

# Prevalence of Malnutrition and its Associated Factors among Adult HIV Positive Clients on Anti-Retroviral Therapy at Chiro Zonal Hospital, West Hararghe Oromia Zone, Ethiopia

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## Abstract

**Introduction:** The Human Immune Deficiency Virus (HIV) epidemic remains one of the main public health challenges especially in low- and middle-income countries. At the end of 2010, an estimated 34 million people were living with HIV globally. In sub-Saharan African countries, estimated 1.9 million became infected. In Ethiopia HIV adult prevalence was estimated at 1.5% in 2011.

**Objective:** The Objective of this study is to Assess Prevalence of malnutrition and its associated factors among adult people living with HIV/AIDS who are on anti-retroviral therapy at Chiro Hospital, West Hararghe. Ethiopia, from March 2017 to April 2017.

**Methods:** This study was conducted at Chiro Zonal Hospital. It is found in West Harargue Zone, Chiro woreda administration, Located 333 kilometer far away from the capital city Addis Ababa in the south East of Ethiopia. In this study Institutional based cross-sectional study design was employed. The sample size is 279 PLWHAs, which is calculated by using the formula for the estimation of single proportion. The study subjects were selected using systematic random sampling technique. The data was collected using face to face interview with version of Afan Oromo language. Bivariate and multivariable linear regression model will be used to identify independent predictor of malnutrition. P-value < 0.05 was considered as statistically significant as well as odds ratio at 95% confidence interval is used to examine the precision and strength of association between malnutrition and associated factors.

**Results:** In this study the overall prevalence of malnutrition was 22.2%. The mean BMI was 20.7 & SD ± 2.979. in relation with Gender, malnourished Females were 53% and male 47%. After full control of all variables; Anemia (AOR=3.792: 95% CI, 1.782-8.067), WHO clinical stage 2 (AOR=6.208: 95% CI, 2.141-17.999). Tuberculosis, (AOR=8.033:95% CI, 2.023-31.900), Eating Problem (AOR=3.451: 95% CI, 1.564-8.067). were significantly associated with malnutrition. However, taking Ready-to-use therapeutic food (RUTF) were found to be protective factor for malnutrition (AOR=3.426: 95% CI, 1.648-7.120)

**Conclusion:** From this study it has been learnt that ready-to-use therapeutic food (RUTF) supplement programs should be an integral part of HIV/AIDS continuum of care. Furthermore, it needs to improve Opportunistic infection and nutritional screening and management. Nutritional Counseling & education service will be strengthening at all ART service providing unit.

**Keywords:** BMI (Body Mass Index) • WHO clinical stage • Opportunistic infection and RUTF (Ready to use therapeutic food) • Malnutrition

## Introduction

Human Immune Virus (HIV) mainly infects cells of the immune system-CD4 T-cells and macrophages, which are key components of the cellular immune system and destroys or impairs their function. Infection with HIV results in the progressive deterioration of the immune system, leading to immunodeficiency [1].

Acquired Immune Deficiency Syndrome (AIDS) is an epidemiological definition based on clinical signs and symptoms. It is caused by HIV, and, if it goes untreated, will ultimately lead to death. There are various symptoms associated with HIV infection, as well as an array of opportunistic infections

at various stages of the disease [2]. All pregnant and breastfeeding women with HIV should initiate treatment with a triple antiretroviral drug combination, and this should be maintained for life log Standard antiretroviral therapy. Consists of at least three antiretroviral drugs to suppress viral replication and stop the progression of HIV [3].

Malnutrition is a pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients [4].

The nutritional status of women and men was assessed by use of two anthropometric indices-height and body mass index (BMI). BMI is defined as weight in kilograms divided by height in meters squared (kg/m<sup>2</sup>). The World Health Organization (WHO) has established international cutoffs for BMI:

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under 18.50 is classified as underweight; 18.50-24.99 is the normal BMI range, and 25 or over is classified as overweight [5].

## Statement of the problem

Both HIV/AIDS and malnutrition independently cause progressive damage to the immune system and increased susceptibility to infection. Although surveillance indicates a steady decline in HIV prevalence in Ethiopia, there are still close to a million PLWHA who need care and support [6].

The study show that the prevalence of malnutrition among adult HIV positive who are receiving anti-retroviral therapy were reported with different magnitude in different Regions, and zones of Ethiopia in different study period, For example the magnitude of under-nutrition (BMI <18.5 kg/m<sup>2</sup>) in northwestern parts of Ethiopia Tigray was 42.3%, Hosana western Ethiopia 31.5% & Addis Ababa 27.1% in Dilla, southern parts of Ethiopia. 12.3% in Gondar and Bahirdar, northwestern parts of Ethiopia, were reported 27.8% and 25.5% respectively [5].

HIV/AIDS epidemic is occurring in populations where malnutrition is already endemic. HIV and nutrition are closely related to each other. Immune deficiency as a result of HIV infection leads to malnutrition which in turn, leads to immune deficiency, worsening the effect of HIV and contributing to the more rapid progression to AIDS. Good nutrition, on the other hand, gives strength, helps to maintain and improve performance of the immune system thereby protecting the body against infection and delaying progression of the disease [7].

Morbidity and mortality related to human immunodeficiency virus (HIV) infection in the developing world remain unacceptably high, despite major advances in HIV therapy and increased international funding for care [8,9]. The physiological complications of progression of HIV infection are compounded by the problems associated with poverty, because it translates into insufficient consumption of a diet of adequate quality and quantity to bolster immune function and support medical therapy [10].

The HIV/AIDS epidemic continues to have a devastating impact on health, nutrition, food security and overall socioeconomic development of the population affected by the disease. The Practical evidences on malnutrition among People Living with HIV (PLHIV) have shown that Socio-demographic (Age, Sex, Resident, Ethnic group, Religion, Family size, Current marital status, Employment, Head of the household, Educational level, Source of drinking water, Living condition, Monthly income) Care & treatment (CD4 count, WHO Clinical stage) were reported to be risk factors for malnutrition among PLHIV [11].

Swallowing/Eating difficulty, Gastrointestinal symptoms, TB, Anemia, OI episode, duration of treatment, adherence to medication, ART drug Side effect, return to care after lost to follow up, Dietary and Socio economy, Meal frequency score, Wealth status, Care & support, Ready to use therapeutic food (RUTF), Allergy and life style and behavior of individual, HIV/AIDS and malnutrition combine to emasculate the immunity of many Ethiopians. Currently, body mass index (BMI) may be the "Best predictor" of mortality in PLWHA. Thus, BMI and nutritional issues also need to be monitored once a patient is on treatment [12,13].

Ethiopia's policy and guidelines on the provision of ART show the role of nutrition in health and disease is now widely acknowledged and its importance for HIV infection control recognized. The response to the AIDS epidemic remains a priority issue on Ethiopia's development agenda. HIV is one of the components of the national Plan for Accelerated Development to End Poverty [14]. The FDRE sees a crucial opportunity to endorse nutrition care and support as a cost-effective strategy in the management of HIV/AIDS [15].

The HIV epidemic remains one of the main public health challenges especially in low- and middle-income countries. At the end of 2010, an estimated 34 million people were living with HIV globally. There were 2.7 million new HIV infections in 2010, including 390,000 among children less

than 15 years. The annual number of people dying from AIDS related causes worldwide was 1.8 million in 2010 [16].

In sub-Saharan African countries, where most of the people newly infected with HIV live, an estimated 1.9 million became infected in 2010. Globally, women constituted half (48-53%) of the adults (15 years and older) living with HIV in 2010, according to UNAIDS estimates. In sub-Saharan Africa, 1.4 times more adult women than men were living with HIV in 2010. Women comprised 59% (56-63%) of adults living with HIV in sub-Saharan Africa in 2010 as they have for most of the past decade [17].

In Ethiopia HIV adult prevalence is estimated at 1.5% in 2011, however the country prevalence varies according to age, sex, gender and geographical location. Adult prevalence was high among females compared to males at 1.9% versus 1.0%, respectively. The distribution of HIV prevalence also varies by age, peaking earlier in females in the 30-34 years age group compared to 35-39 years in males. Looking at the younger age groups it can be seen that young women have a two to six-fold higher HIV prevalence than young men (ranging from 15-17 years: 0% males vs. 0.2% females to 20-22 years: 0.1% males vs. 0.6% females) 3. Marked variation in urban rural prevalence is also reported in the 2011 EDHS with urban areas [17].

Oromia is the largest region of Ethiopia's and one of the regions that was highly hit by HIV pandemic. As of FMOH/EHNRI 2014 estimate, the regional HIV prevalence is 0.8% of which 1.8% is urban and 0.5% is rural. According to this estimate, there are about 200,119 PLHIV (all ages) in the region, out of which about 123,156 (62%) need antiretroviral treatment (ART). Out of the estimated total PLHIV and those in need of ART, children constitute 23% and 20% respectively. The estimate also showed as a total of 247,349 AIDS-related orphans live in the region. HIV/AIDS has deepened poverty, exacerbated food insecurity and diverted state resources [18].

Empirical evidences on malnutrition among People Living with HIV (PLHIV) have shown that socio demographic factors such as gender, employment, income, drinking water and sanitation were closely related determinants of nutritional status. Dilla University Referral Hospital Reported that malnutrition patients living in rural area were two times more likely to be malnourished as compared to those living in urban areas), the proportion of malnutrition was higher (23.7%) in unemployed group compared to those employed (8.1%) [19]. As it is confirmed by findings from previous study in Ethiopia, food insecurity is a significant problem for PLWHAs with low household income [20].

Butajira Hospital, southern Ethiopia reported those participants who had one or more eating difficulty were 2.69 times more likely to be malnourished as compared to those who were free of eating difficulty [21]. That finding was in accordance with the results of former studies conducted in Gondar and Bahirdar, northwestern Ethiopia [22]. Participants who were anemic were 1.94 times more likely to be malnourished than those with normal hemoglobin level. However, it could not explain the correlation between malnutrition and CD4 count, Clinical stage as well as women headed household in terms of household productivity to ensure household food security [23].

According to study done at Hosana Hospital Ethiopia, WHO clinical stage four patients were five times as likely to be malnourished than those in stage one [24]. Respondents in the clinical stage three were 3.91 times more likely to be malnourished than those in stage one [23].

Similarly, study done in Uganda showed PLWHA taking ART at WHO clinical stage four were characterized by severe wasting, chronic fever, chronic diarrhea and weight loss greater than 10% from baseline [25]. Regarding Opportunistic Infections (OIs), individuals who were diagnosed with OI during the past six weeks were nearly 2.6 times as likely to be malnourished than not diagnosed with OIs. Likewise, this finding is well supplemented by similar studies conducted in Kenya [26].

A study conducted in Jimma University Hospital, revealed that 63.0% of PLWHA on HAART were food insecure [27]. Moreover, the result of this study is consistent with an earlier similar study conducted in Uganda in 2012 among PLWHA on ART which showed that those who were food insecure were more likely to be undernourished [28]. Clients who had adequately diversified food were 56% less likely to be malnourished than those who had inadequately diversified food as per study conducted in Humera Referral Hospital [25]. A study conducted in Mozambique showed low meal frequency score were 71% more likely to be malnourished than those who had high meal frequency [29]. A study conducted in Dire Dawa showed increased meal frequency was associated with increased BMI [30]. A study done in Haiti demonstrated that food assistance among PLWHA on ART significantly improved their BMI [31].

Cross-sectional survey of PLHIV receiving care in south west Ethiopia hospital, show that the prevalence of current khat use was 23%. Adverse clinical factors (poorer ART adherence and low CD4 count) were associated with khat use in this population [32,33]. Toxicity has been evaluated in laboratory animals, and khat extracts have been reported to contain mutagenic factors [33]. Khat chewing has been shown to be a risk factor for duodenal ulcers [34].

## Objectives

To assess prevalence of malnutrition and its associated factors among adult PLWHA who are on anti-retroviral therapy in Chiro Town, at Chiro Zonal Hospital West Hararghe, Ethiopia, from March 2017 to April 2017.

## Methods and Materials

The study was conducted at Chiro Zonal Hospital, which is found in West Hararghe Zone, which is located at 333 km far away from the capital city Addis Ababa in the south East of Ethiopia. The 2007 Ethiopia national census reported that a total population of the town was about 33,670. Out of which 18,118 were men and 15,552 were women. In the town only Chiro Zonal Hospital has been providing ART service for the people from the zone and for other neighboring zones. Chiro Zonal Hospital average monthly report showed that ever started ART 1476 PLHAs and 931 were currently on ART. Institutional based cross-sectional study design was employed from March 2016 to April 2016.

Source Population was all PLWHAs who has been on ART treatment in Chiro Zonal Hospital ART Clinic during the study period and the study population was all PLWHAs who were enrolled in highly active anti-retro viral therapy at Chiro Zonal Hospital ART clinic and interviewed. Inclusion criteria was PLHAs aged 15 years and above who were on ART, at least for the past six months before the actual study time and adult HIV positive and who were receiving ART during the study and exclusion criteria was individuals who were seriously ill and un-able to get through the interview, pregnant women were excluded from the study since weight gain during pregnancy introduces measurement bias and excluded repeat visits during the study period.

The sample size of the study was calculated by a formula for estimation of a single population proportion taking 95% CI, 5% degree of precisions and 42.3% of proportion of HIV positive individuals with malnutrition (BMI <18.5 kg/m<sup>2</sup>) among PLWHA receiving ART from a study in rural Ethiopia and adding 5% of non-response rate a total of 279 study participants included in the study. The study unit was selected using systematic sampling technique. The study subjects were identified from ART register and electronic data base by using ART unique number or MRN (Medical Record Number), then after listing all subjects based on their follow up appointment from the first to last day of data collection & prepared sampling frame, then sampling fraction was calculated.

The first subject was selected by lottery method and then taking every 3<sup>rd</sup> individual from the list of PLWHAs and going on listing until the total size was

obtained. Each subject was included only once by recording MRN, on his/her first visit during the study period.

Operational Definitions; Body Mass Index (BMI): is the ratio of weight to height in meters squared. CD4 is T-lymphocyte cell bearing CD4 receptor.

Data were collected using pre-tested structured questionnaire by face to face interview, record review and anthropometric measurements (weight, height, BMI). Four ART Adherence counselors as data collectors and one health officer as supervisor were recruited.

The English language questionnaire is adapted from previous literatures & modifies into the study context. Afan Oromefa language version of questionnaires were used.

Two days training was given to data collectors and supervisor. Pretesting of the questionnaire was conducted at Hirna Health Center nearby ART health center a week prior to the actual survey.

During data collection daily the data were strictly checked for completeness, accuracy, clarity and safety by the supervisors and principal investigator.

Data were edited, coded and entered Epi data 3.1 and exported to SPSS for window version 20.0 for analysis. Further, data cleaning (editing, recoding, checking for missing values and outliers) was done after exporting it to SPSS windows version 20 (Chicago Illinois). Bivariate and multivariable linear regression model were used to identify independent predictors of malnutrition among PLWHA.

Ethical approval was obtained from Research and Ethics Committee of college of Health Sciences, Arsi University. Permissions were obtained, from Oromia Regional Health Bureau and Chiro Zonal Hospital administrators. Written informed consent was obtained from each individual Participant.

## Results

### Socio demographic characteristics of the study subjects

A total of 279 adult PLWHA taking ART were participated in this study and response rate was 100%. Out of the total respondents' females accounted for 148 (53%). The mean age of respondents were 35 years (SD=+8) and most of them were in the age range of 30-39 years. Regarding place of residences, 237 (84.9%) of them were living in urban, while 42 (15.1%) were from rural areas. Regarding the head of the household 142 (59.5%) & 137 (49.1%) of them were male and female, respectively. Above half, 161 (58.2%) a family size of less than three followed by those who had a family size ranging from 3 to 5 family size 85(30.5). Among the participants, 99 (35.5%) were single, 89 (31.9%) widowed, 57 (20%) married and 34 (12.2%) divorced. Regarding to the educational status, 116 (41.6%) of them had attended primary school and secondary school 69 (24.7%). Concerning their occupation, 151 (54.1%) of respondents were unemployed (Table 1).

**Table 1:** Socio demography characteristics of the study subjects (PLHAs on ART) in Chiro Hospital, Ethiopia, March 2017.

Variables	Frequency (n= 279)	Percent (%)
<b>Age group</b>		
15-29 year	72	25.8
30-39 year	115	41.2
40-49 year	74	26.5
≥50 year	18	6.5

<b>Gender</b>		
Male	131	47
Female	148	53
<b>Family size</b>		
>3	162	58.1
03-May	85	30.5
≥5	32	11.5
<b>Residence</b>		
Urban	237	84.9
Rural	42	15.1
<b>Religion</b>		
Orthodox	179	64.2
Muslim	78	28
Catholic	15	5.4
Protestant	7	2.5
<b>Ethnicity</b>		
Oromo	176	63.1
Amhara	86	30.8
*Others ethnic group	17	6.1
<b>Marital status</b>		
Single	99	35.5
Married	57	20.4
Divorced	34	12.2
Windowed	89	31.9
<b>Household head</b>		
Male	142	50.9
Female	137	49.1
<b>Education</b>		
Cannot read & write	44	15.8
Only read & write	24	8.6
Primary	116	41.6
Secondary	69	24.7
Collage & above	26	9.3
<b>Employment</b>		

Employed	128	45.9
Unemployed	151	54.1

\*Gurage 5 (1.80%), Tigre 5 (1.80%), Hargoba 3 (1%), Somale 2 (0.72%) and Hadiya 1 (0.04%).

## Dietary, behavior and lifestyle related characteristics of respondents

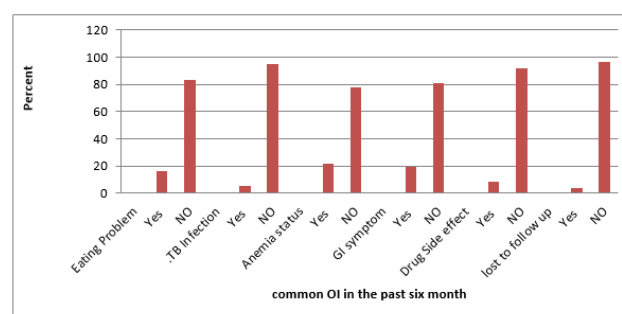
Regarding dietary characteristics, 259 (92.8%) respondents had high meal frequency score and 20 (7.2%) had low meal frequency score, within the past one-month dietary recall. Concerning on nutritional counseling and education only 141 (50.5%) were counseled during their subsequent visit to ART clinic. Concerning the ready to use therapeutic food (RUTF), only 36 respondents were taking RUTF in the past six months also from those who were using RUTF only 8 (22.20%) had experience of RUTF related allergy. Social support (food, money or any kind of nutritional support) from 279 respondents only 12 (4.30%) got social support. About lifestyle and behavior 50 (17.90%), 9 (3.20%) and 18 (6.50%) respondents chewing Khat, smoked Cigarette and drunk alcohol respectively.

## Clinical characteristics of respondents

Regarding CD4 count, 10 (3.6%) of the respondents had less than or equal to 200 cells/mm<sup>3</sup>; while 103 (36%) had a CD4 count ranging from 200-499 cells/mm<sup>3</sup>. Hundred sixty-six (59.5%) had CD4 count greater than or equal to 500 cells/mm<sup>3</sup>. Regarding WHO clinical stage, respondents in clinical stage 1, 2 and 3 were 229 (82.1%), 28 (10%) and 22 (7.9%) respectively. There was no patient in stage 4. Adherence status of respondents showed that 235 (84.2%), 36 (12.9%), 8 (2.9%) were good, poor and fair adherence respectively.

## Opportunistic infection in past six month among respondents

Concerning opportunistic infections in the past six month the common opportunistic infections among respondents were 61 (21.90%) anemia, 16.5% eating problem, 54 (19.40%) Gastrointestinal related Infection (GI) and 15 (5.4%) TB (Figure 1). Who had ART drug side effect were 23 (8.20%)?



**Figure 1:** The past six-month Opportunistic infection characteristics of (PLHAs on ART) in Chiro Hospital, Ethiopia, March 2017.

## Prevalence of malnutrition among PLWHA on ART (HAART)

The Overall prevalence of malnutrition (BMI <18.5 kg/m<sup>2</sup>) among PLWHA on ART at Chiro Hospital was 22.2%. The mean BMI of respondents were 20.7 (SD ± 2.979), out of which 53% Female and 47% Male.

## Factor associated with malnutrition

In this study, both bivariate and multivariate logistic regression analyses were computed. Out of eight selected variables that showed significant association with malnutrition in the bivariate logistic regression analysis model, five variables (Anemia, WHO clinical stage 2, Tuberculosis infection, Eating problem and RUTF) were significantly associated with malnutrition when data were computed with multivariate logistic regression analysis.

Anemia was also positively associated with malnutrition ( $P=0.001$ ) (AOR=3.792: 95% CI, 1.782-8.067). Relatively respondents who had anemia were 3.792 times more likely to be malnourished than those who don't have anemia. Respondents who were on WHO clinical stage 2 were more than 6

times as likely to be malnourished ( $P=0.002$ ) (AOR=6.208: 95% CI, 2.141-17.999). Respondents who had Tuberculosis were eight times more likely to be malnourished than those who don't have Tuberculosis ( $P=0.003$ ) (AOR=8.033: 95% CI: 2.023-31.900).

Respondents who had Eating Problem were 3.451 times more likely to be malnourished as compared to those who were free of Eating Problem ( $P=0.002$ ) (AOR=3.451: 95% CI, 1.564-8.067). Ready-to-use therapeutic food (RUTF) use was negatively associated with malnutrition ( $p=0.001$ ) (AOR=3.426: 95% CI, 1.648-7.120). Individuals who were not taking RUTF were 66% times less likely to be malnourished than those who were taking RUTF (Table 2).

**Table 2:** Multivariate analysis variable with malnutrition among PLHAs on ART in Chiro Hospital, Ethiopia, March 2017

Variables	NO Malnutrition	Malnutrition	COR (95% CI)	AOR (95%CI)	P-value
	Frequency (%)	Frequency (%)			
<b>Anemia</b>					
Yes	38 (62.30%)	23 (37.70%)	0.360 (0.193-0.671)	3.792 (1.782-8.067)	**0.00
NO	179 (82.10%)	39 (17.90%)	1	1	
<b>Eating Problem</b>					
Yes	21 (45.70%)	25 (55.60%)	0.159 (0.080-0.312)	3.451 (1.564-8.067)	2
No	196 (84.10%)	37 (15.90%)	1	1	
<b>TB Infection</b>					
Yes	4 (26.70%)	11 (73.30%)	0.087 (0.027-0.286)	8.033 (2.023-31.90)	0.003*
No	213 (80.70%)	51 (19.30%)	1	1	
<b>WHO Stage 2</b>					
Yes	10 (35.70%)	18 (64.30%)	0.118 (0.051-0.273)	6.208 (2.141-17.999)	0.002*
No	207 (50%)	44 (17.50%)	1	1	
<b>Rural residence</b>					
Yes	24 (57.10%)	18(29%)	3.451 (1.717-6.936)	0.345 (0.172-1.014)	0.003
No	193 (81.4%)	44(71%)	1	1	
<b>RTUF use</b>					
Yes	20 (55.60%)	16 (44.40%)	3.426 (1.648-7.120)	3.426 (1.648-7.120)	0.001
No	197 (81.1%)	46 (18.50%)	1	1	

## Discussion

This study is aimed to assessing the prevalence of malnutrition and its associated factors among adult PLWHA who are currently on ART. Overall prevalence of malnutrition (BMI <18.5 kg/m<sup>2</sup>) among PLWHA on ART at Chiro Hospital was 22.20%. The mean BMI was 20.7 & SD ± 2.979, out of which 53% Female and 47% Male. Relatively this finding is lower than other reports reported from different parts of Ethiopia. For example, higher prevalence of malnutrition was reported from northwestern parts of Ethiopia

Tigray 42.30%, Hosana Western Ethiopia 31.5% & Addis Ababa 27.10%. In Gondar and Bahirdar, northwestern parts of Ethiopia were reported 27.80% and 25.5% respectively. On the other hand, lower prevalence of malnutrition reported in Dilla, southern parts of Ethiopia (12.30%).

The discrepancy of malnutrition among different parts of the country may reflect the existence of different socio-economic and other factors that are practiced by these different communities probably as a result of different ethnic experiences, environmental factors especially drought and other related factors had their own inevitable role.

This study showed a statistically significant association between eating problem and malnutrition. Respondents who had one or more eating problem were 3.451 times more likely to be malnourished as compared to those who were free of eating problem, for example oral ulcer, oral thrush & esophageal thrush and resulting in malnutrition despite the availability of food, also this finding is consistent with the results of former studies conducted in Bahirdar and Gondar, northwestern Ethiopia [22,23].

This study also found a significant positive association between tuberculosis infection and malnutrition. PLWHA who had tuberculosis were 8.033 times more likely to be malnourished than those who don't have tuberculosis. It was observed the most common opportunistic infection among individuals with HIV/AIDS not only had nutritional status as a significant determinant of their incidence and severity, but they also had severe nutritional consequences that they commonly precipitate appetite loss, weight loss and wasting.

Other important finding of this study is the negative relationship of Ready-to-Use Therapeutic Food (RUTF) use and under nutrition. Participants who were not using RUTF were 66% times less likely to be malnourished than those who were taking Ready-to-Use Therapeutic Food (RUTF), which is consistent with a study done in Haiti demonstrated that food assistance among PLWHA on ART significantly improved their BMI [31]. On the other hand, this study showed that 93% of malnourished respondents had high meal frequency score however, 6.5% of malnourished respondents with low meal frequency score, which is consistent with a study conducted in Jimma University Hospital [27]. Moreover, the longitudinal study is needed to explore cause and effect relationship between high meal frequency and malnutrition.

This study found a significant positive association between anemia and malnutrition. Participants who were anemic were 3.792 times more likely to be malnourished than those who had not have anemia (AOR=3.792: 95% CI, 1.782-8.067) which is consistent with former studies conducted in Butajira Hospital, southern Ethiopia and Gondar northwestern Ethiopia [21,23].

This study found a significant positive association between WHO clinical stage 2 and malnutrition. WHO clinical stage 2 is 6.208 times likely to be malnourished than those at stage one 1 and (AOR=6.208: 95% CI: 2.141-17.999) the findings of this study indicated that, WHO clinical stage 3 and 4 didn't show any significant effect on respondent's nutritional status, however, (51%) of respondents that are malnourished were on stage 1 (30.6%) are on stage 2, and (17.7%) are on stage 3. There were no respondents that are on stage 4. Which is not consistent with other studies [24,27]? Because there are no respondents who were on stage 4, it might be CD4 count below 500 ART drug initiation criteria makes people to start ART drug at early clinical stage 1 and 2.

## Strength and Limitations

This cross-sectional nature of the study limits its capacity to investigation into causal relationship between determinants and outcomes of interest. Likewise, further comparative study between HIV-infected and non-HIV infected persons could explore socioeconomic, clinical and pathological related factors. Not using comprehensive anthropometric measurement tool like, laboratory and clinical method and hip circumference. Only using BMI so that it is not the exact measurement of malnutrition especially for Ethiopian because of small body size and body fat mass.

This study used two software's for data entry and analyses. Pre-test was done.

## Conclusion and Recommendations

Anemia, WHO clinical stage 2, Tuberculosis infection, Eating Problem and Ready-to-Use Therapeutic Food (RUTF) were found significantly associated with risk factors for malnutrition among People who are on ART. From this

study, it has been learnt that Ready-to-Use Therapeutic Food (RUTF) supplement programs should be an integral part of HIV/AIDS continuum of care. Furthermore, it needs to improve Opportunistic infection and nutritional screening, OI management, nutritional Counseling & education service need to be strengthened.

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