Double burden of malnutrition among cancer outpatients in Nairobi, Kenya: challenges and opportunities for action

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Abstract

Introduction: the Kenya National Guidelines for Cancer Management identify nutrition care for persons with cancer as an integral part of cancer treatment. However, contribution of nutrition to cancer disease progression or aversion is yet to be established in Kenya.

Methods: this was a facility based cross-sectional study among cancer outpatients seeking treatment at Kenyatta National Hospital and Texas Cancer Centre. Five hundred and twelve adult cancer outpatients with a confirmed diagnosis of stage 1-IV cancers were recruited. Data was collected using a structured questionnaire, anthropometric assessments of weight, height and waist circumference, body composition assessment using bioelectric impedance analysis and abstraction of clinical data from medical records. Proportions and frequencies, measures of central tendency and chi square tests were used in analysis.

Results: mean age of participants was 52+13.8 years. Among the top five cancers, those affecting women were leading (breast 28.7%; cervix 23.2%) followed by colorectal (7.6%), oesophagus (7.4%) and prostate cancer (4.7%). More than half (51.4%) of participants were diagnosed at stage 3 and 4. Majority (43.1%) were overweight and obese with more female (50.7%) than male (24.1%). Fourteen percent were underweight (male 25.5%; female 9.4%) with 97.2% reporting inadequate dietary diversity. Mean total body fat (35%) reported was higher than the recommended levels (18-31%). Only 18.6% participants reported to have received nutrition services during hospital visits.

Conclusion: double burden of malnutrition remains a challenge among cancer outpatients in Kenya with more cases of overweight and obesity than underweight. Despite this, only 18% receive nutrition interventions.

Introduction

Cancer is the third leading cause of death in Kenya with mortality rate estimated at 26,941 annually [**1**]. Double burden of malnutrition is a common problem especially in developing countries [**2**]. According to the Kenya Stepwise Survey for Non-Communicable Diseases Risk Factors, the prevalence of overweight and obese among Kenyans is 27% with a significantly higher prevalence in women (38.5%) than men (17.5%) [**1**]. Although prevalence of malnutrition among cancer patients in Kenya remains unknown, malnutrition among cancer patients is estimated between 40 and 80% globally [**3**]. Characterized by both under- and over-nutrition, malnutrition remains a common problem in cancer patients due to a variety of mechanisms involving the tumour, host response to the tumour and anticancer therapies leading to overall poor prognosis and quality of life [**4-6**]. Early recognition of malnutrition is necessary for appropriate nutritional management of cancer patients. Assessment of nutrition status and evaluation of disease and treatment plays an important role in tailoring nutrition support hence integration of proactive nutrition interventions in cancer therapy with the aim of improving clinical outcomes and quality of life [**7**]. Body composition assessments have enabled better understanding of the variability in body composition and treatment outcomes of cancer patients. For instance sarcopenia (loss of skeletal muscle mass) and obesity have emerged as predictors of poorer prognosis, that is, poor functional status, shorter time to tumor progression, shorter survival, poor outcomes of surgery, physical impairment and higher incidence of dose-limiting toxicity [**8**]. The Kenya National Guidelines for cancer management identify nutrition care for persons with cancer as an integral part of any form of cancer treatment [**9**]. However, contribution of nutrition to cancer disease progression or aversion is yet to be established in Kenya. Like most Sub-Saharan countries, there remains a scarcity of information on nutritional status of cancer patients in the Kenya [**1**]. This study sought to establish the nutrition status of cancer patients and existing nutrition interventions in two cancer treatment centres, with the ultimate aim of identifying challenges and opportunities to scale up nutrition interventions among cancer patients.

Methods

Study design and population: this was a facility based cross-sectional study among cancer outpatients seeking treatment at Kenyatta National Hospital and Texas Cancer Centre in Nairobi, Kenya. Kenyatta National Hospital is the largest referral hospital in Kenya that provides specialized cancer care and receives more than 22,000 cancer patients annually [**10**]. Texas Cancer Centre on the other hand is among the most affordable private facility that accommodates most cancer patients and offers 40% lower prices compared to other private facilities and receives approximately 1,092 cancer patients annually [**11**]. The study targeted confirmed stage 1-IV adult cancer outpatients aged between 18-70years and who were physically stable.

Sample size estimation and allocation: prevalence of malnutrition among cancer patients in Kenya remains unknown. Using the Fischer formula [**12**], a sample size of 512 participants was calculated factoring in a 10% non-response rate. The calculated sample size was distributed between the two facilities using the square root allocation method to ensure appropriate representation of the two facilities based on the number of patients received per facility per year. Systematic random sampling method was used in recruitment of participants from each facility until the desired sample size was achieved.
Data collection: data was collected for a period of 4 weeks and the following data was collected.

Socio-demographics: these were collected using a structured questionnaire including; sex of participant, age, marital status, level of education, occupation and religion. Data on cigarette smoking and alcohol intake was also collected.
Anthropometric assessments: weight and height were measured using a Seca762 classic mechanical medical weighing scales and UNICEF standard height boards calibrated to the nearest 0.1kg and 0.1cm respectively. Weight and height measurements were used to compute body mass index (BMI). Waist circumference (WC) measurements were also taken using a ROCHE circumference tape and recorded to

the nearest 0.1cms. BMI was classified based on WHO 2008 classification as <18.5 (underweight), 18.5-24.9 (normal), 25.0-29.9 (overweight) and 30-34.9 (obese). The waist circumference cut-off was 88cm in females and 102cm in males according to the World Health Organization.

Body composition assessments: total body fat, body water and lean mass percentages recorded to the nearest 0.1% were estimated using a commercially available single-frequency 4-electrode bio-impedance analyser system (Bodystat 1500). The instrument recorded whole body impedance from the hands to the feet by applying an electric alternating current flux of 0.8Amps at an operating frequency of 50 kHz. Body fat percentage was calculated from body impedance and personal data (age, gender, height and weight) of the corresponding subject. Levels of Body Water, Body fat and Lean mass were classified based on American Council of Exercise [**13**] . Over 32% and 25% considered obesity among women and men respectively.

Clinical assessments: details on participants' diagnosis (clinical history, types of cancer and clinical stages and treatment) were retrieved from patient files.

Dietary assessments: dietary diversity was assessed using individual food variety scores [**14**]. The participants provided details of variety of foods consumed 7days and 24 hours prior to the interview. Each food item was given a score of 1(one) if consumed at least once over 24 hours and 7 day period regardless of the frequency.

Data management and statistical analysis: quantitative data was entered using the MS-Access application and exported to MS-Excel for cleaning and validation. Data was later exported to SPSS version 20.0 for analysis. Proportions and frequency distributions were used to summarize categorical variables and measures of central tendency and dispersion for continuous variables. Pearson's Chi-square test or fisher exact test, where applicable, was used to assess the relationship between dependent and independent categorical variables. All independent variables identified to significantly associate with the dependent variables at $p<0.25$ level of significance at bivariate analysis were considered together in multivariate analysis. Adjusted odds Ratios (AOR) together with their respective 95% Confidence Interval (CI) were used to estimate the strength of association between the retained independent predictors and the dependent variable.

Ethical approval: this study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Kenya Medical Research Institute (KEMRI) Scientific and Ethics Review Unit (Reference: KEMRI/SERU/CPHR/001/3026) and the KNH Ethics and Research Review Committee (Registration Certificate: P462/07/2015). Written informed consent was obtained from all study subjects.

Results

Socio-demographic and clinical characteristics of the participants: a total of 512 participants were recruited (m: 28.1%; f: 71.9%). The mean age was 52+13.8 years. Majority of the patients (71.7%) were aged 40 years and above and were self-employed (38.7%). Top five most common cancers were cancer of the breast (28.7%), cervix (23.2%), colorectal (7.6%), oesophagus (7.4%) and prostate (4.7%). **Table 1** shows the ranking of cancer types from most common to the least. The leading cancers were breast (39.7%) and cervical (25%) cancer in females and prostate (24%) and oesophageal (24%) cancer in males as shown in **Table 1**. When ranked based on the organs affected, the study showed that the highest proportion of participants had Breast(28.7%), followed by Female genital cancers(22.7%) and Digestive organ cancers(21.7%) as shown in **Table 2**. Majority (28.2%) of the participants had stage 3 cancer (**Figure 1**). Two hundred and two (43%) participants were on one form of treatment and among them, 78.1% were on chemotherapy, 14.7% on radiotherapy and 6.4% had surgery. Fatigue and poor appetite were reportedly the most common symptoms experienced within 24 hours at 38.3% and 32.4% and one month at 50% and 51% respectively. Only 18.6% participants reported to have received nutrition services in form of nutrition counseling and education or food during their hospital visits.

Nutritional status based on BMI, body composition and food variety score: fourteen percent of the participants were underweight (m: 25.5%; f: 9.4%), 42.9% had normal BMI (m: 50.3%; f: 39.9%), 26.3% were overweight (m: 28.5%; f: 20.7%), and 16.8% were obese (m: 3.4%, f: 22.2%). BMI was significantly associated with sex, occupation, cigarette smoking, alcohol intake, cancer stage,

chemotherapy and surgery as individual treatment types, as shown in **Table 3**. Similar to BMI, a significant association was observed between WC and sex ($p<0.001$), occupation ($p=0.001$), cancer type ($p<0.001$), cancer stage ($p=0.001$) and treatment type ($p=0.005$). No significant association was observed between BMI and WC with level of education or length of treatment. The mean total body fat, total lean mass and total body water were 35%, 65%, and 52% respectively. A significant association ($p<0.001$) was observed between Total Body water, Total Body fat and Total Lean Mass with sex and type of cancer. Total Body fat and Total Lean Mass were significantly associated with age ($p<0.001$), occupation ($p<0.001$) and cancer stage ($p=0.009$), while Total Body Water was significantly associated with occupation ($p<0.001$) and cancer stage ($p=0.038$). BMI was associated with food variety score, basal metabolic rate (BMR), impedance, and TBF at $p<0.001$ (**Table 4**). BMI was significantly associated with the previous 24 hour and 7 days food variety scores at $p <0.0001$. Majority (69/71) of participants who were underweight reported inadequate dietary diversity. Similarly, 39.3% and 25% of those with adequate diversity were obese and underweight respectively. Variables associated with BMI using a cut-off of $p <0.25$ were subjected to binary and ordinal logistic regression as applicable. Total body fat percentage, basal metabolic rate and impedance were found to predict nutritional status as shown in **Table 5**.

Discussion

The leading cancers in this study were breast and cervical cancer in females and prostate and oesophageal cancer in males. The current findings are in line with those reported in the Global Burden of Disease (GBD) 2016 report that show prostate cancer and breast cancer as the leading types of cancer in men and women respectively [**15**]. Malnutrition is a frequent problem in cancer patients that leads to a higher degree of treatment-related toxicity, reduced response to cancer treatment, impaired quality of life and a worse overall prognosis [**6**, **16**]. Our results reflect a double burden of malnutrition among cancer patients in Kenya (43% overweight and obesity; 14% Underweight). Currently, double burden of malnutrition is well recognized in low and middle income countries [**17**] not excluding Kenya. The prevalence of overweight and obesity among cancer patients was higher (43%) compared to national prevalence of 27% [**1**]. With regards to gender, our results were consistent with findings from the Stepwise Survey which showed a higher prevalence of overweight and obesity among females than males. There is therefore need for promotion of healthy lifestyle practices through nutrition education, counselling and follow up among cancer patients as well as the general population. Early detection and management of malnutrition in these cancer patients has the potential to promote healing, improve the quality of life and survival, and is cost-effective in long term [**18**]. Those with late stage cancer disease had a lower BMI. Cancer patients face an array of challenges that affect feeding patterns leading to inadequate food intake hence modifying nutritional status. These include nausea, vomiting, decreased caloric intake or oncologic treatments. Nausea and vomiting may limit the nutrient intake and are most often the consequence of oncologic treatments. Decreased caloric intake and alterations in nutrient metabolism are considered to be the major causes of malnutrition [**19**, **20**]. Other factors such as depression, fatigue and malaise also significantly impact on patient well-being. Over a period of one month, more than 50% of the study participants reported having a poor appetite and feeling fatigued, while 35% felt nauseated and 28% reported vomiting. Thus, nutritional support addressing the specific needs of this patient group is required to help improve prognosis, and reduce the consequences of cancer-associated nutritional decline [**5**].

Poor nutritional status and weight loss can lead to poor outcomes among cancer patients leading to decreased quality of life, decreased functional status, increased rates of complications and treatment disruptions [**21**]. Changes in nutrition status may begin prior to diagnosis, a time when physical and psychosocial issues have a negative impact on appetite and food intake hence at diagnosis half of the patients present with some form of nutritional deficit [**21**]. With treatment and cancer side effects, the nutrition status further deteriorates. Research has shown that nutritional management during and after cancer treatment varies considerably with many malnourished patients receiving inadequate nutritional support [**22**]. Our study found that up to 81% of the cancer outpatients did not receive nutrition services, alluding to possible challenges in the referral process. Patients identified through screening require referral to a dietician or specialist in nutrition for an in-depth nutritional assessment involving

examination of medical, dietary, psychological and social history, physical examination, anthropometry and biochemical testing [**23**]. Streamlining the referral system can enhance access to this much needed nutrition services. In addition, the current National Cancer Management Guidelines identify nutrition management as one of the key support needed for cancer treatment though limited detail in nutrition guidelines. There is therefore need to develop nutrition guidelines and advocate for nutrition service provision targeting outpatients. It is recommended that among cancer patients, medical history, physical examination, estimates of daily oral intake, weight changes and consideration of the nutritional requirements according to the stage of disease be assessed to allow individualization of therapeutic approaches [**24**]. At present, body composition is not routinely measured in clinical settings. However, the estimation of fat, lean and body fluids is significant in management of nutrition therapies in oncology [**25**]. The value of bioelectrical impedance as an index of body composition in cancer patients has been demonstrated and linked to survival time. Morbidity risk increases with increasing loss of muscle mass). From our findings, the main predictors on nutritional status were body composition parameters, that is, total body fat, basal metabolic rate and impedance. These findings support previous studies on cancer that pointed out alterations that occur in components of energy expenditure accompanied by increased resting energy expenditure related to the systemic inflammatory response that can contribute to malnutrition if not compensated for by an increase in energy intake [**22**]. Thus, supportive care issues such as ensuring sufficient energy and protein intake, maintaining physical activity to maintain muscle mass and reducing systemic inflammation should be considered for all patients [**26**]. Given the clinical relevance of nutritional intervention in patients' quality of life, the nutritional status assessment has a key role in oncological and surgical practice and should include body composition assessment in order to tailor nutritional treatment to patients' individual requirements. In view of malnutrition status among cancer outpatients and gaps in accessing nutritional services, there are opportunities to leverage on across the health system in improving access to nutrition services by cancer patients. In view of the GBD 2016 report that shows mortality due to all cancers largely located on the African continent and expected to increase due to the epidemiological transition, there is need for effective health systems with robust cancer preventive and control strategies. Prioritization of cancer control programs within existing functional health-care systems is necessary [**27**]. There is need for development of country-specific tailored nutrition guidelines and screening tools for use both at diagnosis and at regular time points during the course of disease according to tumor type, stage and treatment [**28**].

There is need to build capacity in nutrition care through training, providing of appropriate equipment and participation in accreditation program [**29**]. There is need to appreciate the role of nutrition as a therapy that compliments basic treatment and greatly improves treatment outcomes and quality of life [**30**]. Inclusion of nutritionists in mainstream oncology practice has the potential to improve early detection and screening of malnutrition, access to nutrition services and communication for improved patient management. Awareness and consideration of nutritional issues among oncologists and other related health discipline is vital to the success of nutrition support in cancer care [**31**]. In settings with limited nutritionists/dieticians, provision of algorithms and protocols for screening can enable task shifting that has been shown to be potentially effective and affordable in improving access to healthcare [**32**]. The emergence of population based cancer registries provides information on incidence, clinical presentation, outcome, and tumor biology in East Africa [**33**]. The current findings help inform appropriate management options. However, further research is needed to understand the nutritional support required in different care settings, and explore use of functional nutrition components in improving treatment efficacy and nutritional status. Continued surveillance remains critical [**24**, **34**]. Cancer management requires a multimodal approach. Enhancing cancer survivorship requires knowledge and application of nutritional science and integrative health care approaches. A multidisciplinary team is needed to consider the implications beyond the patient's dietary needs, and is best started earlier rather than late [**16**, **34**]. The focus should be on supporting patients' nutritional and functional state throughout the prolonged course of anti-cancer treatment and not just at end-stage. Thus, reliable, personalized, team-generated nutritional advice must be provided to cancer patients and survivors to reduce the risk of recurrence, optimize energy balance, and improve quality of life [**22**, **34**, **35-37**].

Conclusion

Malnutrition remains a challenge among cancer outpatients seeking treatment in Nairobi, Kenya. Double burden of malnutrition was reported among cancer patients with majority presenting with overweight and obesity compared to underweight. In addition, mean Body fat is higher than the recommended levels. There is need for facilities that provide cancer treatment to ensure that nutrition interventions (nutrition assessments, education counselling and follow up) are initiated immediately a patient is diagnosed. Men cancer patients are more affected with under nutrition than females. There is need for further research to determine causes of under nutrition among male cancer patients. In addition, nutritionist should address nutrition issues that affect intake among male cancer patients as soon as they are diagnosed. Minimal access to nutrition services among cancer patients with only 18.6% participants reported to have received nutrition services during hospital visits. The Ministry of nutrition in partnership with facilities offering nutrition services need to establish functional nutrition units to support cancer patients. There is also need to develop detailed guidelines for management of cancer patients and build capacity of nutritionists to tackle each of the cancer cases.

What is known about this topic

- Malnutrition is a common occurrence in cancer patients and affects the patient prognosis negatively;
- Most patients suffer weight loss and cachexia which occurs as a result of side effects of cancer treatment and other anticancer therapies;
- Management of malnutrition among cancer patients is more focused on undernutrition with less emphasis on overweight and obesity.

What this study adds

- Findings from this study clearly indicate double burden of malnutrition among cancer patients; a new trend among cancer patients;
- Study highlights the importance of incorporating robust nutrition assessment methods other than BMI in screening for malnutrition among cancer patients including body composition measurements which are good predictors of nutrition status than BMI;
- The study raises the need to carry out further research on nutritional needs of cancer patients who present with overweight and obesity and the need to revise the National Guidelines for Cancer Management in Kenya to include components of management of overweight and obesity.

Competing interests

Authors declare no competing interests.

Authors' contributions

Yvonne Opanga, Lydia Kaduka, Zipporah Bukania, Richard Mutisya and Charles Mbakaya contributed to study conceptualization, design, data collection, analysis and manuscript writing. Erastus Muniu and Moses Mwangi contributed to the study design, data processing, data analysis and manuscript writing. Anne Korir participated in study conceptualization, data analysis and manuscript writing. Veronicah Thuita and Catherine Nyongesa participated in data collection and manuscript writing.

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Tables and figure

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