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FACTORS ASSOCIATED WITH UNDERNUTRITION AMONG PEOPLE LIVING WITH HIV AND AIDS RECEIVING ANTIRETROVIRAL THERAPY IN WAU TEACHING HOSPITAL, SOUTH SUDAN. A CROSS-SECTIONAL STUDY.

[1,2]Michael Yake Uchalla[*], [2]Judah Turumanya, [1,2]Dr. Jane Frank Nalubega
[2]Mildmay Institute of Health Sciences
[1]Department of Agricultural Sciences at Uganda Christian University

ABSTRACT

Background
Undernutrition in the form of wasting, underweight, and stunting. Micronutrient deficiency is a major concern in people on antiretroviral treatment. Therefore, the study aimed to assess factors associated with undernutrition among people living with HIV and AIDs receiving antiretroviral therapy in Wau Teaching Hospital, South Sudan.

Methodology
A cross-sectional descriptive study was conducted with a quantitative research approach. Using purposive sampling, we recruited key informants to introduce the study to the target population. By simple random sampling, the study assessed 338 respondents. Data on socio-demographics were collected using structured questionnaires while anthropometric data was collected using anthropometric tools and data analysis was done using the SPSS version 25. Descriptive statistics such as the frequencies, means, and standard deviations were expressed. The degree of relationship among variables was statistically evaluated using chi-square analyses. Statistical significance was reported at the $p > 0.05$ level.

Results
The majority of the respondents were female (58.6%) and (64.5%) were married. Undernutrition was more prevalent in females (25.3%) than in males (22.1%). In addition, undernutrition was significantly associated with age (P=0.009), marital status (P<0.001), highest level of education (P=0.008), treatment regimen (P=0.002), opportunistic infections (P=0.014), and clinical staging of disease (P=0.022).

Conclusion
Undernutrition is a major challenge among people attending the anti-retroviral treatment at Wau Teaching Hospital. Major changes in extension service provision, by including adults in affected western barh-ghazal Wau would help alleviate the problem at hand.

Recommendation
Health care providers including nutritionists and dietitians should create awareness on the role of nutrition in HIV/AIDS and in anti-retroviral treatment for example through routine dietetic nutrition education and nutritional counseling sessions at the ART clinic to empower PLWHIV to make appropriate food choices.

Keywords: *Under-nutrition among People Living With HIV, Antiretroviral Therapy, Wau Teaching Hospital, South Sudan*
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Corresponding author: *Dr. Jane Frank Nalubega*
Email: *janecll.nalubega@gmail.com*
Mildmay Institute of Health Sciences
Department of Agricultural Sciences at Uganda Christian University

BACKGROUND

HIV is a major global public health issue. According to the Joint United Nations Programmes on HIV/AIDS (UNAIDS) report in 2021, an estimated 38.7 million people were living with HIV with a global prevalence of 0.7% among adults. The vast majority of HIV cases are located in low-and middle-income countries. (Dembelu et al., 2021).

HIV and undernutrition interact around the cycle; HIV-induced immune impairment heightens the risk of opportunistic infection and can worsen the nutritional status of PLHIV. HIV infection often leads to nutritional deficiencies through decreased food intake, malabsorption,

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and increased utilization and excretion of nutrients, which in turn can fasten death. Nutritional status regulates the immunological response to HIV infection, affecting the overall clinical outcome, since malnutrition is the primary cause of immunodeficiency. Malnutrition on the background of HIV infection is a complex medical condition that carries significant morbidity and mortality for affected individuals, with greater mortality from Severe Acute Malnutrition (SAM) among HIV-positive persons (Abate et al., 2020).

There are multi-factorial causes of undernutrition among PLHIV and these include and not limited to food consumption disorder, medications that cause loss of appetite, nausea and vomiting, anorexia, opportunistic infections, diarrhea, nutrient malabsorption, and wasting syndrome. In addition, HIV has a particular impact on the nutritional status by increasing energy requirements through metabolic and oxidative changes (Shifera N et al, 2022)

In some African regions, notably sub-Saharan Africa, (HIV) infection poses an added challenge to the care of malnourished people. The prevalence of under-weight among HIV-positive people was found to be 49.67% in Ethiopia, Rwanda 42.0%, 29.7% in Tanzania, and 24.94% in 48.21% in Uganda. (Abbate BB et al, 2020)

HIV has been a great public health concern in South Sudan; however, given the recurrent conflict and humanitarian situation, attention has often been focused on emergency health needs, nutrition, and shelter for the displaced. South Sudan is one of the poorest countries in the world, HIV testing and treatment services are extremely limited, with antiretroviral therapy (ART) coverage at 10%, and little is known about HIV in the country. HIV prevalence in South Sudan is estimated at 2.7% among 15–49-year-olds and an estimated 200,000 people are living with HIV in the country. (Hakim AJ, et al, 2020). This study determined factors associated with undernutrition among people living with HIV and AIDs receiving antiretroviral therapy in Wau Teaching Hospital, South Sudan.

METHODOLOGY

Study Area

The study was conducted in the Wau Teaching Hospital ART clinic. The Hospital is located in Western Bahr el Ghazal State South Sudan; it is about 626.01km away from the capital of South Sudan Juba and serves a population of about 1 million people. The main catchment areas of this hospital include three counties of Western Bahr el Ghazal State i.e Jur River, Raja, and Wau County and the Hospital is supported by the Dutch base organization CORDAID & other partners in partnership with the Ministry of Health Government of South-Sudan run the Hospital.

Study Type

The study design was cross-sectional with a descriptive approach. The descriptive approach involves observing, describing, and documenting aspects of a situation as it naturally occurs in a given population; the cross-sectional examines what currently exists. This design was chosen because the researcher intended to collect data at a single point in time from a dynamic population and no need to follow up on the participants hence taking a short time. Data was collected from respondents on the key drivers for undernutrition among adults living with HIV-infected patients at the ART clinic in Wau Teaching Hospital.

Study Population

The study population was People Living with HIV and AIDs who are above 18 years old and are attending ART Clinic for treatment. Specifically, the study targeted HIV-positive adults attending the anti-retroviral clinic at the hospital in Wau Teaching Hospital in South Sudan.

Inclusion Criteria

All adults attending the ART clinic at Wau Teaching Hospital who accepted to participate in the research activity based on consent form were interviewed.

Exclusion Criteria

- People living with HIV and AIDS on Antiretroviral treatment but were critically ill or mentally unstable.
- People living with HIV and AIDS and who are on Antiretroviral treatment but below the age of 18 years.
- Pregnant women attending the antiretroviral Clinic will not be included in the study lactating women in their first six months postpartum, Adults with edema, and the elderly, 60 years and above.

Sample size

Considering a 39.0% prevalence of undernutrition among PLHIV reported in the Western Barh el Gazal state (DHIS2 annual report 2020), the sample size was calculated using the Leslie and Kish formula, as shown below.

n=required sample size

z=standard error of mean which corresponds to a 95% confidence level (standard value of 1.96)

p=known prevalence; 39% (~0.39)

d=margin of error as 5% (standard value of 0.05)

n= (1.96x1.96) (0.39) (1-0.39) / (0.05x0.05)

n= 366 respondents will be targeted

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Sampling techniques

Purposive sampling of key informants

This is a sampling technique that involves the identification and selection of individuals, or groups of individuals that are proficient with a particular community or society considering investigating a condition associated with stigma, the study first purposively identified core contacts; nurses and physicians working at the clinic in who introduced the analysis to the target population (Palinkas LA, 2019). Wau Teaching Hospital was chosen because it is the main ART site in the whole region hence researcher intended to collect data at a single point in time from a dynamic population and no need to follow up with the participants hence taking a short time

Convenient sampling methodology

From the identified population, study participants were selected and interviewed one after the other as they visited the facility. To get the 366 participants, the researcher has been collecting data following the work schedule from Monday to Saturday six working days from 8th Jan 2024 to 8th of Feb 2024

Data Collection Procedures

Structured interviews

In the study, there was face-to-face interaction with participants being asked open and close-ended questions in a structured format. In addition, key informant interviews with probing and guiding questions regarding the study were applied to purposively selected persons such as clinic in-charges including nurses and doctors.

Anthropometry

This refers to the physical measurement of body parts compared to reference standards. Anthropometry involved the following measurements: Mid-Upper-Arm Circumference in centimeters, body weight in kilograms, and height in centimeters which was used to compute the BMI of the study participants.

Height; this involved the following assessment procedure
The study participants were asked to stand barefoot on the footpiece without any head gears on the height board or heavy clothes.

To ensure accuracy, the following were carried out with the help of an assessment assistant who was recruited to help in the assessment; shoulder blades, buttocks, and heels touched the surface of the height board; knees fully straight, arms stretched on the sides; and the neck straight with the eyes looking straight ahead with the headpiece firmly extended in position.
The measurement was taken and recorded to the nearest 0.1 cm.
The procedure was repeated to ensure accuracy and the average height recorded.

Weight; this involved the following assessment procedure;
Before each weight, measurement was taken, the weighing scale was calibrated to zero.
The study participants were asked to step on the weighing scale with minimal clothing.
Weight was recorded to the nearest 0.01 kg.

Data collection tools

Structured questionnaires

The study used structured questionnaires with mostly open & closed-ended questions, the questionnaires had sections on socio-demographic, socio-economic, and clinical factors data including age, occupation, education level and marital status, and factors such as duration of therapy, political factors, cultural factors, and drug combinations.

Key informant guides

The tool was designed with guiding questions to probe patterns of Anti-retroviral treatment. The questionnaires were pre-tested on a few individuals to determine suitability before the actual field exercise of data collection.

Anthropometric tools

Height board

This is an anthropometric tool that was used to measure the standing height of individuals, in the study, the height board was used to determine the height of the study participants which were read and recorded to the nearest 0.1 cm.

Weighing scale

The study used the digital weighing scale to determine the weights of the study participants which were read and recorded to the nearest 0.01 kgs. The weighing scales were standardized periodically using objects of known weight. In addition, the batteries were tested for functionality before the actual assessments of the individuals and the reading to zero.

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Data Analysis Method

Statistical analysis methods

Data were coded, entered, and analyzed using IBM SPSS statistics version 25 for Windows. Descriptive statistics were carried out using frequencies and proportions. Statistical tests were carried out to examine relationships between the outcome variables and selected determinant factors of ART. Data analysis for frequency distribution, and mean were done.

Validity and reliability

Validity and reliability were debated and approved by the research supervisor and the research committee to ensure that the design was well-framed. The researcher employs and trains research assistants with medical backgrounds so that interpretation and use of tools become easy for reliability. In addition, the assessment tools were pre-tested before the actual data collection.

Ethical Consideration

An introductory and approval letter was obtained from the Mildmay Institute of Health Sciences and was presented to the relevant authorities in Wau Teaching Hospital. Study participants were informed that participation in the study is voluntary and that information collected during the study was purposely for research. In addition, written or verbal consent using a consent form was sought before the collection of information from eligible respondents.

RESULTS

Characteristics of the Study Participants

Table 1: Showing socio-demographic characteristics of respondents

Characteristic	Frequency	Percentage (%)
Age group		
<25	81	23.9
26-35	98	28.9
36-45	107	31.6
>45	52	15.4
Sex		
Male	140	41.4
Female	198	58.6
Religion		
Catholic	187	55.3
Protestant	32	9.5
Muslim	78	23.1
Traditional	34	10.1
Others	7	2.1
Marital Status		
Single	31	9.2
Married	218	64.5
Separate/Divorce	89	26.3
Level of Education		
No education	90	26.6
Table 1: Showing socio-demographic characteristics of respondents		
Primary	121	35.8
Secondary	47	13.9
Tertiary	80	23.7

Socioeconomic factors of participants attending ART Clinic at Wau Teaching Hospital

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Table 2: Showing socioeconomic factors of the respondents

Socioeconomic factors of respondents	Frequency	Percentage (%)
Occupation		
Employed	119	35.2
Unemployed	134	39.6
Others	85	25.2
Estimated Monthly Income (SSP)		
<5000	172	50.9
5000-25000	77	22.8
>25000	89	26.3
Monthly expenditure		
<25000	138	40.8
>25000	200	59.2
Landownership		
Yes	231	68.3
No	107	31.7
Alcohol Use		
Yes	75	22.2
No	263	77.8
Food taboos		
Yes	63	18.6
No	275	81.4
Physical Exercise		
Yes	94	27.8
No	244	72.2
Family support		
Yes	45	13.3
No	293	86.7
Status disclosure		
Yes	257	76.1
No	81	23.9

Table 2: shows that the majority of the respondents were unemployed (39.6%), while (35.2%) were employed and the rest were (25.2%) 31.1% were salary earners and 11.1% were unemployed. The estimated monthly expenditure with less than 25,000 was at (40.8%) and with above 25,000 was (59.2%) ssp among the assessed individuals.

Physical exercises were reported in 27.8% of the respondents while 72.2% did not engage in any planned physical exercises. In addition, the majority of the respondents own land (68.3%) while only 31.7% did not own land.

Substances such as alcohol was used by 22.2% of the respondents while 77.8% of the respondents did not drink alcohol. In addition, family support was reported in 13.3% of the respondents while 86.7% did not have any family support. In addition, those who did not eat certain food were 13.3% while the rest 86.7% ate every food.

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Table 3: Showing Clinical factors of participants attending ART clinic at Wau Teaching Hospital.

Clinical Factors	Frequency	Percentage (%)
Treatment line		
First line	252	74.6
Second line	57	16.9
Third line	29	8.6
Duration on ART		
<12 months	10	2.9
12-24 months	11	3.3
>24 months	317	93.8
Common Opportunistic		
Tuberculosis	78	23.1
Pneumonia	163.7	48.4
Diarrhea	52	15.4
Others	44.3	13.1
Clinical Staging		
Stage I	277	81.9
Stage II	42	12.4
Stage III	14	4.1
Stage IV	5	1.5
Viral Load Results		
Suppressed	324	95.9
Unsuppressed	14	4.1

Table 3: shows that the clinical staging of HIV was (81.9%) of stage one, (12.4%) of stage two, (4.1%) of stage three, and (1.5%) of stage four among respondents who were in the first line 74.6%, second line 16.9.% and third line 8.6% treatment regimens respectively. Duration of Anti-retroviral treatment was less than 12 months, 12 to 24 months, and above 24 months in 2.9%, 3.3%, and 93.8% of the people attending the ART clinic at the Wau Teaching Hospital. The commonly reported opportunistic infections in the people assessed included pneumonia (48.4%) tuberculosis (23.1%), and diarrhea 15.4%. Other conditions (13.1%) such as headaches, stomachaches, evening chills, vomiting, and nausea were also reported. Meanwhile, viral load suppression was reported in 95.9% and un suppression was 4.1% of the assessed adult clients.

Table 4: Showing political factors of participants attending the ART clinic at Wau Teaching Hospital

Political Factors	Frequency	Percentage (%)
settlement		
IDPS	285	84.3
Residential area	33	9.8
others	20	5.9
permission to visit the Hospital		
Yes	18	5.3
No	320	94.7

Table 4: shows that the majority of the clients (84.3) were found to be in the internally displaced camp (IDP), while 9.8% live in their residential areas and the rest were 5.9%. In addition, 94.7% asked no permission to visit the hospital for medical care while 5.3% had to ask for permission to go to the hospital for medical care.

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Table 5: showing the association between socio-economic factors and undernutrition

Characteristic	N	Undernutrition		Chi-square value
		Yes	No	
Sex				
Female	171	27	171	$X^2(2)1.600$, p=0.206
Male	113	27	113	
Age group				
<25	81	4	42	
26-35	98	24	69	$X^2(2)9.425$, p=0.009
36-45	107	26	169	
Marital status				
Married	229	23	206	
Single	78	28	50	$X^2(2)29.247$, p=0.000
Divorce	27	3	24	
Education				
Primary	57	16	41	
Secondary	205	24	181	$X^2(2)9.537$, p=0.008
Tertiary	72	14	58	
Occupation				
Employed	119	18	86	
Unemployed	134	33	160	$X^2(2)1.996$, p=0.369
Others	85	34	34	
Estimated Monthly Income (SSP)				
<5000	172	4	42	
5000-25000	77	24	168	$X^2(2)12.240$, p=0.002
>25000	89	26	70	
Alcohol use				
Yes	122	15	107	$X^2(2)4.660$, p=0.031
No	212	39	173	

Table 5: shows that, only the age $X^2(2)9.425$, p=0.009, marital status $X^2(2)29.247$, p=0.000 and the highest level of education $X^2(2)9.537$, p=0.008 were associated with undernutrition among respondents. In addition, only the estimated monthly income $X^2(2)12.240$, p=0.002 and alcohol use $X^2(2)4.660$, p=0.031 were also associated with malnutrition.

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Table 6: showing the association between Clinical factors and undernutrition

Characteristic	N	Undernutrition		Chi-square
		Yes	No	
Treatment line				
First line	252	16	138	
Second line	57	30	86	$X^2(2)$ 12.472, p=0.002
Third line	29	8	56	
Duration on ART				
<12 months	10	7	46	
12-24 months	11	16	94	$X^2(2)$ 2.041, p=0.594
>24 months	317	31	140	
Common Opportunistic				
Tuberculosis	78	17	110	
Pneumonia	163.7	29	130	$X^2(2)$ 3.214, p=0.014
Diarrhea	52	8	40	
Others	44.3			
Clinical Staging		8	94	
Stage I	277	36	142	$X^2(2)$ 7.597, p=0.022
Stage II	42	10	44	
Stage III	14			
Stage IV	5	19	76	
Unsuppressed VL	14	30	143	$X^2(2)$ 4.800, p=0.091
Suppressed VL	324	5	61	

Table 6: shows that undernutrition was significantly associated with the treatment regimen X2(2) 12.472, p=0.002, common opportunistic infections X2(2) 3.214, p=0.014 and the clinical staging of HIV X2(2) 7.597, p=0.022.

DISCUSSION OF THE RESULTS

Factors associated with under-nutrition among respondents

The findings showed that undernutrition was significantly associated with the marital status of adults attending the ART clinic at Wau Teaching Hospital. The marital status of women with HIV/AIDS in Uganda was documented to be driving undernutrition among women in Africa(Turumanya, 2024).

The findings showed that undernutrition was significantly associated with the highest level of education of adults attending the ART clinic at Wau Teaching Hospital. A study in Ghana revealed that there was an increased likelihood of undernutrition among patients with no formal education (Nanewortor et al., 2021). The findings showed that undernutrition was significantly associated with alcohol use in adults attending the ART clinic at Wau Teaching Hospital. Similarly, studies have documented a significant association between alcohol use and undernutrition in people living with HIV/AIDS(Gebru et al., 2020).

The findings showed that undernutrition was significantly associated with the treatment line in adults attending the ART clinic at Wau Teaching Hospital. Previous studies have shown that undernutrition is significantly associated with the treatment line among HIV/AIDS patients(Negessie et al., 2019). The findings showed that undernutrition was significantly associated with common opportunistic infections in adults attending the ART clinic at Wau Teaching Hospital. Opportunistic infections especially tuberculosis have been linked to the difficulty of drug metabolism; it affects productivity at personal, family, and country levels thus aggravating the disease(Alebel et al., 2022).

The findings showed that undernutrition was significantly associated with the clinical staging of the disease in adults attending the ART clinic at Wau Teaching Hospital. Previous studies have linked disease progression to loss of muscle mass and increased resistance to treatment thereby causing undernutrition among people living with HIV/AIDS(Molla et al., 2022).

CONCLUSION

Undernutrition was mostly linked to age, marital status, highest level of education, estimated monthly income, alcohol use, treatment regimen, opportunistic infections, and clinical staging of the disease. Undernutrition in anti-retroviral therapy hastens HIV progression into AIDS resulting from a compromised immune system. This would predispose people living with HIV/AIDS to a double jeopardy of life-threatening opportunistic infections, chronic gastrointestinal complications, and impaired nutrient absorption that would result in death.

STUDY LIMITATION

The respondents may conceal some data that may be needed on personal-related aspects for privacy reasons.

RECOMMENDATION

Healthcare providers including nutritionists and dietitians should create awareness of the role of nutrition in HIV/AIDS and anti-retroviral treatment for example through routine dietetic nutrition education and nutritional counseling sessions at the ART clinic to empower PLWHIV to make appropriate food choices.

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The cooperation and support of all the authorities in Wau Teaching Hospital and the persons who participated in the study are greatly appreciated. I hope our findings can contribute something of any magnitude towards the process and efforts to make a difference in the lives of the respondents and their families.
Lastly, I thank my family for their love, patience, and encouragement during these years of my undergraduate studies. I will always cherish, love, and support you to the best of my ability and potential.

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LIST OF ABBREVIATION

AIDS: acquired immunodeficiency syndrome
AOR: Adjusted Odds Ratio
ART: Anti-Retroviral Therapy
BMI: Body Mass Index
CI: Confidence Interval
FSW: Female Sex Workers
FANTA: Food and Nutrition Technical Assistance
HFIAS: Household Food Insecurity Access scale
HIV: Human Immune Deficiency Virus
MOH: Ministry of Health
PMTCT: Prevention of Mother to Child Transmission
SD: Standard Deviation
SMoH: State Ministry of Health
SPSS: Statistical Package for the Social Sciences
WHO: World Health Organization
OI: Opportunistic infections
TB: Tuberculosis
USAID: United States Agency for International Development
GOSS: Government of Southern Sudan
UCU: Uganda Christian University

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There is no source of funding.

CONFLICT OF INTEREST.

The authors declare no conflict of interest.

AUTHORS BIOGRAPHY.

Michael Yake Uchalla is a student of Bachelor of Science in Human Nutrition and Clinical Dietetics at the Department of Agricultural Sciences at Christian University.

Judah Turumanya is a research supervisor at the Mildmay Institute of Health Sciences.

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