Original Article

Prevalence and Determinants of Undernutrition among People Living With HIV at Ngarama Hospital, Rwanda

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Abstract

Background
Undernutrition is one of the important health problems in developing countries, which has undesirable health effect among people living with HIV (PLWHA).
Objectives
To determine prevalence and determinants of undernutrition among PLWHA in Ngarama District Hospital.
Methods
Cross sectional study was conducted among 267 PLWHA who were selected systematically as they came for care. Questionnaire and anthropometric measurements were used to collect data. Descriptive and inferential statistics were performed.
Result
The prevalence of undernutrition was 22.0%. After controlling all the possible confounders using multivariable analysis, the following variables were predictors of undernutrition: respondents' age 21 to 30 (AOR = 17.24; 95% CI = 5.55 – 53.56; p < 0.001) and 31 to 40 (AOR = 19.15; 95%CI = 5.97 – 61.40; p <0.001) compared to those aged 41 years and above, social category one (AOR = 3.54; 95%CI = 1.18 – 10.59; p = 0.024); experienced gastrointestinal discomfort (AOR = 19.87; 95%CI = 5.09 – 77.55; p <0.001) and not received dietary counseling (AOR = 7.45; 95%CI = 2.83 – 19.62; p <0.001).
Conclusion
The prevalence of undernutrition among PLWHA was high. Therefore, the Ministry of Health and other stakeholders should campaign, counsel and assist with provision of dietary diversity using locally available foods.
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Keywords: Anti-Retroviral Drugs; Determinants; Undernutrition; People Living With HIV; Prevalence

Introduction

Undernutrition is a condition where an individual's function is impaired and can no longer maintain normal body performance due to inadequate or unbalanced diet.[1]There is evidence that Human Immunodeficiency Virus (HIV) and undernutrition are linked, both being capable of causing progressive damage to the immune system.[3] While the HIV compromised the nutritional status due to low food intake and high energy requirement, undernutrition further weakens the immunity which can put individuals at higher risk for opportunistic infections.[3] Furthermore, undernutrition impairs immunity which aggravates the effect of HIV into AIDS progression. Therefore, undernutrition is regarded as both a contributor to and consequence of HIV progression.[4]

In 2018, there were 37.9 million of people living with HIV (PLWHA) globally where 70% of this were from Sub-Saharan Africa (SSA).[5] The prevalence of undernutrition among PLWHA differs from place to place. However, SSA in particular, has the highest prevalence of undernutrition worldwide among PLWHA. Studies done in different parts of the SSA reported 43.3% in Nigeria, [6] 19.5% in Tanzania ,[7] 19.2% in Senegal ,[8] 13.8% in Ghana, [9] 10.28% in Uganda [10], 10% in Zimbabwe, [11] and in different parts of Ethiopia it was indicated 42.3% ,[12] 34.0% ,[13] 18.2% ,[14] and 12.3%.[15] The factors that are associated with undernutrition among PLWHA range from personal to underlying level factors. Based on several studies, the determinants of undernutrition are socio-economic status, level of education, unemployment, age, sex, marital status, CD4 count, depression, alcohol consumption, smoking tobacco, substance use, previous opportunistic infections, gastrointestinal symptoms, HIV/AIDS stage, medication adherence, duration of treatment, food insecurity, poor dietary diversity, family or social support. [7,8,11,15–18]

The high undernutrition rate and HIV/AIDS are among the main public health concerns especially on the health systems of SSA, despite considerable control made in the last decade. Complication due to undernutrition among PLWHA is a major challenge of the HIV control efforts in low and middle-income countries. While it is paramount to identify the determinants of undernutrition among PLWHA in order to implement proper interventions, limited research has been done on the subject in Rwanda. Therefore, this study intended to determine the prevalence of undernutrition and its determinants among PLWHA on antiretroviral treatment in Ngarama hospital, Eastern Province, Rwanda.

Materials and Methods

Study design and setting

This cross sectional study was conducted at Ngarama District Hospital in the Eastern Province, Rwanda. According to the hospital records there were 609 registered HIV patients on ARV Services in 2022. The study was conducted from April to July 2022.

Study population, sampling and sample size

The study included a population of HIV adults on ART aged above 20 years attending Ngarama Hospital. A total sample size of 242 HIV patients was calculated using the formula of Yamane (1967) for a finite small population as cited in Israel.[19] as follows:

$$n = \frac{N}{1+N(d^2)} = \frac{609}{1+609(0.05^2)} = 242$$

Where

'n' stands for the desired sample size

'N' stands for the total population (609).

'd' stands for margin of error at 5%,

After considering 10% for non-response rate, the sample size was raised to 267.

All HIV patients above 20 years on ARV visiting for follow-up were eligible to participate in the study. The list of HIV patients receiving services at the hospital was obtained from the registry book. Systematic sampling techniques was used to select HIV patients into the sample. The calculated sampling interval was two (2) based on the total target population of 609

and sample size of 267, giving the sampling fraction of 1/2. This means that every 2nd patient coming for a follow-up visit was selected until the desired sample size was full. Each day of data collection, the first participant was selected using lottery method from the first two HIV patients.

Data collection tools

A semi-structured questionnaire was designed after critical review of relevant literature.[20] The questionnaire measured the following: socio-demographic characteristics, clinical factors, dietary diversity practices and anthropometric features. It was prepared in English and then translated into local language (Kinyarwanda) as respondents were residents of the study area where Kinyarandwa is widely spoken. Data was collected by direct face-to-face questionnaire based interview of the selected HIV patients, as well as measuring anthropometry.

Anthropometric measurements of weight and height were taken using standard calibrated scales and recorded. All measurements were taken in duplicate with light clothing and without shoes. Then nutritional status among the study participants was determined using Body Mass Index (BMI) by weight in kilogram divided by height in metres squared. WHO reference standard was used to classify undernutrition through BMI cut off point of <18.5kg/m2.[21]

The dietary diversity among the respondents was assessed using validated food groups by the Food and Agriculture Organization. [1] The food items include cereals, white roots and tubers, vegetables, fruits, meat, eggs, fish and seafood legumes nuts and seeds, as well as milk and milk products. The study participants were asked to recall whether they had eaten or not from each food group 7 days preceding data collection. Then food dietary diversity was determined. The Dietary Diversity Score (DDS) was calculated according to the food groups consumed by the respondents in the last 7 days.

A score '1' was assigned to each consumed food group or score '0' was assigned if not consumed. The scores were aggregated to calculate the total dietary diversity score (DDS) and the study participants with DDS of less than five were classified as having poor dietary diversity and those with DDS greater than or equal to five were grouped as good dietary diversity.[1]

Data analysis

The data collected were analysed using Statistical Package for Social Sciences (SPSS) Version 25.0 IBM New York. Firstly, descriptive statistics using frequency and percentages were computed to describe the respondents' characteristics. Secondly, bivariate analysis using Chi-Square test was carried to show the relationship between the independent variables and outcome (undernutrition). Finally, all explanatory variables that were significantly associated with the outcome variable in the bivariate analyses ($P< 0.05$) were entered into the multivariable logistic regression model to identify independently associated factors of undernutrition. Confidence intervals at 95% were used to show the precision of the results, and the level of significance was taken at p value < 0.05.

Ethical Consideration

Ethical clearance was obtained from Mount Kenya University ethical committee (REF: MKU04/PG&R0491/2021) which was presented to Ngarama Hospital. Then approval from Ngarama Hospital was secured to allow the researchers to conduct the research in the health facility. The information provided was anonymized and identification codes were used instead on the data which were stored in a securely locked place accessible only to the study researchers. Data kept on computers was reached with password by authorized researchers. Informed consent form was given to every participant to read, and if agreeable to sign before participating in the study of which the purpose had been explained to them.

Result

Socio-demographic characteristics of respondents

Out of 267 expected sample size, 236 PLWHA participated which yielded a response rate of 88.4%. More than half of participants (57.6%) were male. With regard to age category, about half of the participants (52.5%) were aged 41 years and above. Regarding to religion, the highest proportion (48.3%) were Protestants followed by Catholics (39.0%). Most of the participants (66.9%) had attained primary level education while the majority of the participants (84.3%) were unemployed. The highest number of the participants (44.1%) were from the second social category (Table 1).

Table 1. Socio-demographic characteristics of the respondents

Characteristics	Categories	Frequency	Percent
Gender	Male	136	57.6
	Female	100	42.4
Age category	21 to 30	37	15.7
	31 to 40	75	31.8
	41 and above	124	52.5
Religion	Protestant	114	48.3
	Catholic	92	39.0
	Muslim	24	10.2
	Others	6	2.5
Marital status	Single	11	4.7
	Married	161	68.2
	Divorced/ separated	19	8.1
	Widow(er)	45	19.1
Education level	None	39	16.5
	Primary	158	66.9
	Secondary and above	39	16.5
Occupation	Employed	37	15.7
	Unemployed	199	84.3
Social categories	Category 1	50	21.2
	category 2	104	44.1
	Category 3 and 4	82	34.7

Clinical factors and food diversity among the respondents

Most participants (77.5%) were living with HIV for ten to twenty years. Those who reported to have opportunistic infections, chronic diseases and gastrointestinal discomfort were 13.1%, 9.3% and 10.6% respectively. More than half (57.6%) claimed they got counselling regarding diet. Respondents were also requested to indicate whether they had taken food items in the last 7 days and majority (96.2%) had consumed cereals and 73.3% white roots/ tubers. Similarly, most respondents had taken vegetables (89.8%), fruits (86.0%), meat (75.8%) and eggs (61.4%) in the previous 7 days prior data collection. Almost half (49.6%) had consumed fish or seafoods in the last 7 days. Three quarters (75%) reported that they had eaten legumes, nuts or seeds in the previous 7 days. Most (61.9%) also indicated to have consumed milk and milk products. A proxy score was examined by considering the 9-dietary diversity items and majority (87.3%) had high/good DDS and while the remaining 12.7% scored low for DD. (Table 2).

Table 2. Clinical factors and food diversity among the respondents

Characteristics	Categories	n(%)
Duration with HIV [years]	≤10	53 (22.5)
	11-20	183 (77.5)
Current/past opportunistic infections	Yes	31 (13.1)
	No	205(86.9)
Any chronic diseases other than HIV/AIDS	Yes	22 (9.3)
	No	214 (90.7)
Any gastrointestinal discomfort	Yes	25 (10.6)
	No	211 (89.4)
Given dietary counseling	Yes	136 (57.6)
	No	100 (42.4)
Cereals consumption per 7 days	No	9 (3.8)
	Yes	227 (96.2)
White roots and tubers per 7 days	No	63 (26.7)
	Yes	173 (73.3)
Vegetables per 7 days	No	24 (10.2)
	Yes	212 (89.8)
	No	33 (14.0)
Fruits per 7 days	Yes	203 (86.0)

Table 2. Clinical factors and food diversity among the respondents

Characteristics	Categories	n (%)
Meat per 7 days	No	57 (24.2)
	Yes	179 (75.8)
Eggs per 7 days	No	91 (38.6)
	Yes	145 (61.4)
Fish and Sea food per 7 days	No	119 (50.4)
	Yes	117 (49.6)
Legumes, nuts and seeds per 7 days	No	59 (25.0)
	Yes	177 (75.0)
Milk and milk products per 7 days	No	90 (38.1)
	Yes	146 (61.9)
Dietary diversity score (DDS)	Poor	30 (12.7)
	Good	206 (87.3)

Prevalence of undernutrition in PLWHA

The prevalence of the undernutrition among PLWHA was found to be 22.0%, 95% CI: 17.0% to 28.0% (Figure 1).

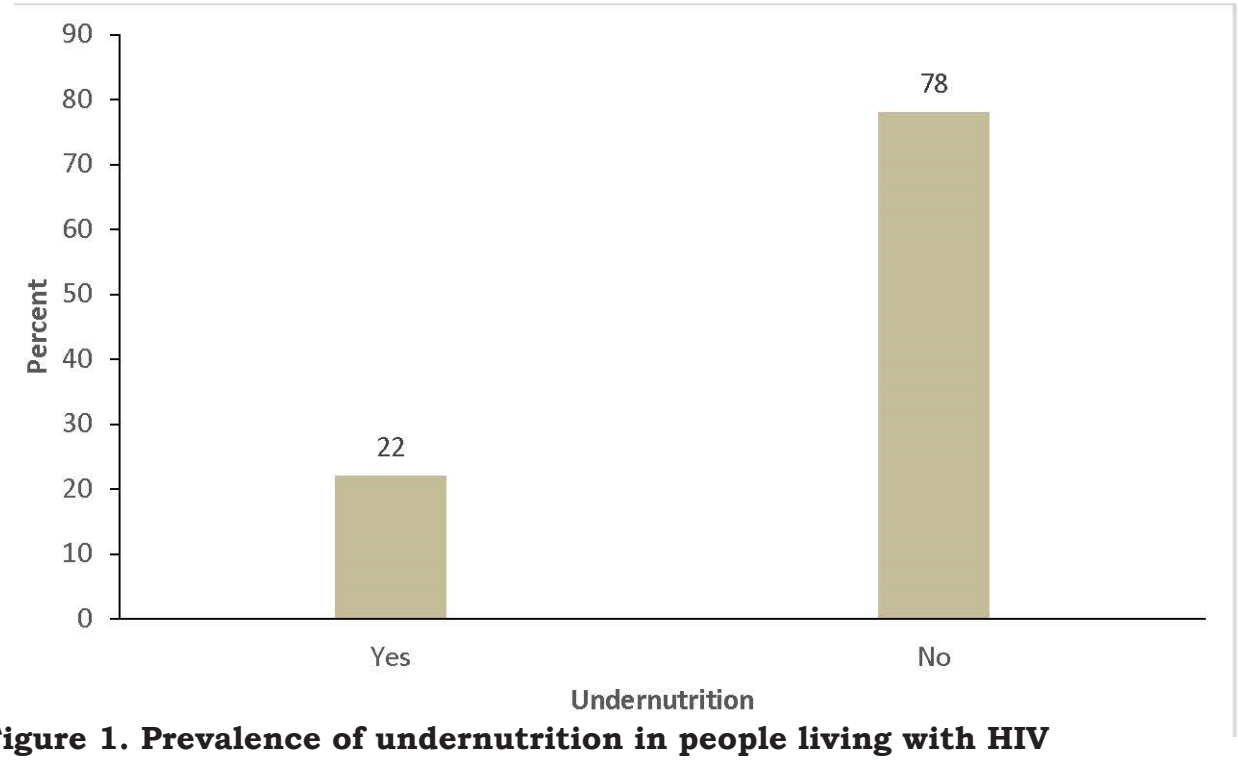

Figure 1. Prevalence of undernutrition in people living with HIV

Determinants of undernutrition in PLWHA

The prevalence of the undernutrition among PLWHA was found to be 22.0% (95% CI: 17.0%, 28.0%). As indicated in Table 3, there was significant association between age and undernutrition where the proportion of undernutrition was significantly higher among respondents aged 21 to 30 years compared to those age 41 years and above ($p < 0.001$). Respondents who belong to first social category were significantly more likely to develop undernutrition than those in social class 2 and 3 ($p = 0.001$).

The proportion of the undernourished was also significantly higher among respondents who had experienced opportunistic infection ($p = 0.016$). Respondents who indicated gastrointestinal discomfort were likely to have undernutrition compared to those with no intestinal problem ($p < 0.001$). The table further indicates that the PLWHA who received counselling about dietary were significantly less likely to develop undernutrition ($p = 0.004$). The proportion of undernutrition was also significantly more among PLWHA with poor dietary diversity score compared to those with high dietary diversity score ($p < 0.001$).

Table 3. Bivariate analysis of determinants of undernutrition in people living with HIV

Variables	Undernutrition		x^2 value	p-value*
	Yes, n (%)	No, n (%)		
Gender				
Male	27 (19.9)	109 (80.1)	0.89	0.346
Female	25 (25.0)	75 (75.0)		
Age category				
21 to 30	17 (45.9)	20 (54.1)	45.74	**<0.001**
31 to 40	29 (38.7)	46 (61.3)		
41 and above	6 (4.8)	118 (95.2)		
Religion				
Protestant	26 (22.8)	88 (77.2)	3.04	0.219
Catholic	23 (25.0)	69 (75.0)		
Muslim and others	3 (10.0)	27 (90.0)		
Marital				
Single	4 (36.4)	7 (63.6)	2.07	0.354
Married	32 (19.9)	129 (80.1)		
Divorced/Widow(er)	16 (25.0)	48 (75.0)		
Education				
None	13 (33.3)	26 (66.7)	4.02	0.134
Primary	33 (20.9)	125 (79.1)		
Secondary	6 (15.8)	33 (84.6)		
Occupation				
Employed	6 (16.2)	31 (83.8)	0.86	0.352
Unemployed	46 (23.1)	153 (76.9)		
Social categories				
Category 1	21 (42.0)	29 (58.0)	14.74	**0.001**
category 2	17 (16.3)	87 (83.7)		
Category 3	14 (17.1)	68 (82.9)		
Duration with HIV				
≤10 years	11 (20.8)	42 (79.2)	0.07	0.799
11 to 20 years	41 (22.4)	142 (77.6)		
Current/past opportunistic infections				
Yes	12 (38.7)	19 (61.3)	5.78	**0.016**
No	40 (19.5)	165 (80.5)		
Any gastrointestinal discomfort				
Yes	20 (80.0)	5 (20.0)	54.69	**<0.001**
No	32 (15.2)	179 (84.8)		
Any chronic diseases other than HIV/AIDS				
Yes	6 (27.3)	16 (72.7)	0.39	0.534
No	46 (21.5)	168 (78.5)		
Received dietary counseling				
Yes	21 (15.4)	115 (84.6)	8.12	**0.004**
No	31 (31.0)	69 (69.0)		
Dietary diversity score (DDS)				
Poor	19 (63.3)	11 (36.7)	34.12	**<0.001**
Good	33 (16.0)	173 (84.0)		

* Bolded p value indicates significance at 0.05

Multivariable analysis for determinants of undernutrition in people living with HIV

Respondents aged 21 to 30 and 31 to 40 were 17 times (AOR = 17.24; 95% CI = 5.55 – 53.56; p < 0.001) and 19 times (AOR = 19.15; 95%CI = 5.97 – 61.40; p <0.001) respectively more likely to develop undernutrition compared to those aged 41 years and above. Respondents in social Category 1 were about 3.5 times more likely to have undernutrition than those in social Category 3 and 4 (AOR = 3.54; 95%CI = 1.18 – 10.59; p = 0.024). Undernutrition was 19.8 times more among respondents who experienced gastrointestinal discomfort/symptoms (AOR = 19.87; 95% CI = 5.09 – 77.55; p < 0.001). Respondents who did not receive dietary counselling during visits were 7.5 fold more likely to have undernutrition compared to those who indicated otherwise (AOR = 7.45; 95% CI = 2.83 – 19.62; p <0.001) as indicated in Table 4.

Table 4. Multivariable logistic regression analysis of determinants of undernutrition in people living with HIV

Variables	AOR	95%CI		p value
		Lower	Upper	
Full model				
Age category				
21 to 30	17.59	4.92	62.88	**<0.001**
31 to 40	18.33	5.54	60.59	**<0.001**
41 and above	Ref			
Social categories				
Category 1	3.76	1.21	11.69	0.022
category 2	1.68	0.59	4.81	0.330
Category 3	Ref			
Current/past opportunistic infections				
Yes	0.40	0.09	1.71	0.216
No	Ref			
Any gastrointestinal discomfort				
Yes	17.66	3.88	80.34	**<0.001**
No	Ref			
Received dietary counseling				
Yes	Ref			
No	7.37	2.72	19.95	**<0.001**
Dietary diversity score (DDS)				
Poor	2.04	0.58	7.12	0.266
Good	Ref			
Reduced model				
Age category				
21 to 30	17.24	5.55	53.56	**<0.001**
31 to 40	19.15	5.97	61.40	**<0.001**
41 and above	Ref			
Social categories				
Category 1	3.54	1.18	10.59	0.024
category 2	1.49	0.53	4.16	0.446
Category 3	Ref			
Any gastrointestinal discomfort				
Yes	19.87	5.09	77.55	**<0.001**
No	Ref			
Received dietary counseling				
Yes	Ref			
No	7.46	2.83	19.62	**<0.001**

AOR= Adjusted Odds Ratio, CI = Confidence Interval

Discussion

This study focused on assessing the prevalence of undernutrition and its associated factors among adult PLWHA receiving ART. The findings has indicated that the prevalence of undernutrition was 22.0%. This is in line with other studies done in different parts of the world, for instance in Tanzania, 19.5%,[7] Senegal, 19.2% [8], Ethiopia Arba Minch area, 18.2% [14] and in Nepal, 19.9%.[22] However, it was higher compared to studies conducted in Zimbabwe, 10% ,[11] in Ghana 13.8% [9], in Uganda 10.28% [10] and in Ethiopia in Dilla university hospital 12.3%.[15] On the other hand, higher prevalence of undernutrition was reported in different regions of Ethiopia including in Tigray (42.3%) [12] and in Jimma Medical Center (34.0%) [13] and in Nigeria which reported at 43.3%.[6] The discrepancy of these undernutrition prevalences among different studies may reflect the existence of different socio-economic and other cultural factors that are practiced by different communities probably because of different ethnic experiences. Sample size, immunity and stage of HIV also might have contributed to these disparities.

The multivariable logistic regression results of this study showed that younger respondents were more likely to be undernourished than the older ones. This finding is similar to those of other studies conducted in various parts of the sub-Saharan Africa. For example in Tanzania [7,23], Zimbabwe [11] and in Ethiopia [13,24,25] which indicate that the prevalence of undernutrition was higher among young PLWHA, while overweight was higher among older respondents. However, other studies revealed contradicting results which showed that undernutrition was prevalent among older patients.[20,26] These different findings may be attributed to the CD4 count, immunity of the respondents as well as awareness on nutrition. This implies that the uncertainty around the impact of age on nutritional status would require further research to be undertaken.

Social class in this study was found to be independently associated with undernutrition among PLWHA, where respondents that belonged to lower social class were more likely to have undernutrition. Poverty is believed to be one of the leading cause of undernutrition worldwide. Several studies have shown that low wealth index is a key predictor for undernutrition among PLWHA.[9,23,27–30] This might limit individuals to spend money on nutritious and balanced diet for consumption, resulting in undernutrition. It is also evidenced that households with low income are significantly associated with food insecurity.[31]

The study further showed that respondents with gastrointestinal discomfort/symptoms were more likely to have undernutrition. This is in line with the study conducted in Uganda, which revealed that reduction of food consumption is due to loss of appetite because of gastrointestinal symptoms/ discomfort including vomiting and nausea because of ART side effects.[32] This may lead to reduced energy intake and may also be the main reasons for the loss of weight among PLWHA.[32]

The study also found that that PLWHA who did not receive dietary counseling were likely to be malnourished. This is consistent with a study done in India [33]; in Honduras [34] and in Ethiopia [18,35] which indicated that those PLWHA on ARV who received nutritional counseling had lower undernutrition due to improved dietary feeding practices. This can be explained that those who attended dietary counselling during care visits acquired more knowledge on nutritious food such as adequate amount, quality and diversity. This suggests that sustainable and appropriated intervention on nutrition counseling and education needs to be intensified for PLWHA on ART. The strength of the study include adequate sample size, using calibrated anthropometric measurements and collecting data with trained interviewers.

However, some limitations should be considered such as using cross-sectional study which by nature is limited in providing information about cause and effect relationship, recall bias especially on the frequency food consumption and the study did not use laboratory test to measure micronutrients deficiencies.

Conclusion

Our findings showed that the prevalence of undernutrition among PLWHA was moderately high. Moreover, younger age, low social class, gastrointestinal discomfort/ symptoms and not receiving dietary counseling were found to independent determinants of undernutrition. Therefore, economic strengthening, nutritional counselling and nutritional support during the comprehensive care visits should be promoted. Moreover, the Ministry of Health should consider restarting the program of giving supplements such as plump nut and CSB to malnourished people who are on ART in order to decrease the prevalence of undernutrition in ART users. Lastly, the study did not explore all possible determinants of undernutrition among ART users hence other studies are needed to cover those areas.

Authors' contribution

JG designed the study, collected, analyzed, interpreted the data and writes a manuscript. R O and M H supervised the study, contributed to data analysis and manuscript writing. All authors have read and approved the manuscript for publication.

Declaration of conflict of interest

The authors declare no conflict of interest with regards to this research and authorship of this article.

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