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Original Article

Under Nutrition and Associated Factors among Women on Antiretroviral Therapy, at Yirgalem General Hospital, Sidama Region, Southern Ethiopia

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Abstract

Background: Nutritional management is a fundamental practice of concern to all patients infected with the human immunodeficiency virus (HIV). The nature of HIV/AIDS and malnutrition impacts are interlocked and intensify one another being worsened in case of women of reproductive age. This study aimed to assess under nutrition and associated factors among women on Anti-Retroviral Therapy (ART) in Yirgalem Hospital, Sidama Regional State, Southern Ethiopia.

Methods: Institution based cross-sectional study was employed from March 1-31/2023. Systematic random sampling techniques used for recruitment of 268 participants. A pretested and structured, interviewer-administered questionnaire, checklist, and measurements were used to collect data. Adjusted odds ratio with a 95% confidence level was used to identify determinants of under-nutrition.

Results: The prevalence of overall under nutrition (BMI <18.5k.g/m^2) among women using ART was found to be 39.2%. Educational status of unable to read and write (AOR=4.72; 95%CI (1.32, 8.93), WHO's clinical stage of AIDS (AOR=2.23(1.05-3.62) and adherence to Highly Active Anti-Retroviral Therapy in the past six months (AOR=6.56(2.45-10.67) predicted the under nutrition of women, using ART.

Conclusion: Under-nutrition was found to be high in this study as compared to other Ethiopian environments. Educational status of women, the WHO clinical stage of AIDS and adherence to HAART have all been linked to under nutrition among women living with HIV/AIDS and attending ART. Based on our findings, we suggest that all HIV-positive adults be tested for nutritional status during antiretroviral therapy, and counseling, supplementation, and nutritional treatments be tailored to HIV-positive women with low level of education, poor ART adherence and WHO clinical stages of AIDS. Further interventional trials will be conducted to determine the impact of these factors on the treatment out- comes of HIV-positive women who are malnourished.

Keywords: ART, women, under nutrition, Yirgalem hospital, Ethiopia

Introduction

Human nutrition and HIV/AIDS are closely linked to each other, both of which can independently cause progressive immune system damage. Malnutrition worsens the situation by hastening the progression of HIV infection to AIDS. HIV/AIDS is frequently linked to biological and social variables that impair people's ability to eat and use food (1). Despite significant progress in boosting HIV/AIDS treatment coverage in recent decades, high burden of HIV/AIDS and under nutrition have remained as key health-care system challenges in Sub-Saharan Africa (2).

Under nutrition is commonly associated with HIV/AIDS than the general population (3). There are multi-factorial causes of under nutrition in patients with HIV/AIDS. These include food consumption disorder, medications that cause loss of appetite, nausea and vomiting, anorexia, opportunistic infections, diarrhea, nutrient mal absorption of nutrients and wasting syndrome (2). Several studies showed that female gender, functional impairment, difficulty of swallowing, and eating less than half of the offered food portion are significantly associated with under-nutrition (4). According to the joint United Nations Program on HIV/AIDS (UNAIDS) report in 2021, an estimated 37.7 million people were living with HIV. Unlike other regions, the majority (60%) of people living with HIV in Sub-Sahara Africa are women (5). The most affected Africa region was East and Southern Africa with 20.6 million people living with HIV and 670,000 new HIV infections in 2020 (6). Africa has the highest prevalence rate of AIDS as well as under nutrition in the world (7). A significant proportion of patients who require Antiretroviral Therapy (ART) are malnourished because of low energy intake combined with increased energy demands due to HIV and other related infections (8). Under nutrition constitutes an important threat to the success of HIV/AIDS control programs in Sub-Saharan Africa (9). Ethiopia is one of the seriously affected countries both by HIV/AIDS and malnutrition.

Nutritional status is one of the key indicators for assessing the health of an individual, and the nutritional status of women is vital for their reproductive roles and more important in the era of HIV/AIDS pandemic. A study conducted to describe the prevalence of malnutrition in HIV infected women from eleven countries in Sub-Saharan Africa revealed a pooled prevalence of the disease to be 10.3% (10). Nutritional deficiencies affect immune functions that may influence viral expression and replication, leading to the

progression of the disease while HIV affects the production of hormones which are involved in the metabolism of carbohydrates, proteins and fats (11).

Adequate dietary intake and receiving ART helps the immune system to be strong and enables it to fight diseases better (12). On the other hand, inadequate dietary intake could contribute to micronutrient deficiencies that further leads to HIV/AIDS disease progression and to the depletion of CD4 count, which increases the risk of opportunistic infections (13). Other evidences also showed that HIV/AIDS affects nutrition by reducing food consumption, impairing digestion and nutrient absorption causing changes in metabolism in addition to directly attacking and destroying the cells of the immune system (11).

The ART coverage in Ethiopia was 50-69% with estimated 222,723 people receiving Antiretroviral therapy in 2020 (14). Nutrition is an important component of comprehensive care for HIV-infected women and it is particularly so in resource-limited settings where malnutrition and food insecurity are endemic. Under-nutrition among women remains a major challenge to achieve the full impact of AIDS related interventions which aim at improving quality of life, productivity, and survival.

Under-nutrition among women, who are using ART, remains undiagnosed in up to 70% of patients and about 70-80% of the malnourished patients enters and leaves the hospital without receiving any nutritional support and the diagnosis of malnutrition did not appear on their discharge sheet (15). This study, therefore, determined under nutrition and associated factors among women who are using ART at Yirgalem General Hospital, Ethiopia. The findings of the study would provide stakeholders engaged in HIV/AIDS and nutrition programs with information on the prevalence of under nutrition and associated factors to plan for appropriate interventions.

Method and Materials

Study design and period

Institutional based cross sectional study design was carried out from March 1-31/2023 among women using ART in Sidama Region, Southern Ethiopia.

Study area

The study was conducted in Yirgalem General Hospital, Sidama Region and the hospital is located 47 km far from Hawassa city (Sidama Regional Capital) and 322 kilometers from Addis Ababa, the capital city of the country. As reported by the hospital, total number of

patients using ART in Yirgalem General Hospital was 2037 and number of women using ART was 701.

Source population

All patients using ART in Yirgalem General Hospital

Study Population

All HIV positive women who were using ART in Yirgalem General Hospital during the study period

Inclusion and Exclusion criteria

Inclusion criteria

HIV positive women aged 18 and above who were attending ART clinic at Yirgalem General Hospital during the study period

Exclusives criteria

Pregnant and lactating women as well as those seriously ill at the time of the interview were excluded.

Sample size and Sampling procedures

A single population proportion formula was used to calculate the sample size. A prevalence of 42.3% was taken as a prior estimate from a study conducted on under-nutrition among women with HIV/AIDS in Humera Hospital, Northern Ethiopia (16).

$$n = \frac{(Z_{\alpha/2})^2 p (1-p)}{d^2}$$

Where,

n= is required sample sizes;

p=42.3%, prevalence of under nutrition among women with HIV/AIDS in Humera Hospital

d =Margin of error = 5%

$\mathbf{Z_{\alpha/2}}$ =desired 95% CI P=42.3(0.05);

Therefore, $n= \frac{(1.96)^2 \times 0.423 \times 0.577}{(0.05)^2} = 375$

Hence the population size (women who are using ART at Yirgalem general hospital was 701, and this is less than 10,000 population), a correction formula was used to minimize the required sample size as the calculated sample size, 375, is more than 5% of total population. Based on the correction formula, n=n/ 1/n/N, sample size n=n/1+n/N= 375/1/375/701 n=244. Adding 10% of estimated non-respondents rate, total sample size was 268.

Sampling procedures

Systematic random sampling techniques used to select the study participants in the study area. First, by randomly selecting the first participant, then every other participants from lists of women patients using ART were interviewed; individual patient folder (patient charts) corresponding to the selected participant were reviewed using a checklist to collect clinical data.

Variables of the study

Dependent variable

- Under nutrition

Independent variables

- **Socio-economic and demographic characteristics:** age, sex, ethnicity, religion, marital status, education level, monthly income, occupation
- **Dietary related factors**: dietary counseling, food sources of households
- **Clinical and behavioral factors:** CD4 count, AIDS clinical stages, Adherence of ART

Data Collection instrument and procedures

A pretested and structured interviewer-administered questionnaire, checklist, and measurements were used to gather data. The questionnaire were initially prepared in English **(Supplementary material S1),** translated into Amharic **(Supplementary material S2),** and then translated back to English to check its consistency before administration. Three nurses and one public health professional were recruited as data collectors and supervisors respectively. The questionnaires included socio-demographics, clinical factors, household and behavioral characteristics. The nutritional status of the study participants were determined by anthropometric measurements by using Body Mass Index (BMI). The weight of the study participants was determined using a beam balance with a measurement range of up to 120 kg and a precision of 0.1 kg. Weight was taken while wearing only light clothing and no shoes. Before weighing each participant, the calibration was done by setting the scale to zero. The respondents' heights were measured using a vertical height scale in the middle of the board, standing upright, and recorded to the nearest 0.5 cm. The participants were instructed to remove their shoes, stand tall, and look straight down in the horizontal plane. BMI was then calculated by dividing the weight in kilograms by the square of the height in meters (kg/m2). As a result, if the study participants' BMI was less than 18.5 kg/m2, they were classed as undernourished (underweight) (17).

The Household Food Insecurity Access Scale (HFIAS) was used to assess household food security (18) which was validated by Food and Nutrition Technical Assistance (FANTA). The Morisky Medication Adherence Scale (MMAS-8) was used to assess the patient's drug adherence (17).

ASSIST which is a brief screening questionnaire developed by the WHO to find out about people's use of psychoactive substances was used to assess current and ever substance use history of the participants (18)

Data Analysis

Data were entered into Epi-data entry software (version 3.1). Further data cleaning and analysis were done using the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive analysis was computed to measure the proportion of socio-demographic and other characteristics of women on ART and the prevalence of under-nutrition. A binary logistic regression analysis was employed to identify association between dependent and independent variables. Accordingly, variables in binary logistic regression analysis with a p value < 0.25 were considered in the multivariate logistic regression to control for possible cofounders. An adjusted odds ratio (AOR) with a 95% confidence interval was employed to determine the level of significance. A variable with an AOR not including 1 and p value of less than 0.05 was used to declare the presence of statistical significance.

Operational definitions

Adherence to ART: fulfillment with a drug regimen as in taking medications properly and on time.

Under weight: The person whose Body mass index (BMI) is less than 18.5 Kg/M^2

Under nutrition: refers to a state where the women have insufficient intake and/or absorption of essential nutrients, leading to deficiencies, imbalances, or excesses. In this study, participants were categorized either under-nutrition or normal based on their BMI.

Normal weight: The person whose Body mass index (BMI) between 18.5Kg/M to 24.9 Kg/M2

Results

Socio-Demography Characteristics of Respondents

A total of 268 women with HIV/AIDS, who were enrolled in ART clinics, took part in the study, with a 100% response rate. The mean age of respondents was 37.7 with standard deviation (SD ±7.03). More than one third of respondents, (42.5%) were in the age group of 30-39 years. One hundred fourteen (42.5%) of respondents were orthodox in religion. One third (33.6%) of respondents were Sidama by ethnicity and majority 191(71.3%) were urban dwellers. Regarding marital status, 125 (46.6%) of respondents were married. Nearly one-third (32.8%) of respondents attended primary education. Participants who are unable read and write were only 7.5%. One-third (33.2%) of respondents were daily laborer by occupation, and 69.4% of the participants earn average monthly income of 700-1500 ETB. Table 1 shows details of socio-economic and demographic characteristics of respondents.

Table 1: The socio-demographic and economic characteristics of the study participants (n=268)

Variables	Category	Frequency	Percentage
Age of respondent	20-29	83	31.0
	30-39	114	42.5
	40-49	71	26.5
Religion	Orthodox	114	42.5
	Protestant	99	36.9
	Catholic	20	7.5
	Muslim	18	6.7
	Others	17	6.3
Ethnicity	Sidama	90	33.6
	Wolaita	80	29.9
	Gurage	29	10.8
	Amhara	25	9.3
	Oromo	14	5.2
	Other	30	11.2
Marital status	Married	125	46.6
	Unmarried	76	28.4
	Divorced	33	12.3
	Widowed	34	12.7
Current residence	Urban	191	71.3
	Rural	77	28.7
Educational level	Unable read and write	20	7.5
	Able to read and write	31	11.6
	Primary school	88	32.8
	Secondary school	72	26.9
	College/University	57	21.3
Occupation	Employed	60	22.4
	Merchant	51	19.0
	Daily laborer	89	33.2
	Farmer	48	17.9
	Student	20	7.5
Average monthly income	<700 ETB	52	19.4.4
	700-1500 ETB	186	69.4
	>1500 ETB	30	11.2

Health related characteristics of respondents

Majority, 212 (79.1%) of the study subject were on ART at least for one year. Most of the respondents 231 (86.2%) had not experienced side effect on HAART in the past six months. Only forty nine (3.4%) of respondents had loss of appetite, and only 28 (10.4%) experienced gastrointestinal tract symptoms as side effects of ART in the past six months. Table 2 below shows health related characteristics of respondents.

Table 2: The clinical and behavioral characteristics of the study participant (n=268)

Variables	Category	Frequency	Percentage
Respondent's clinical AIDS stage	Stage one	98	36.6
	Stage two	78	29.1
	Stage three	65	24.3
	Stage four	27	10.1
Current CD4 cell count	<200 cells/mm^3	16	6.0
	200-499 cells/mm3	203	75.7
	>500 cells/mm3	49	18.3
Adherence to HAART in the past six month	Good adherence	195	72.8
	Fair adherence	58	21.6
	Poor adherence	15	5.6
Time started receiving ART	Weeks	8	3.0
	Months ago	48	17.9
	Years ago	212	79.1
Gastro intestinal symptom in past six month	Yes	28	10.4
	No	240	89.6
Had loss of appetite	Yes	9	3.4
	No	259	96.6

Clinical and behavioral Characteristics of respondents

In regards to the clinical staging of AIDS, 36.6% of respondents were at the WHO clinical stage I. Around three fourth of the respondents had CD4 count between 200-499 cells/mm3. The majority, (195, 72.8%) of clients had good adhered to HAART in the past six month.

Households' food sources and consumption patterns of diet by respondents

More than half (58.5%) of respondents reported that they had their household's daily food from open market for the last six months. Seventy (18.3%) respondents were provided/supported food by aid organizations and 23.2% of respondents

reported that they get food from their garden/farms. Around three fourth (74.3%) respondents ate their meals three and more times a day. More than half (59.7%) of the respondents changed their feeding frequency and types of foods after knowing HIV status. Almost all (94%) of the respondents consumed cereal, legumes and dark green vegetables 24 hour prior to the time of data collection. Animal source foods such as meat/fish, milk and milk product and egg were consumed by less than 6 % of respondents 24 hours prior to date of data collection.

Household Food Security Status

Majority (67.5%) of households were food secure. The magnitude of mild, moderate and severe food insecurity was 17.2%, 10.4% and 4.9, respectively. Figure 1 shows Household Food Insecurity Access Scale (HFIAS) measurement tools of respondents on ART at Yirgalem General Hospital, Ethiopia, 2023 (n=268) .

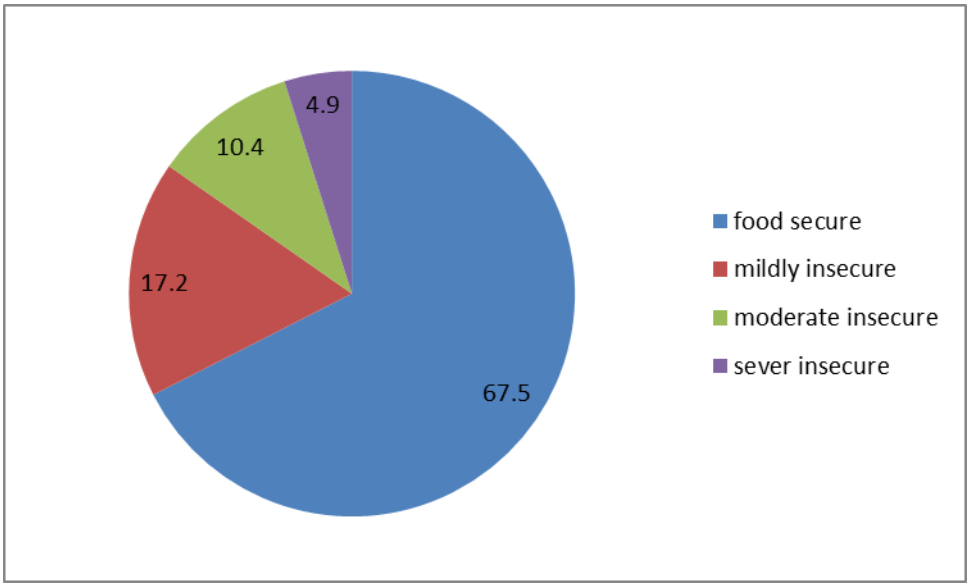

Figure 1: Household Food Insecurity Access Scale (HFIAS) measurement tools of respondents on ART at Yirgalem General Hospital, Ethiopia, 2023 (n=268)

Nutritional status among reproductive age women living with HIV on ART

The prevalence of overall under nutrition (BMI <18.5k.g/m^2) in this study was 39.2%. The mean BMI of respondents was 20.15 Kg/m2, with (SD ±3.06).The finding revealed that more than half 163 (60.8%) of the respondents had normal weight (18.5-24.9 Kg/m2). Figure 2 shows nutritional status of HIV positive women on ART at Yirgalem General Hospital, Ethiopia, 2023 (n=268).

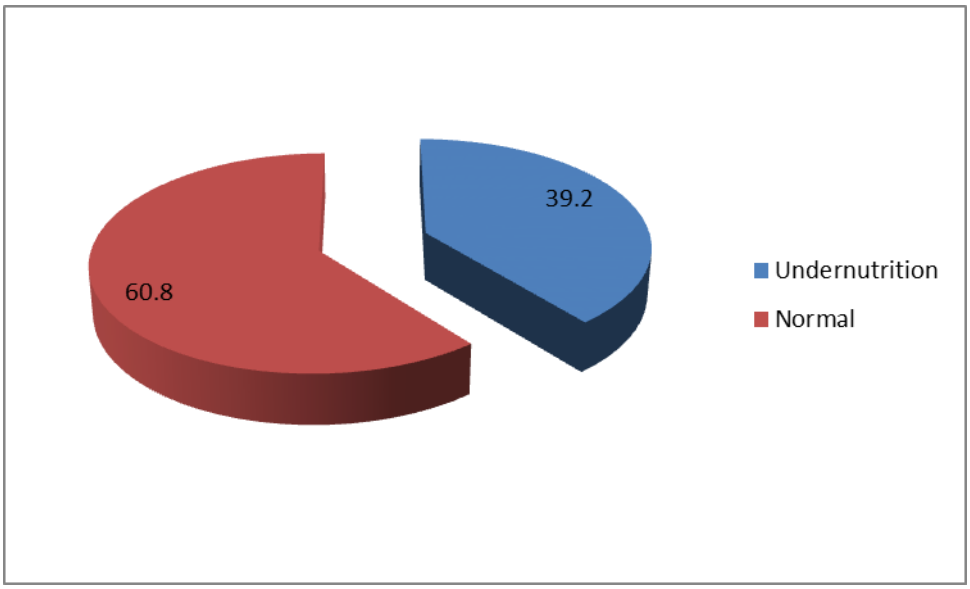

Figure: 2. The nutritional status of HIV positive women on ART at Yirgalem General Hospital, Ethiopia, 2023 (n=268)

Factors associated with under nutrition among women living with HIV on ART

In this study both bivariate and multivariate logistic regression analysis were computed. Out of 8 selected candidate variables with under nutrition in the bivariate model, only three variables (educational level, clinical stage, and Adherence to HAART in the past six month) were significantly associated with under nutrition when data were computed with multivariate logistic regression analysis. Regarding educational status of participants in this study, those women who were unable to read and write were 4.72 times more likely to be undernourished than those women who had college and university educations (AOR= 4.72; 95%CI (1.32, 8.93). The WHO clinical stage of AIDS was another predictor of under nutrition. Those respondents who were clinical stage two were 2.23 times more likely to be undernourished than those clients who were clinical stage one (AOR=2.23(1.05-3.62).

In this study, adherence to HAART in the past six months was significantly associated with under nutrition. Those clients who had poor adherence to HAART in the past six month were 6.56 times more likely to be undernourished than those participants with good adherence to HAART in the past six month (AOR=6.56(2.45-10.67). Table 3 shows variables computed to assess factors associated with under nutrition among women of reproductive age using ART.

Table 3: The factors for under nutrition among women on ART at Yirgalem General Hospital, Sidama region, Ethiopia in 2023 (n=268)

Variable	Categories	BMI		COR (95%CI)	AOR(95%CI)
		Under nutrition	Normal		
Age of respondents	20-29	27	56	0.69(0.37-1.26)	0.96(0.51-1.80)
	30-39	52	62	1.19(0.61-2.33)*	1.89(0.93-3.83)
	41-49	26	45	1	1
Current residence	Urban	73	118	1.15 (1.01-4.23)	1.15(0.62-2.14)
	Rural	32	45	1	1
Educational level	Unable read & write	16	4	3.35(1.60-11.29)*	4.72(1.32-8.93)*
	Able to read & write	14	17	1.10(0.42-2.45)	1.38(0.52-3.98)
	Primary school	32	56	1.46(0.74-2.90)	1.84(0.50-3.8)
	Secondary school	29	43	1.24(0.61-2.51)	2.01(0.91-4.43)
	College/University	26	31	1	1
Eating difficulty due to loss of appetite	Yes	15	34	1.58(1.23-3.07)	1.40(0.68-2.84)
	No	90	129	1	1
Respondents' WHO AIDS stages	Stage one	47	51	1	1
	Stage two	53	25	2.0(1.05-3.62)*	2.23 (1.096-4.55)*
	Stage three	23	46	1.7(0.88-3.20)	1.83(0.88-3.82)
	Stage four	10	17	1.5(0.65-3.76)	1.43(0.51-4.00)
Adherence to HAART in the past six month	Good adherence	79	116	1	1
	Fair adherence	25	33	0.72(0.49-1.62)	1.03(0.54-1.95)
	Poor adherence	14	1	9.53(1.23-14.56)*	6.56(2.45-10.67)*
Meal frequency	Three and above	79	121	1	1
	Two meals	26	41	1.03(1.01-4.34)*	1.35(0.02-5.60)
Food security	In secured	43	45	1	1
	Secured	62	118	0.55(0.32-1.94)	1.47(0.43-4.56)

*: level of significance<0.05) COR=Crude Odd ratio, AOR=Adjusted Odd Ratio, CI= Confidence Interval and 1= Reference Variable

Discussion

Under nutrition and HIV/AIDS effects are interrelated and exacerbated one another in a vicious cycle. Both HIV/AIDS and under-nutrition independently cause progressive damage to the immune system and increased susceptibility to infection. This study gave picture of what HIV positive women dietary practice and their nutritional status looks like. In this study the prevalence of under nutrition of in Yirgalem general hospital

HIV/AIDS women who were on ART was 39.2%. It founded that respondent's educational level, clinical AIDS stage, adherence to HAART in the past six month were associated with under nutrition. The prevalence of under nutrition revealed in this study was much closer to that documented in Tigray (42.3%) (16). The prevalence of under nutrition was higher compared to studies conducted in different parts of Ethiopia, 25.2% in Butajira hospital (19), 18.2% in Arbamich area public health facilities (9), 12.3% in Dilla University hospital (20) and 27% in Nekemte referral hospital (21). In this study, educational status of women (age 15-49) receiving ART was factor that predicted under-nutrition. Women who were unable to read and write were 4.72 times more likely to be undernourished than those who had college and university. This had been also supported by the study conducted in Abay Choman District (22). This probably could be related to an increased awareness of self-care, health service utilization and acknowledging the importance of increasing meal frequency among educated women.

The WHO's Clinical staging of AIDS was also another predictor of under nutrition of this study. Women with AIDS clinical staging of two and above were 2.23 times more likely to be undernourished than AIDS clinical staging of one. This study is in line with study conducted in Addis Ababa selected public health (23) which stated that the WHO's clinical stages of two and above are determinants of under-nutrition among adult women.

In this study, adherence to HAART in past six month was significantly associated with under nutrition among women of reproductive age receiving ART. Those clients whose adherence was poor adherence to HAART in past six month were 6.56 times more likely to be undernourished than whose adherence was good. This finding supported by study conducted in Bench Sheko Zone (24) which justified poor adherence for HAART as a determining factor for under-nutrition in adults receiving ART. This may be due to poor ART adherence leads to viral replication, destruction of CD4 cells, compromised immunity, and advanced disease progression; finally leads to reducing the dietary intake and nutrient absorption. Other independent variables did not have significant association with under-nutrition as determining factors.

Limitation of the study

The outcome variable and the factor variables were assessed simultaneously, making establishing cause and effect

relations impossible. This study also didn't use food record and used secondary data source, this data might not give full information about nutritional status of HIV positive women on ART. In this study under-nutrition was measured by BMI. However, BMI alone may not capture all aspects of under-nutrition. The study does not include qualitative analysis of cultural issues.

Conclusion

The prevalence of malnutrition was found to be high in this study as compared to other Ethiopian environments. Women's education, the WHO's clinical stage of AIDS and participants' adherence to HAART have all been linked to under nutrition among women with HIV/AIDS patients attending ART. Based on our findings, we suggest that all HIV-positive women be tested for nutritional status during antiretroviral therapy, and counseling, supplementation, and nutritional treatments be tailored to HIV-positive women with low educational status, poor ART adherence and WHO's advanced clinical stage of AIDS. Further interventional trials should be conducted to determine the impact of these factors on the treatment outcomes of HIV-positive women who are malnourished.

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Ethical considerations

Ethical clearance was obtained from the Research and Ethical Committee (REC) department of Public Health Pharma college of Health Science, Hawassa campus through a Ref No: PHA/16/23. An official letter of cooperation was written from Sidama Regional Health Bureau with reference number SHB/02/739. Each study participant was adequately informed about the objective of the study and anticipated benefit and risk of the study by their data collectors. Verbal consent was obtained from study participants for protecting autonomy and ensuring confidentiality. Respondents also told the right not to respond to the questions if they don't want to respond or want to terminate the interview at any time.

Acronym and Abbreviation

AIDs: Acquired Immune Deficiency Syndrome

AOR: Adjusted Odds Ratio

ART: Antiretroviral Therapy

BMI: Body Mass Index

CD_4: Compacted of differentiation

CI: Confidence Interval

COR: Crude Odds Ratio

CSA: Central Statistical Agency of Ethiopia

DNA: Deoxyribonucleic Acid

FAO: Food and Agricultural Organization

FANTA: Food and Nutrition Technical Assistance

FFQ: Food Frequency Questionnaires

IRB: Institutional Review Board

HAART: Highly Active Antiretroviral Therapy

HIV: Human Immunodeficiency Virus

MUAC: Middle-Upper Arm Circumference

NGO: Non-governmental Organization

RNA: Ribonucleic acid

OI: Opportunistic infection

OR: Odds Ratio

PLWHA: People Living with HIV/AIDS

SNNPR: South Nation Nationalities and Peoples Regional State

SPSS: Statistical package for Social Science Students

UNAIDS: United Nations Program on HIV/AIDS

Data availability statement

The datasets analyzed during the current study are available upon reasonable request.

Conflicts of Interest

The authors declared no conflicts of interest exist.

Funding statement

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