appetite enhancers could be given to cancer patients in order to improve their food intake.

**Table 1: Socio-demographic characteristics of study population**

Demographic Characteristics	Frequency	Percentage
<b>Gender of patients</b>	N=132	
Male	33	25
Female	99	75
<b>Level of education of patients</b>		
Tertiary education	45	34
Secondary education	53	40
Primary education	12	9
None	22	17
<b>Age of patients</b>		
Youth 15-35yrs	18	14
Middle-age 36-59yrs	76	58
Elderly 60+	38	29

**Table 2: Nutrition knowledge scores of the patients**

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

N= Number of respondents

SD= Standard Deviation

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

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

\*significant at  $p < 0.05$

**Table 4: Distribution of patients by dietary diversity scores**

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

**Table 5: Cross tabulation between Nutrition Knowledge Score and Dietary Diversity Score**

		Dietary Diversity score(DDS)			Total		
		Low	moderate	High			
Nutrition Knowledge Score(NKS)	Low	Count	13	12	0	25	
		% within NKS	52.0%	48.0%	.0%	100.0%	
		% within DDS	27.1%	14.8%	.0%	19.2%	
		% of Total	10.0%	9.2%	.0%	19.2%	
	Moderate	Count	30	58	0	88	$\chi^2$ Fishers exact test P>0.05
		% within NKS	34.1%	65.9%	.0%	100.0%	
		% within DDS	62.5%	71.6%	.0%	67.7%	
		% of Total	23.1%	44.6%	.0%	67.7%	
	High	Count	5	11	1	17	
		% within NKS	29.4%	64.7%	5.9%	100.0%	
		% within DDS	10.4%	13.6%	100.0%	13.1%	
		% of Total	3.8%	8.5%	.8%	13.1%	
Total	Count	48	81	1	130		
	% within NKS	36.9%	62.3%	.8%	100.0%		
	% within DDS	100.0%	100.0%	100.0%	100.0%		
	% of Total	36.9%	62.3%	.8%	100.0%		

NKS= Nutritional Knowledge Score

DDS= Dietary Diversity Score

## REFERENCES

1. **Sylla BS and CP Wild** Cancer burden in Africa in 2030: What can cancer research and control offer the continent *International Journal of Cancer*. 2012;**130(2)**:245-250-2.
2. **Riboli E, Hunt K , Slimani N, Ferrari P, Norat T, Fahey M, Charrondière U, Hémon B, Casagrande C, Vignat J, Overvad K, Tjønneland A, Clavel-Chapelon F, Thiébaud A, Wahrendorf J, Boeing H, Trichopoulos D, Trichopoulou A, Vineis P, Palli D, Bueno-De-Mesquita HB, Peeters PH, Lund E, Engeset D, González CA, Barricarte A, Berglund G, Hallmans G, Day NE, Key TJ, Kaaks R and R Saracci** European Prospective Investigation into cancer and nutrition (EPIC): Study New England Population Journal and data collection. *Journal of Public Health Nutrition*. 2002;**5 (6)**:1113-24.
3. **Aceves C, Anguiano A and G Delgado** "Is iodine a gatekeeper of the integrity of the mammary gland?" *Journal of Mammary Gland Biology and Neoplasia*. 2005;**10 (2)**:89–96.
4. **Willett WC** Diet, nutrition, and avoidable cancer. *Environ Health Perspective*. 1995;**103(8)**: 165–170.
5. **Parmenter K and J Wardle** "Development of a general nutrition knowledge questionnaire for adults." *European Journal of Clinical Nutrition* 1999; **53(4)**: 298-308.
6. **Dallongeville J, Marceau N, Cottel D, Bingham A and P Amouye** Association between nutrition knowledge and nutritional intake in middle aged men from Northern France. *Public Health Nutrition* 2000; **4(1)**:27-33.
7. **Jemal A, Bray F, Melissa M, Ferlay J, Ward E and D Forman** Global Cancer Statics. *Cancer Journal for Clinicians*. 2011; **61(2)**:69-90.
8. **McGrath P and MA Bsocwk** Reflections on Nutritional Issues Associated with Cancer Therapy. *Journal of Oncology and Radiotherapy*. 2002; **10(2)**: 94–101.
9. **Brown JK, Byers T, Doyle C, Courneya KS, Wahnfried W, Kushi LH, McTiernan A, Rock LC, Noreen Aziz N, Bloch SA, Eldridge B, Hamilton K, Katzin C, Amy Koonce A, Julie Main J, Mobley C, Morra E M, Pierce SM and AK Sawyer** Nutrition and physical activity during and after cancer treatment: An American cancer society guide for informed choices. *A Cancer Journal for Clinicians*. 2003; **53(5)**:268-291.
10. **Moery CM, Synder DC, Sloane R, Cohen JH, Peterson B, Hartman TJ, Miller P, Mitchell DC and DW Wahnerfried** Effects of home based diet exercise on functional outcomes among older overweight long-term cancer survivors. *American Medical Association*. 2009; **30(18)**:1883-1891.

11. **Azadbakht L and A Esmailzadeh** Dietary diversity score is related to obesity and abdominal adiposity among Iranian female youth. *Public Health Nutrition*. 2010; **14(1)**:62-69.
12. **FAO**. Food, Nutrients and Diets- Food Groups, Chapter 7. **In:** Agriculture Food and Nutrition for Africa. A resource book for teachers of agriculture. Publishing Management Group, Rome. 1997. Available at <Google Scholar> (Accessed 5<sup>th</sup> July 2012):105-181.
13. **World Health Organization (WHO)**. Global status report on non-communicable diseases. WHO Press, 2011; **1**:1–176.
14. **Albano J, Brinton L and E Calle** Breast cancer facts and figures. American Cancer Society 2007; **1(1)**:1-25.
15. **Xavier C, Bruni L, Alemany L, Diaz M, Sanjose S and X Bosch** Epidemiology of Cervical Cancer. *Journal of HPV and Cervical Cancer*. 2012; **1(1)**:63-83.
16. **Pukkala E, Rautalahti M, Seppa K and T Hakulien** Education, survival and avoidable death in cancer patients in Finland. *British Journal of Cancer*. 2010; **103(1)**:1109-1114.
17. **Forrest L, White M, Rubin G and J Adams** The role of patient, tumor and system factors in socioeconomic inequalities in lung cancer treatment: population-based study. *British Journal of Cancer*. 2014; **111(3)**:608-618.
18. **Xue F, Willett W C, Rosner B A, Hankinson S E and KB Michels** Cigarette smoking and the incidence of breast cancer. *Archives of Internal Medicine*. 2011; **171(2)**:125-133.
19. **Temel J, Joseph M, Greer A, Muzikansky A, Emily MA, Gallagher R, Sonal RN, Admane M, Vicki A, Jackson M, Constance M, Dahlin A, Craig D, Blinderman M, Juliet J, William F, Pirl J and B Andrew** Early palliative care for patients with metastatic non-small cell lung cancer. *The New England Journal of Medicine*. 2010; **363(1)**:733-742.
20. **Ravasco P, Monteiro-Grillo I, Marques Vidal P and M Camilo** Dietary counseling improves patient outcomes: a prospective, randomized, controlled trial in colorectal cancer patients undergoing radiotherapy. *Journal of clinical oncology*. 2005; **23(7)**:1431-1438.
21. **Sánchez-Lara K, Sosa-Sánchez R, Green-Renner D, Rodríguez C, Laviano A, Motola-Kuba D and O Arrieta** Influence of taste disorders on dietary behaviors in cancer patients under chemotherapy. *Nutrition Journal*. 2010; **9(15)**:1-6.

22. **Spronk I, Kullen C, Burdon C and H O'connor** Relationship between nutrition knowledge and dietary intake. *British Journal of Nutrition*. 2014; **111** (10):1713-1726.
23. **Nontobeko M, Jan V, Meera C, Kany L, Ayesha J and M Bennish** HIV Infection is associated with decreased dietary diversity in South African children. *Journal of Nutrition Community and International Nutrition*. 2008; **138**:1705-1711.
24. **Martina S, Michael W, Peter W, Wolfgang S, Reinhard Z and W Peter** Tumor necrosis factor increases serum leptin levels in humans. *Journal of Clinical Endocrinology and Metabolism*. 1997; **82** (12):4080-4082.
25. **Stacenhoef A and B Pilar** Circulating leptin and adiponectin concentrations during tumor necrosis factor blockade in patients with active rheumatoid arthritis. *The Journal of Rheumatology*. 2009; **36**(4): 724-730.