

Research Article

Malnutrition Diagnosis Among Cancer Outpatients Using Malnutrition Universal Screening Tool in Nyeri County Referral Hospital, Kenya

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Abstract

Cancer burden remain unacceptably high with global incidence of 19.3 Million and 10million cancer mortalities according to the 2020 global cancer estimates. There has been notable improvement in cancer care in Kenya but malnutrition in cancer patients remain highly under-recognised and the malnutrition screening tools remain under-utilised especially in Nyeri county. The main objective of this study was to determine the malnutrition risk among the cancer outpatients attending Nyeri County Referral Hospital using Malnutrition Universal Screening Tool using analytical cross-sectional study design. Sixty one percent of the respondents were female while 39% were male. 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%. Using the MUST, more than half (51.7%) of the respondents were at a high risk of developing malnutrition, followed by low risk (32.6%) with only 15.7% respondents being at a medium risk of malnutrition. Using the BMI, half of the respondents, (50%) had a normal nutrition status and only 19.8% respondents were underweight. There is a significant difference between classifying nutrition status of cancer patients using BMI and Malnutrition Universal Screening Tool ($P<0.05$). Malnutrition Universal Screening tool is easy to use and has the ability to identify the risk of malnutrition among cancer patients and can be adopted in cancer care to improve cancer prognosis and reduce malnutrition rates among cancer patients.

Keywords

Cancer, Malnutrition, Malnutrition Universal Screening Tool, Body Mass Index

1. Introduction

Global cancer incidence and mortalities remain unacceptably high [1]. According to [2], there is a rapid increase in the non-communicable diseases and they pose a great challenge when it comes to achieving a global progress. The cancer burden has been increasing and the 2020 global report indi-

cated an incidence of 19.3 Million and approximately 10 million cancer mortalities. In 2020, new breast cancer cases were 2.3 million (11.7%) and the second leading cancer was the lung cancer at 11.4% followed by colorectal, prostate and stomach at 10%, 7.3% and 5.6% respectively [3]. Kenya is

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similarly experiencing an increasing burden of the disease, with an estimated incidence and mortality of 28000 cancer cases and 22,000 cases respectively [4].

Malnutrition among cancer patients is very common and it affects 85% of cancer patients. A study conducted in two hospitals in Nairobi County showed that 31% of cancer patients were malnourished, with notable increase among the patients with gastro-intestinal tumors [5]. Malnutrition has significant effects on an individual including poor health outcomes, decreased quality of life and it is also linked to negative disease prognosis [6]. Furthermore, research shows that approximately 10-20% of cancer mortalities are due to cancer-related malnutrition and not as a result of the tumor itself [7]. Malnutrition among cancer patients remain highly under-recognised [5].

There has been a sluggish attainment of the specific targets across the globe due to emerging challenges such as Covid-19. Nyeri County in Kenya is one of the counties with a high prevalence of Non-communicable diseases such as hypertension, diabetes and cancer [8]. 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 [9].

The European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines outlines the need for proper malnutrition screening by the healthcare provider at the first contact with the cancer patient, to detect any nutritional disturbances that could be controlled if diagnosed earlier [7]. In Kenya however, evidence shows that there still exists gaps in malnutrition recognition among cancer patients. In addition, malnutrition screening tools have been greatly under-utilized [5]. With the high prevalence of cancer related malnutrition, its under-recognition and under-utilization of the malnutrition screening tools, this study sought to utilize the Malnutrition Universal Screening Tool (MUST) to screen the risk of malnutrition among the cancer patients 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 screen them for malnutrition risk at one point in time. A study conducted in Netherlands on determining the Malnutrition status of the hospitalized patients similarly employed an observational research design, using the Malnutrition Universal Screening tool [10].

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 [4, 11]. 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 [12] 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

A study on performance of the MUST in Nairobi Kenya reported a sensitivity of 83.1%, 95% CI and specificity of 85.7%, 95% CI [13]. Pre-testing of the research instruments enhanced the validity and reliability of the research instruments and the methodology. 10% of the total sample (18 respondents) was used in pre-testing the data collection tools at Meru level 5 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 method was used (split half method) 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 [14].

2.5. Data Collection Procedure

Two research assistants with Bachelor of Science in Nutrition and dietetics were trained to assist in data collection. They were trained on how to administer the MUST, how to record the information and on ethical consideration during the process. The oncology nurse in charge assisted in retrieving the information on the previous weight trend from the patients file.

The socio-economic and demographic characteristics of respondents' data was collected using a researcher administered questionnaire. The questionnaire also had sections on the cancer type, staging and comorbidities. A Malnutrition Universal Screening Tool was used to screen the cancer patients for malnutrition. It utilizes three parameters related to each other to determine the nutrition status and thus stands as a good tool of assessing cancer-related malnutrition [15]. It utilizes the BMI score, unplanned percent weight loss in the previous 3-6 months and the acute disease score. To determine the overall risk of malnutrition, these three values are

added together. A score of 0 represents a low risk of malnutrition, a score of 1 shows medium risk while a score of 2 or more means a high risk of malnutrition [10].

The respondents' weight was taken using SECA weighing scale, which was calibrated every session, and the recording was done to the nearest 100 grams. The respondent was requested to be on minimal dressing and remove the shoes for the weight to be taken. The weight was taken and recorded twice, average was taken and used in BMI calculation. Individual's height was measured using a stadiometer and it was recorded to nearest 0.1 centimeters. The respondent was requested to stand straight with the back on the stadiometer. The height was taken and recorded twice and the average calculated to determine BMI of the subjects. MUAC is used in computing the scores for the MUST, in case the BMI of the respondent is not feasible. It was taken between the prominent tips of the acromion and the olecranon processes using adult MUAC tapes.

A BMI score was then calculated using the BMI score chart on MUST classifications. A BMI below 20kg/m^2 was Scored zero, a BMI of between $18.5\text{--}20.0\text{ kg/m}^2$ was scored 1 and a BMI below 18.5 was scored 2. The % weight loss (previous 3-6 months) was got from the patients file and was estimated using the weight loss charts of MUST. A score of 2 meant more than 10% body weight loss, score of 1 – 5 is 10% body weight loss and a score of 0 is less than 5% weight loss. Another parameter on the MUST is the acute disease score which factors in the nutritional intake in the previous 5 days. A score of 2 is added to the total calculation if the patient has had no nutrient intake for the previous 5 days. To determine the overall risk of malnutrition, the BMI score, % weight loss and the acute disorder scores were added together.

2.6. Data Analysis

Data was entered on Microsoft Excel, cleaned and exported to Statistical Package for Social Sciences (SPSS) software version 27 for analysis. 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 [16]. 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
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

Gender was significantly associated with the respondents' BMI ($p=0.01$) and the overall risk of malnutrition as estimated using Malnutrition Universal screening tool (MUST) was found to have a significant association with the age of the respondents. The cancer type was significantly associated with BMI and MUST at $p<0.05$ at all levels. 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%).

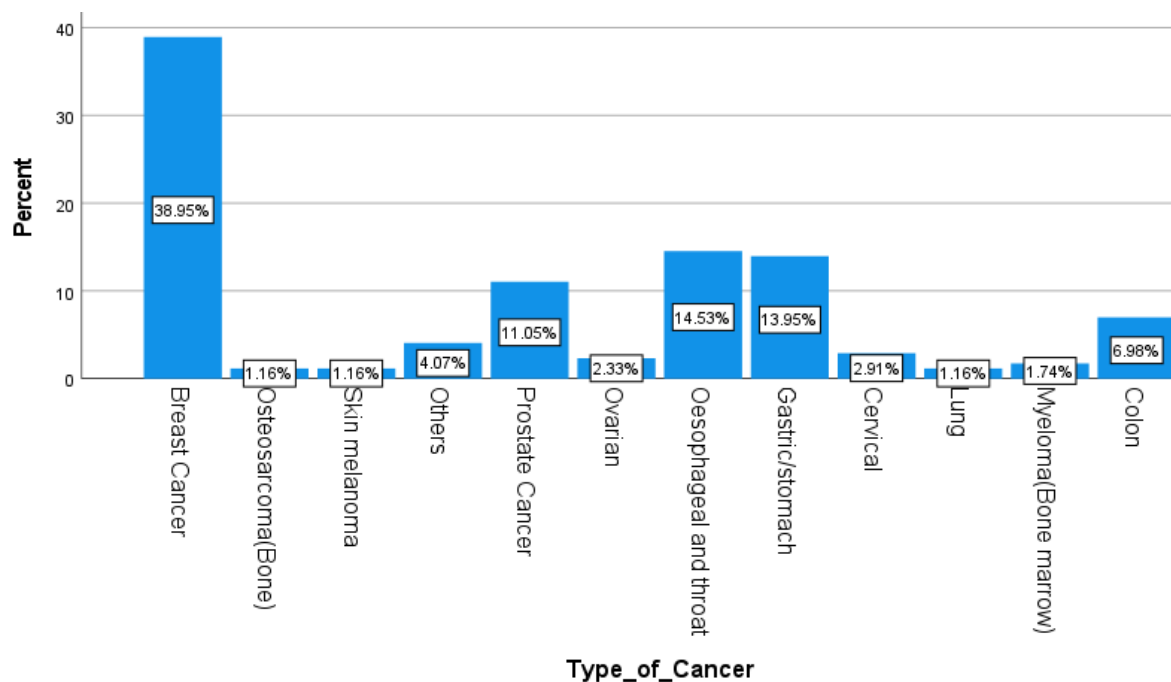


Figure 1. Percentage distribution of cancer types.

3.3. Stage of Diagnosis

The average year of diagnosis ranged from 2014 to 2023, with the majority of the respondents being diagnosed with

cancer in 2022 (28.5%) followed by 2023 (26.7%). At the point of diagnosis, 34.3% subjects had a late diagnosis at stage IV and 40.7% of all cancer cases was diagnosed at stage III (40.7%). Only 25 % had been diagnosis at stage I and II as shown in [figure 2](#) below.

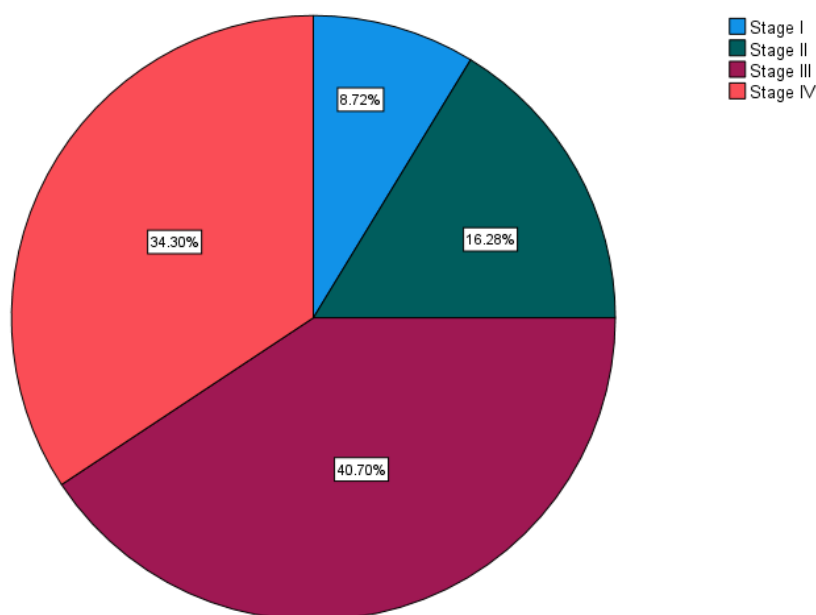


Figure 2. Clinical diagnosis of cancer patients.

3.4. 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.

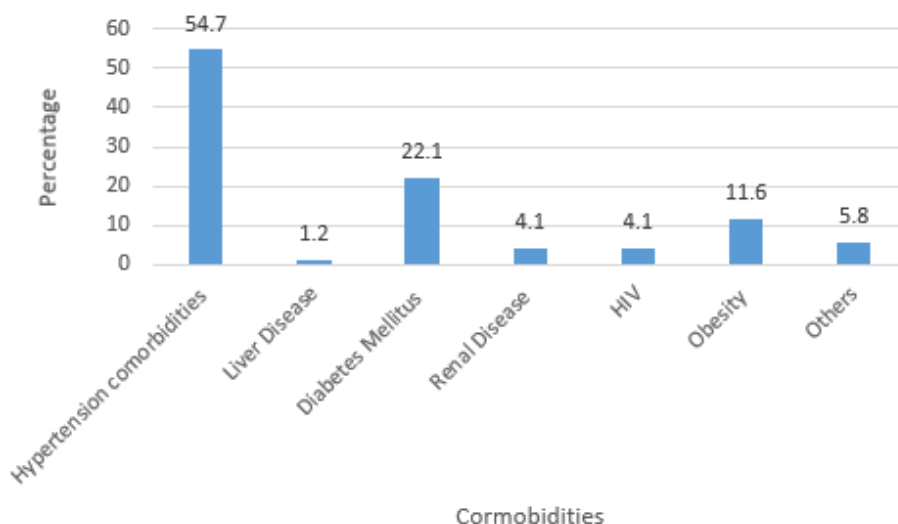


Figure 3. Distribution of respondents by the comorbidities.

3.5. Malnutrition Screening of Cancer Patients Using MUST

Malnutrition Universal Screening tool (MUST) was used to

screen the cancer patients for malnutrition risk. More than half (51.7%) were at a high risk of developing malnutrition, followed by low risk (32.6%) with only 15.7% respondents being at a medium risk of malnutrition as shown below, [figure 4](#).

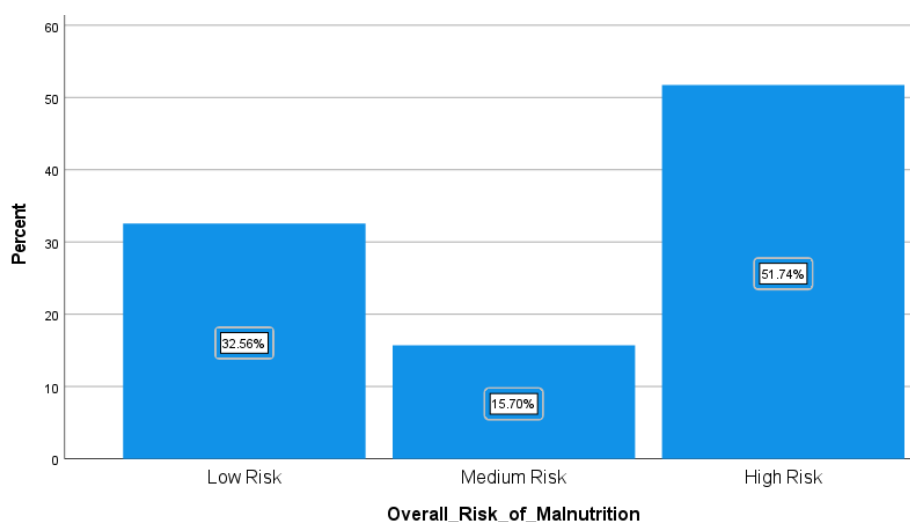


Figure 4. Percentage risk of malnutrition for the cancer patients using MUST.

3.6. Body Mass Index (BMI)

The BMI of participants was classified as per the WHO

classification [17]. Using the BMI, Half of the respondents, (50%) had a normal nutrition status and only 19.8% respondents were underweight as illustrated in [table 2](#) below.

Table 2. BMI classification of the respondents.

Classification	N	%
<18.5 (underweight)	34	19.8%
18.5-24.9 (Normal)	86	50.0%
25-29.9 (Overweight)	34	19.8%
>30.0 (Obese)	18	10.5%

A significant difference between BMI and Malnutrition Universal screening tool in classifying the Nutrition status was found, (Pearson Chi square Value=76.497a), significance (2 sided) $p < 0.01$).

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 [4], 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 [18]. 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 [19]. 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 [20].

Gender had a significant association with the nutrition status, ($p < 0.05$). The overall risk of malnutrition as estimated using Malnutrition Universal Screening Tool (MUST) was found to have a significant association with the age of the respondents. This agrees with literature that one of the factors that influence nutrition status of individuals in gender. Men tend to be more masculine than their female counterparts [21].

4.2. Clinical Diagnosis of Cancer and Comorbidities

The Kenya Medical Research Institute regional cancer registry shows that 80% of late cancer diagnosis [4]. The treatment goal for cancer stage IV patients is to improve the length and quality of life but not curative [20]. In this study, the average year of diagnosis ranged from 2014 to 2023, with the majority of the respondents being diagnosed with cancer in 2022 followed by 2023. Seventy five percent of the cancer cases were made at stage III and stage IV. There is clear evidence that if cancer is diagnosed early, the treatment outcomes are better than when diagnosed at late stages [22]. This raises the need for adequate cancer awareness across populations.

Based on the Charlson comorbidity index, most cancer patients at NCRH had hypertension, followed by Diabetes Mellitus and obesity. The non-communicable diseases such as cancer, hypertension and diabetes share the risk factors and this may explain this observation. Comorbidities affect cancer prognosis and it has been noted that comorbidities are associated with poor survival and poor quality of life leading to high health care costs. Cancer comorbidities leads to a physiological state of increasing vulnerability to stressors emanating from physiologic reserves commonly referred to as frailty [23]. 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, (diets and physical activity). This however may need to be re-looked at. From this study, less than half of the respondents had received nutrition education and counselling in the course of their treatment.

4.3. Malnutrition Risk of Cancer Patients

More than half of the respondents (51.7%) were at a high risk of developing malnutrition, followed by low risk (32.6%) with only 15.7% respondents being at a medium risk of malnutrition. Using the BMI, half of the respondents, (50%) had a normal nutrition status and only 19.8% respondents were underweight. Body Mass Index has been greatly used as an indicator for the nutrition status in a healthy population, but it tends to under-estimate weight loss in patients with chronic illnesses [13]. The utilization of MUST is becoming popular because of its good validity and reliability. MUST utilizes three components, the BMI-Score, unplanned weight loss for the last 6 months and the acute disease score. High risks of malnutrition have been significantly associated with mortality, (HR=3.9; 95%CI, p=0.02) [10]. The malnutrition screening tools have been greatly under-utilized despite the fact that they can predict malnutrition early, and improve the treatment outcome [5]. A significant difference was found between classifying the nutrition status using BMI and Malnutrition Universal screening tool and this justifies the reason why adoption of more than one tool in determining malnutrition in cancer patients is recommended.

5. Conclusions

Malnutrition Universal Screening tool is easy to use and has the ability to identify the risk of malnutrition among cancer patients and can be adopted in cancer care to improve cancer prognosis and reduce malnutrition rates among cancer patients. Secondly, Nutrition Education and Counselling is key in reducing the cancer burden and its commodities in Nyeri County. Cancer awareness creation and screening strategies need to be enhanced in the County to reduce the cases of late cancer diagnosis which is still high. Body Mass Index alone is not sufficient to detect malnutrition among cancer patients for it tends to under-estimate weight loss in patients with chronic illnesses.

Abbreviations

MUST	Malnutrition Universal Screening Tool
BMI	Body Mass Index
NCRH	Nyeri County Referral Hospital

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Author Contributions

Dorothy Kareainto 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



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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.