

Undernutrition and associated factors among HIV-Infected adults receiving ART at Health centers, Lega Tafo and Surrounding, Ethiopia, 2021

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Research

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Abstract

Background: Globally 38 million people were living with HIV in 2019. In Africa, 25 million people are living with HIV/AIDS undernutrition and food insecurity is endemic. Hence the study aimed to assess the magnitude of undernutrition and associated factors among HIV-infected adults receiving ART.

Methods: Institutional based cross-sectional study was conducted among HIV/AIDS patients who following the ART service was selected by a simple random sampling method. The data were collected by direct interview, using a structured questionnaire. Descriptive statistics and a Logistic regression model were employed.

Result: The study revealed that the magnitude of under-nutrition was 18.8%. The history of opportunistic infection (AOR=4.518:95% CI: 2.304-8.857), Patients taking ART for less than one year (AOR=3.675:95% CI: 1.831-7.377) household food insecure (AOR= 3.113:95% CI: 1.628-5.950) and dietary diversity score (AOR=2.340:95% CI: 1.221-4.485) were found to have a statistically significant association with undernutrition.

Conclusion: The magnitude of undernutrition among people living with HIV/AIDS was found to be high. Having an opportunistic infection, duration of taking ART treatment, household food security status, and dietary diversity status were found to statistically significant association with undernutrition.

Introduction

Globally, 38 million people were living with HIV in 2019 among them 26.0 million people were accessing antiretroviral therapy as of the end of June 2020 and about 690,000 people died from AIDS-related illnesses in 2019 (1). In Africa where more than 25 million people are living with HIV/AIDS under nutrition and food insecurity are endemic(2).

Sub-Saharan Africa carries a disproportionate burden of HIV, accounting for more than 70% of the global burden of infection, which accounted for 74% of the 1.5 million AIDS-related deaths (3).

Undernutrition unacceptably increases the risk of mortality among adults living with the Human Immune Deficiency Virus (HIV)(6). HIV specifically affects nutritional status by increasing energy requirements, reducing food intake, and adversely affecting nutrient absorption and metabolism (4).

Despite major advances in the treatment and survival of patients infected with human immunodeficiency virus (HIV), weight loss and undernutrition remain common problems (8).

Undernutrition unacceptably increases the risk of mortality among adults living with the Human Immune Deficiency Virus (HIV)(6). In sub-Saharan Africa accounted for 74% of the 1.5 million AIDS-related deaths and undernutrition has its contribution by increasing disease severity (3). Also, studies indicate lower BMI(undernutrition) was associated with a higher risk of death (9). There is a high burden of

undernutrition. HIV/AIDS and under-nutrition effects are interrelated and exacerbate one another in a vicious cycle (4).

The effects of undernutrition on the immune system are well known and include decreases in CD4 T cells suppression of delayed hypersensitivity and abnormal B-cell responses (2). The immune suppression caused by protein-energy malnutrition is similar in many ways to the effects of HIV infection (2).

Another problem raised with HIV/AIDS patient undernutrition is increasing susceptibility to other opportunistic infections and diseases. This happens due to the decrement of defending cell-like B-lymphocyte and CD4 count (2,10). Human immunodeficiency virus (HIV) compromises the nutritional status of infected individuals, and in turn, undernutrition worsens the effects of the infection itself by weakening the immune system consequently, accelerating disease progression and death (11).

Undernutrition also reducing the effectiveness of ART drugs and increasing side effects. As studies indicate undernutrition is reducing drug metabolism, distribution, and effectiveness due to lack of protein carrier (12). In addition, adherence to ART drugs is low in undernourished HIV/AIDS patients (13).

HIV-infected persons are at higher risk for undernutrition, and certain conditions can magnify the risk, such as anorexia, difficulty swallowing or painful swallowing, malabsorption and diarrhea, altered metabolism of nutrients, increased utilization of nutrients, and greater loss of nutrients (4). Not only this but also, there are many factors associated with HIV/AIDS undernutrition among them household food insecurity, lack of nutritional counseling, educational status, and economic status are evidenced by many studies(6,10,14,15).

Many studies were conducted on HIV/AIDS patients but since the dispute undernutrition is unanswered and still there is a lack of information in the Ethiopian context further investigation will be needed. Again, there is a difference between malnutrition and undernutrition but most of the studies use malnutrition and undernutrition interchangeably as the same term. Therefore, there is an interpretation error in many studies. This confusion was solved by this study, since the aim of this study was to put the magnitude of undernutrition and associated factors.

Methods And Materials

4.1 Study area and period

The study was conducted at Lega Tefo, Edase, Yeka Abedaw, and Hayat health centers from February 8/2021 to June 10/2021. Lega Tefo health center is found in Oromia regional states that are located at the boundary of Addis Ababa city near Yeka sub-city while Edase, Yeka Abedaw, and Hayat health centers are found in Addis Ababa, Yeka sub-city. All selected health centers are ART centers and geographically located in nearly the same local area in the northeast of Addis Ababa. More than 443 patients, 268 patients, 146 patients, and 517 patients are receiving ART from Lega Tafo, Edase, Abadew, and Hayat health center respectively (data obtained from selected health facilities).

4.2 Study design

An Institutional based cross-sectional study was conducted.

4.3. Population

4.3.1 Source of population

All HIV-infected adults receiving ART at Lega Tefo, Edise, Yekabadew, and Hayat health centers.

4.3.2 Study population

All HIV-infected adults receiving ART from selected health centers, whose fit inclusion criteria and are not excluded by exclusion criteria.

4.3.3. Eligibility Criteria

4.3.3.1 Inclusion criteria

- Adult HIV/AIDS patients those currently receiving ART drugs from selected health centers and come to health centers during data collection.
- Age group from 15-55 years old.

4.3.3.2 Exclusion criteria

- Lipodystrophy patients (patients with abnormal fat accumulation).
- Patient held in the category of lost to follow up.
- Known undernutrition patients, whose holding in the nutritional treatment program.
- Pregnant and lactate women (less than 6 months postpartum).
- Patient with Spinal deformity.
- Ascites and the edematous patient due to chronic disease like Congestive heart failure.

4.3 Sample size determination

The sample size (n) required for the study is calculated using the formula to estimate a single population proportion by considering the following assumptions.

$Z_{\alpha/2}$ = critical value for normal distribution at 95% CI to 1.96 (Z value at $\alpha = 0.05$). According to the study conducted in 2018 at Addis Ababa the prevalence of under nutrition among ART attendants was 15.1% (24).

Hence, according to the study; $P = 15.1\%$

$d(w)$ = margin of error of 0.05 with 95% CI level.

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

$$n = \frac{(1.96)^2 0.151(1 - 0.151)}{(0.05)^2}$$

$$n = 197$$

The sample size for the factors associated with undernutrition was calculated by Epi info launcher software version 7.2.4 and aggregated in table 1. The proportion was taken from the study conducted in Demba district, northwest of Ethiopia (6) , and a study conducted in the Tigray region (21).

Hence 344 sample size is the largest sample size obtained and it is used as sample size.

Therefore, the sample size is $363 + 10\%$ (none response)399.

4.4 Sampling method

Totally, 1374 patients are receiving ART at selected health centers. The desired sample was proportionally allocated based on the number of patients receiving ART. To get proportional size multiplying the number of ART patients in the health center with desired sample (399) and divided by Total patients of all four health centers (1374).

For Lega Tafo health center there are 443 patients attending ART. So, the sample going to be taken will be128.

For all health centers calculated and represented in Figure2.

After the number of the sample was allocated and selected by considering inclusion and exclusion criteria. The sample was taken by simple random sampling from those who fit the criteria.

4.6. Study Variables

4.6.1 Dependent variable

- Undernutrition

4.6.2 Independent variables

Socio-demographic factors

- Age
- Sex
- Employment condition
- Monthly income
- Education status
- Marital status

Dietary pattern and related

- Frequency of food.
- Difficult to eating
- Individual dietary diversity score.
- Appetite.
- Household food security

Opportunistic infections and complication factors

- Diarrhea
- Mouth thrush.
- WHO clinical stage.
- Current clinical condition
- Existence of co-infection

Treatment-related factors

- ART adherence
- Duration on ART
- CD4 count.
- Co-trimoxazole preventive therapy

4.7. Operational Definition and Measurements

- **Adherence to ART drug:** It was assessed using Morisky medication adherence score to ART drug having eight questions each with yes = 1 and no = 2, good adherence for those score 7–8, and poor adherence for those score ≤ 6 (21).
- **Body mass index:** is a measure of body fat based on height and weight that applies to adult men and women, it computed by dividing weight in kilogram for height in meter square. BMI has considered as Underweight(under nutrition) when = <18.5 , Normal weight(well-nourished) when = $18.5-24.9$, Overweight when = $25-29.9$ and Obesity = BMI of 30 or greater(27). Specifically, categorized as under nutrition (severe- $< 16 \text{ kg/m}^2$; moderate 16.0 to 16.99 kg/m^2 and mild 17.0 to 18.49 kg/m^2)(27) .
- **High dietary diversity:** scoring greater than or equal to five from twelve food types(32).
- **Household Food secure:** if [(Q1a=0 or Q1a=1) and Q2=0 and Q3=0 and Q4=0 and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0](43).
- **Household mildly food insecure:** if [(Q1a=2 or Q1a=3 or Q2a=1 or Q2a=2 or Q2a=3 or Q3a=1 or Q4a=1) and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0] (43).g
- **Household moderately food insecure:** if [(Q3a=2 or Q3a=3 or Q4a=2 or Q4a=3 or Q5a=1 or Q5a=2 or Q6a=1 or Q6a=2) and Q7=0 and Q8=0 and Q9=0] (43).
- **Household severely food insecure:** if [Q5a=3 or Q6a=3 or Q7a=1 or Q7a=2 or Q7a=3 or Q8a=1 or Q8a=2 or Q8a=3 or Q9a=1 or Q9a=2 or Q9a=3] (43).
- **Low Dietary diversity:** scoring less than five food group among nine food type(32).
- **Under nutrition:** when the measurement of Body mass index is less than 18.5 kg/m^2 (24).

4.8 Data Collection tools and methods

Data were collected by structured questionnaires by face-to-face interviews. The questionnaires have contained the questionnaires that measure the socio-demographic status of the respondents, opportunistic infections and related questionnaires, Dietary pattern and related, specifically individual dietary diversity score measurement tool, Household Food Insecurity Access Scale (HFIAS), and Morisky medication adherence score questionnaires. In addition to those, the anthropometric measurement of the respondents was taken. Both primary and secondary data were used, patients' cards and registration books were used as secondary data.

Individual dietary diversity scores and HFIAS are adopted from FANTA(43). DDS tool has 16 types and was aggregated into 9 food types. 24 hours recall method was used to collect data for DDS. Then after it was categorized as low DDS and High DDS based on criteria and further categorized as minimum dietary, higher and lower dietary diversity score.

The HFIAS was used to measure household food security level and its data was collected through a recall period of 30 days and consists of two types of questions: nine "occurrence" and nine "frequency-of-occurrence" questions. The respondent was first asked if a given condition was experienced (yes or no)

and, then asked, with what frequency (rarely, sometimes, or often). Finally, based on the result the households were categorized as food secure, mildly food insecure, moderately food insecure, or severely food insecure.

The weight and height of respondents were collected. The height was measured by using a standio-meter after the respondents were asked to remove their shoes, stand erect and look straight in a horizontal plane. The shoulder blades, buttocks, and heel touch the standing measuring board. Height was recorded to the nearest 0.1cm. Weight was measured by using Beam balance. After the scale was set to zero, the respondents were asked to remove heavy clothes and weight measurement was recorded to the nearest 0.1kg.

Data collection did by to be trained data collectors. Four data collectors were assigned one-one to each health center. The questionnaires were originally prepared in English and translated to Amharic and Afan Oromo by language expertise during data collection for more clarity. Then translated back to English after data collection for consistency. After data was collected online on google forms, then copied to SPSS version 25 for analysis.

4.9 Data quality control

Pre-data collection, the questionnaires were organized in an orderly manner and translated to the local language Afan Oromo and Amharic language by linguistics. Experienced data collectors were selected and Training was given on how to collect data, taking appropriate anthropometric measurements, recording data, ethical approach, and how to submit data. Anthropometrics measurement materials were checked whether they well function or not. Beam balance was set to zero before measurements. All materials in all four health centers were compared and accepted with only minimal variation. The pre-test was done on 5% of respondents to assure its fitness for the newly prepared questionnaire. The data collectors give brief orientation for the candidate before data collection.

During data collection, based on the instruction of the questionnaires, the data was collected online on google forms. The code was given for each candidate during data collection. The anthropometric of the respondents was taken carefully. The investigator was controlled, supervised, and support the overall work of data collectors.

After data collection, data were checked for completeness and consistency then copied from google form spreadsheet to the Statistical Package for Social Science (SPSS) software version 25 for further processing.

4.10 Data processing and analysis

Data were checked for completeness and consistencies and then exported to the Statistical Package for Social Science (SPSS) software version 25 for analysis. Descriptive statistics were used to describe the

study population about relevant variables. Logistic regression was fitted to identify the association between dependent (undernutrition) and independent variables.

The analysis was conducted to select candidate variables to the initial multivariable model. Those variables that show an association with undernutrition at a p-value less than 0.2 were included in an initial multivariable logistic regression model.

Both crude and adjusted odds ratios with their corresponding 95% confidence interval were used to determine the strength of association. Assumptions of logistic regression were checked before the final multivariable analysis using probability Bivariable graph and collinearity diagnostic (Variance inflation factor and correlation matrix).

The final multivariable model goodness of fit was checked using classification table percentage, Hosmer-and-Lemeshow chi-square test, and log-likelihood chi-square test. A p-value of less than 0.5 was used to declare the statistical significance of the finding in this study. The result was presented using text, tables, and graphs based on the types of data.

4.11 Ethical considerations

An ethical clearance letter was taken from Addis Ababa public health research and publication directorate after the requested letter was obtained from Abichus Campus of Rift Valley University. Also, the Permission letter was taken from Lega Tefo, Edase, Yekabadew, and Hayat Health center. Informed consent was done with study participants. Confidentiality of data was kept and used only for the purpose of this study.

Results

Three hundred eighty-three (96%) of HIV-infected ART attendants at lega Tafo and surrounding health centers participated in this study.

5.1 Characteristics of Sociodemographic and socioeconomic respondents

The majority, 274(71.5%) respondents were females and 228(59.5%) of respondents were married. The Median Age of respondents was 38 years old with 10 years interquartile range. Two hundred one (52.6%) of respondents earn monthly income less than 2000ETB with a median of monthly income was 2000 Birr. Three hundred fifteen (82.2%) of respondents were working in the private work area and 209(54.6%) attended grade 1-12 education (Table 2).

5.2 Opportunistic infection and other related characteristics of respondents

Most of the respondents had no diarrhea, mouth thrush, abdominal disturbance, and vomiting as well. Similarly, 366 (95.6%) of respondents were clinically improved and most of the respondents were in WHO clinical stage I while only 94 (24.5%) of them were in stage I-IV. One hundred four (27.2%) of respondents had an opportunistic infection within the past six months. Tuberculosis was the most co-disease reported among HIV/infected patients while almost half tuberculosis thirty-six (48.6%) infected individuals were undernutrition. The report indicated few of respondents were clinically not improved thirteen (3.4%) and almost all (twelve) (92.3%) of them were undernutrition (Table 3).

5.3 Treatment and follow up of respondents

The majority, 305(79.6%) of respondents were following ART drug at least for one year and 305(79.6%) of them adhered to take ART drug. Eight-two (21.4%) of respondents were received co-trimoxazole therapy and 74(19.3%) of respondents were on Tuberculosis treatment (Table 4).

5.4 Dietary related variables

One hundred forty-seven (38.4 %) of HIV infected were household food insecure while nineteen (5%) of them were severe household insecure. Only 6.8% of individuals from household food security were undernutrition. Similarly, sixty (15.7%) of respondents scored low on dietary diversity while one hundred twenty-seven (33.2%) of them were higher. About more than 93% of respondents scoring higher dietary diversity were not undernutrition. Only 7 respondents were receiving food support within the past three months (Table 5).

5.4 Magnitude of undernutrition

This study indicated that 72(18.8%) (95%, CI (15.1%-23%)), of respondents, were undernourished of which 34(8.9%) (95%, CI (6.4%-12.8%)) of them had mildly undernourished, 13(3.4%) (95%, CI (1.97%-5.77%)) of them had moderately undernourished and 25(6.5%) (95%, CI (4.44%-9.49%)) had severe undernourished (Figure 3).

5.5 Factors associated with undernutrition

The bivariate analysis was carried out to examine the associations between each of the independent variables and dependent variable separately and the unadjusted odds ratios of the associations and the 95% confidence intervals of each independent variable with the dependent variable were obtained. Those

variables showed association with outcome variables at $p < 0.25$ in the bivariate analysis such as, abdominal disturbance, the difficulty of digestion, appetite change On TB treatment, opportunistic infections, WHO clinical stage, duration on ART, co-trimoxazole therapy adherence status, and household food security Dietary diversity status.

The multivariable logistic regression analysis was used by taking all these factors into account simultaneously and only four of them remained to be significantly and independently associated with the dependent variable.

Having an opportunistic infection, duration of taking ART treatment, household food security status, and dietary diversity status had statistically significant associations with undernutrition. Hence the patients had one or more opportunistic infection were four times more likely to develop undernutrition as compared with those who do not have opportunistic infection [AOR=4.518(2.304-8.857)]. Patients taking ART for less than one year are 3.6 times more likely to develop undernutrition as compare with those who are taking more than one year [AOR=3.675(1.831-7.377)]. Patients were from household food insecurity three times more likely to develop undernutrition as compared with those from food secure households [AOR= 3.113(1.628-5.950)]. Patients with low dietary diversity scores were two times more likely to develop undernutrition as compare to those with high dietary diversity scores [AOR=2.340(1.221-4.485)] (Table 6).

Discussion

The study was intended to assessing magnitude of under nutrition and associated factors. The study indicated the magnitude of under nutrition was 18.8% (95% CI (15.1%-23%), it is in line with study conducted in Arba minchi(18.2%)(38), Study conducted in south Africa(18.2%)(38), study conducted in Asella (18.3%)(44) and in Addis Ababa (15.1%)(24). The finding is in line with study conducted in Addis Ababa might be due to similarity in socio-economic level and health service accessibility. Likewise, it is in line with the prevalence range of study conducted in Goba town (12.3%-55.6%)(22). Similarly, it is in line with study conducted in Awassa town which is 20%(45).

The finding was lower when compared with study conducted in Brazil (46%)(17), study conducted in Kenya (29%)(18), Tanzania (27%)(20), study reported from Tigray region (42%)(21), study reported from Jimma(34%)(23), Southern Ethiopia (23.72%)(46) and Silte Zone(24.1%)(15).

The discrepancy might be related with socio-economic variation, cultural, change in health service quality and feeding pattern related characteristics among the study areas. It could be increment of awareness through increase in information accessibility. Again, it might be due to most of our respondents were in WHO clinical stage I (75.5%) and most of our respondents were good adhere to ART (79%). Since obviously, ART adherence and WHO clinical stage I are negatively associated with under nutrition as evidenced by many studies(19),(23),(38).

However, the finding of the study indicated the magnitude of under nutrition obtained from our study was greater than study conducted south Africa, which is (13%)(19). The discrepancy could be due to socio economic and methodological approach. Likewise, our study were greater than study conducted in Dilla university(12.3%(25). This variation might be as a result of sample size.

The magnitude of under nutrition is high in male when compared with female. In this study the magnitude of under nutrition among male were. 22% while 17.5% among women, the study conducted in south Africa proved that the prevalence of under nutrition was high, according the that study prevalence of under nutrition was higher in males (18%) than females (9%)(19).

Food insecurity have long term and short-term effect on nutritional status as evidenced by different study. In this study about 38.4% of household of children were recorded under household food insecure. This finding is almost similar with study conducted in Awassa Town (38.5%). About 33.3% of patients from household food insecure were under nutrition.

The finding of the study showed household food insecurity was significantly associated with under nutrition. This finding was consistent with study conducted in Humera hospital, West shewa zone (five times) and Goma(14). Similarly, nearly the same report from Study conducted in Bale Goba(22) and study conducted in Asella Town (44). But also house food security agreed with study reported from Siltie zone that stated household food security as protective effect on under nutrition HIV/AIDS patients(15). This is might be why food accessibility directly related with daily consumption of food. In our study more than half of respondents from household food insecure were consuming less than four type of food per 24 hours.

Duration on ART less than one year was strong positively associated with under nutrition. This report consistent with study conducted in Arba Minch (46) and study conducted in West Shewa Zone (47). This association in fact may be due to the action of ART drug reducing virial load by increasing CD4 number and give recovery for patient through time to time.

This study indicated had opportunistic infection was four times more risk for under nutrition. it is consistent when compared with study conducted in Debre markos (28) and the study conducted in Asella (44). Likewise, our study indicated opportunistic infection was double odd of risk when compared with study conducted in Awassa(45). This strong association was might be due to opportunistic reducing eating pattern (anorexia), difficulty swallowing or painful swallowing, malabsorption and diarrhea, altered metabolism of nutrients, increased utilization of nutrients, and greater loss of nutrients (4).

Dietary diversity score is measurements of daily consumption of food that is another factor associated with under nutrition. According to this study patients with low dietary diversity score were two times more likely to being under nutrition. This finding was in line with study recently conducted in Awassa (45). Similarly, our study showed magnitude of under nutrition was significantly lower among those consuming food from five or more food groups per day. it is agreed with the study conducted in Arba minchi(38).

Conclusion And Recommendations

5.1 Conclusion

The magnitude of undernutrition among people living with HIV/AIDS was found to be high. Having an opportunistic infection, duration of ART treatment, household food security status, and dietary diversity status were found to statistically significant association with undernutrition.

5.2 Recommendation

Based on the finding the following recommendations were forwarded.

Health care provider should early monitor, evaluation and treating patients with the opportunistic infection before threatening and complication. Health workers provide health education daily to improving the food intake of patients. The government should prepare and implement appropriate stratagem to improve economic status for alleviating the problem with household food insecurity. The non-government organization should support the patients with severe household food insecurity by food aid. It is better if investigators conducting a study by using a different method of body composition measurement not only by BMI.

Acronym And Abbreviation

AIDS Acquired Immune Deficiency Syndrome

ART Anti-retro Viral Therapy

DDS Dietary Diversity Score

ETB Ethiopia Birr

FANTA Food and Nutrition Technical Assistance

HFIAS Household food Insecurity Access Scale

H/C Health Center

HIV Human Immune Virus

OIS Opportunistic Infections Symptom

PLWH People Living With HIV

WHO World Health Organization

Declarations

Ethics approval and consent to participate

An ethical clearance letter was taken from Addis Ababa public health research and publication directorate after the requested letter was obtained from Abichus Campus of Rift Valley University. Also, the Permission letter was taken from Lega Tefo, Edase, Yekabadew, and Hayat Health center. Informed consent was done with study participants. Confidentiality of data was kept and used only for the purpose of this study.

Consent for publication

Not applicable

Availability of data and materials

All data related the study are available, can obtain from corresponding author through email for tangible reason.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

Lelisa Worku (LW), participated in the design of the study, the statistical analysis and serve as cross ponding.

Gadise Ragessa(GR), Eyerusalem Degife (ED) and Sisay Hailu(SH) performed the data collection and help cross ponding author on analysis.

Dube Jara(DJ) and Tola Aberra(TA) participate by advising and guiding cross ponding author.

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Tables

Table 1: Sample determination for associated factors, undernutrition among adult receiving ART at Lega Tafo health centers and surrounding health center, Ethiopia, 2021

Factors	CI	Power (1-b)	Ratio	The proportion of outcome among exposed	The proportion of outcome among unexposed	OR	Sample size	
							N	N and Nonresponse rate (10%)
Deteriorated (clinical condition)	95%	80	1	0.201	0.384	0.4	214	235
Stage II and above	95%	80	1	0.485	0.778	0.26	96	106
CD4 <200	95%	80	1	0.183	0.071	2.9	310	341
Age 18-29	95%	80	1	0.265	0.735	0.13	42	46
No formal education	95%	80	1	0.45	0.283	2.07	284	312
Single (marital status)	95%	80	1	0.178	0.057	3.6	252	277
Divorced (marital status)	95%	80	1	0.314	0.168	2.26	294	323
Active TB	95%	80	1	0.278	0.146	2.25	363	399
Co-tromozaxole (not received)	95%	80	1	0.235	0.102	2.7	276	304

Table 2: Socio-demographic and socio-economic characteristic of HIV infected patients receiving ART at Lega Tafo and surrounding health centers, Ethiopia, 2021

Variables		frequency	percent	Under nutrition	
				Yes	No
Sex	Male	109	28.5	24(22%)	85(78%)
	Female	274	71.5	48(17.5%)	226(82.5%)
Age	20-29	61	15.9	12(19.7%)	49(80.3%)
	30-39	180	47	41(22.8%)	139(77.2%)
	40 and above	142	37.1	19(13.4%)	123(86.6%)
Marital status	Single	115	30	30(26.1%)	85(73.9%)
	Married	228	59.5	35(15.4%)	193 (84.6%)
	Other	40	10.4	7(17.5%)	33(82.5%)
Occupation	Job seeker	33	8.6	13(39.4%)	20(60.6%)
	Government employed	35	9.1	7(20%)	28(80%)
	Private work	315	82.2	52(16.5%)	263(83.5%)
Educational status	No formal education	149	38.9	27(18.1%)	122(81.9%)
	Grade 1-12	209	54.6	37(17.1%)	172(82.3%)
	Higher education	25	6.5	8(32%)	17(68%)
Monthly income	<2000	201	52.6	38(18.9%)	163(81.1%)
	Above 2000	181	47.4	34(18.8%)	147(81.2%)

Table 3: Opportunistic infection and related sign of HIV infected patients receiving ART at Lega Tafo and surrounding health centers, Ethiopia, 2021

Variables		FrequencyPercent		Under nutrition	
				yes	No
Diarrhea	Yes	27	7	12(44.4%)	15(55.6%)
	No	356	93	60(16.9%)	296(83.1%)
Mouth thrush	yes	19	5	12(63.2%)	7(36.8%)
	No	364	95	60(16.5%)	304(83.5%)
Abdominal disturbance	yes	45	11.7	23(51.1%)	22(48.9%)
	No	338	88.7	49(14.5%)	289(85.5%)
Vomiting/Nausea	Yes	23	6	5(21.7%)	18(78.3%)
	No	360	94	67(18.6%)	293(81.4%)
Clinically	Improved	366	95.6	60(16.4%)	306(83.6%)
	Not improved	13	3.4	12(92.3%)	1(7.7%)
Type of OIS	TB	74	59.6	36(48.6%)	38(51.4%)
	Candidiasis	27	26	14(51.9%)	13(48.1%)
	stronglodosiosis	13	12.5	6(46.2%)	7(53.8%)
	Isospora belli	2	1.9	1(50%)	1(50%)
Had Opportunistic	yes	104	27.2	50(48.1%)	54(51.4%)
	No	279	72.8	22(7.9%)	257(92.1%)
WHO clinical stage	I	289	75.5	36(12.5%)	253(87.5%)
	II-IV	94	24.5	36(36.3%)	58(61.7%)
CD4 count	< or 450/μl	160	41.8	36(22.5%)	124(77.5%)
	>450/μl	178	46.5	29(16.3%)	149(83.7%)

Table 4: Treatments and follow up of HIV infected patients receiving ART at Lega Tafo and surrounding health centers, Ethiopia, 2021

Variables		Frequencypercent		Under nutrition	
				yes	No
ART duration	< 12 months	78	20.4	40(51.3%)	38(48.7%)
	>12 months	305	79.6	32(10.5%)	273(89.5%)
Co-trimoxazole therapy	Yes	82	21.4	26(31.7%)	56(68.3%)
	No	301	78.6	46(15.3%)	255(84.7%)
ART Adherences	yes	305	79.6	39(12.8%)	266(87.2%)
	No	78	20.4	33(42.3%)	45(57.7%)
On TB treatment	yes	74	19.3	36(48.6%)	38(51.4%)
	No	309	80.7	36(11.7%)	273(88.3%)

Table 6: Factors associated with undernutrition among HIV infected patients receiving ART at Lega Tafo and surrounding health centers, Ethiopia, 2021

Variables	Alternatives	Undernutrition		Crude OR at 95% CI	AOR at 95% CI	p-value
		Yes	No			
Opportunistic infections	Yes	50(48.1%)	54(51.4%)	10.816(6.050-19.337)	4.518(2.304-8.857) *	0.000
	No	22(7.9%)	257(92.1%)	1	1	
Duration on ART	<1years	40(51.3%)	38(48.7%	8.980(5.051-15.968)	3.675(1.831-7.377) *	0.000
	>1years	32(10.5%)	27% (89.5%)	1	1	
Household food security	Insecure	49(33.3%)	98(66.7%)	4.630(2.671-8.027)	3.113(1.628-5.950) *	0.001
	Secure	23(9.7%)	213(90.3%)	1		
Dietary diversity status	Low	51(30.4%)	117(69.6%)	4.027(2.306-7.033)	2.340(1.221-4.485) *	0.010
	High	21(9.8%)	194(90.2%)	1	1	

Note: *Associated variables
1 (odd of reference group)

Figures

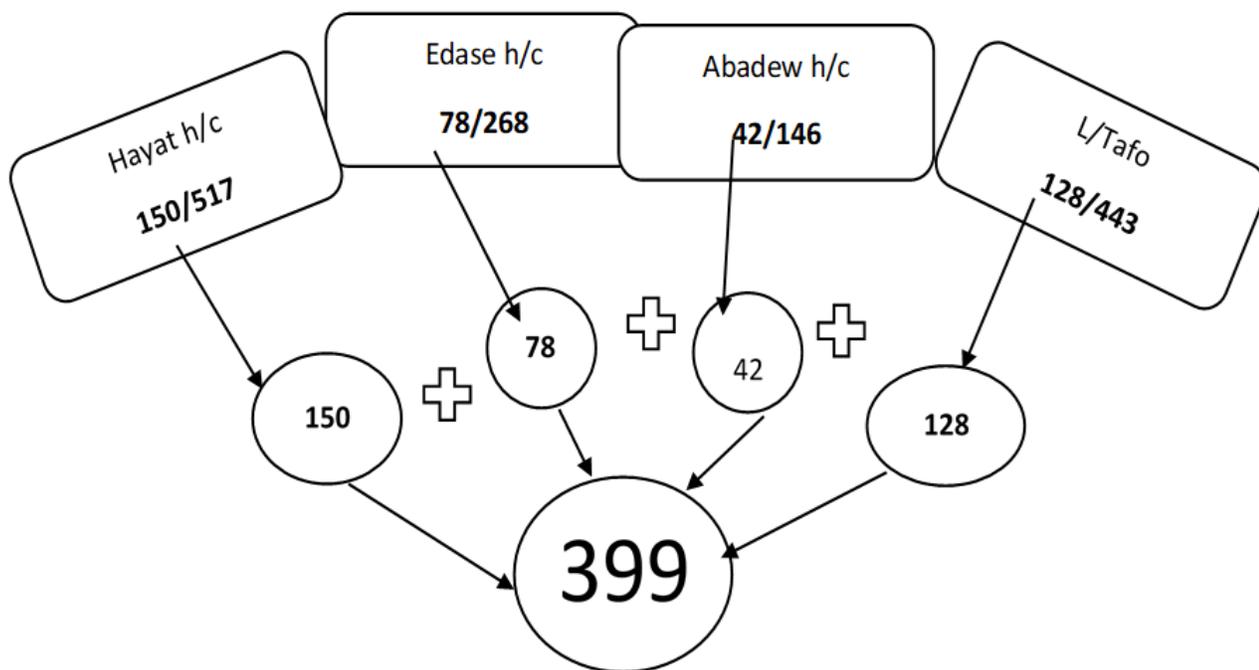


Figure 1

Sampling method hierarchy, under nutrition among adult receiving ART at Lega Tafo and surrounding health centers, Ethiopia, 2021

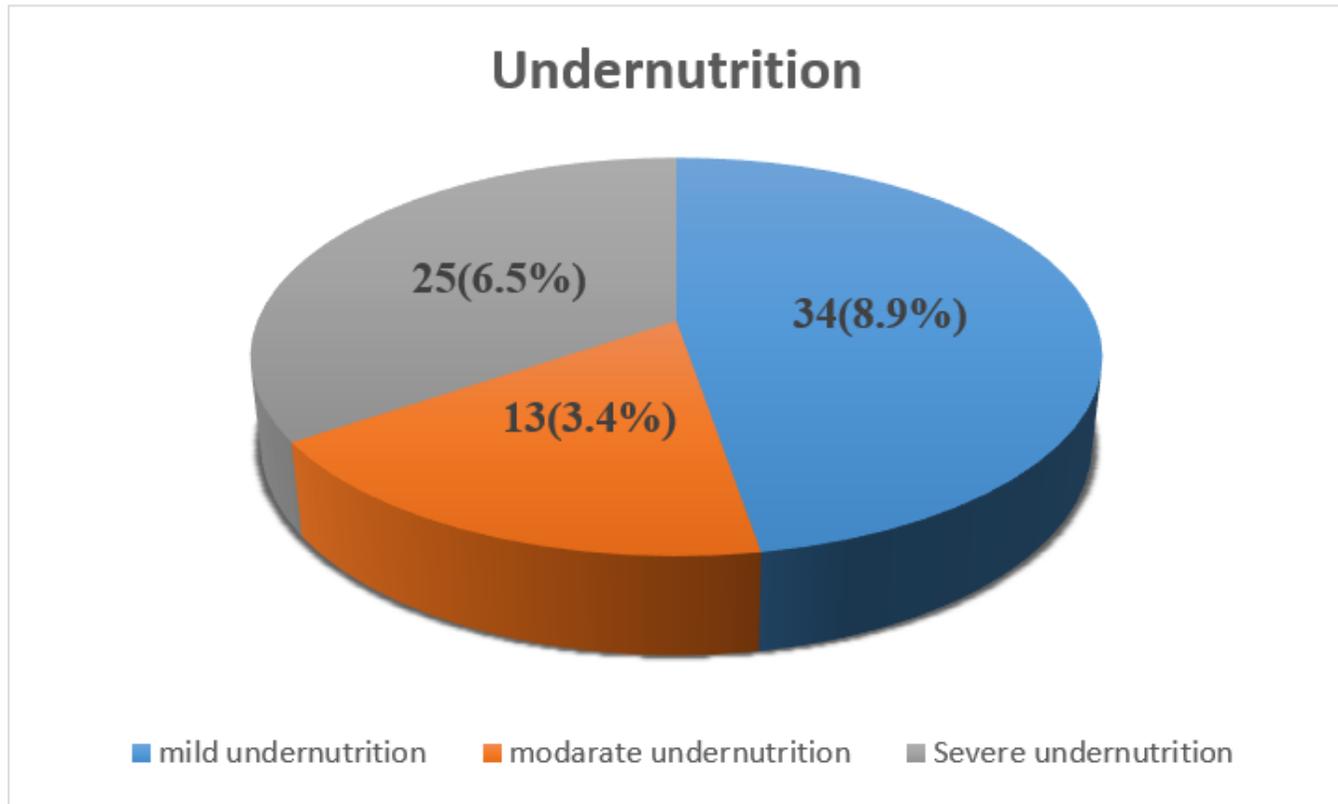


Figure 2

Magnitude of under nutrition among HIV infected patients receiving ART at Lega Tafo and surrounding health centers, Ethiopia, 2021