

# Nutritional Status and Associated Factors Among Adult HIV/AIDS Patients Receiving ART in Dilla University Referral Hospital, Dilla, Southern Ethiopia

Mahlet Birhane<sup>1</sup> Eskindir Loha<sup>2</sup> Fikadu Reta Alemayehu<sup>1</sup>

1.Academic Center of Excellence for Human Nutrition in Ethiopia, SNFST, Hawassa University

2.College of Health Sciences, Hawassa University

## Abstract

Without appropriate intervention, HIV/AIDS and Malnutrition are interconnected and can worsen health situation of individuals in a vicious cycle. In Sub Saharan African countries including Ethiopia, the problem of HIV/AIDS, poverty and malnutrition are among the top development concerns. However, little have been studied about nutritional status of HIV/AIDS patients receiving ART drugs. Thus, in this study we did assess nutritional status of adults living with HIV/AIDS receiving ART in Dilla University Referral Hospital, Gedio zone, Southern Ethiopia. Institutional-based cross-sectional study was used from March to May 2015 on 389 PLWHA adults taking ART drug at the hospital. Study participants were randomly selected among all adult ART clients at the Hospital. Data collection was done using: face-to-face interview using structured and pretested questionnaire, secondary data from the record in the hospital and Anthropometric measurement. Data analysis was done using SPSS and Microsoft Excel. There was 100% response rate and majority (about 60%) of the study participants were female where as 25% of them had chronic energy deficiency with (BMI<18.5kg/m<sup>2</sup>). Among key factors that predict nutritional status of the study participants were: Clinical stage of HVI/AIDS infection, wealth status, presence of care giver, dietary diversity, food security status and CD4 cell count were significantly associated with under nutrition. In addition to clinical factors, food insecurity and low dietary diversity status were found as important risk factor associated with malnutrition. We concluded that, since only ART can't solve problem of malnutrition, attention needs to be given to improve income, food security, feeding habits and dietary diversity of PLWHA.

**Keywords:** Nutritional status, HIV/AIDS, ART, Dilla University Referral Hospital

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## Background

Approximately 37 million people in the world are currently living with HIV/AIDS (USAIDS, 2014). Currently, about 2 million people were newly infected and over 1.2 million people died of HIV/AIDS (UNAIDS, 2014). Africa has the highest HIV prevalence rates in the world. Sub-Saharan Africa (SSA) remains the worst hit region with AIDS (World Health Statistics, 2008). In 2014, an estimated 1.4 million people in the region became newly infected (UNAID 2014). The majority (90%) of adults newly infected with HIV are in the Sub-Saharan Africa (SSA) (UNAIDS and UNICEF, 2012).

Ethiopia is one of the countries hit hardest by HIV epidemic alongside of malnutrition and it occurs in severe forms and affects many people either before or within the era of ART (IBR and World Bank, 2007). Latest report by WHO indicated that there are nearly 1.2 million people living with HIV/AIDS where as the adult prevalence rate is estimated at 2.4% and the incidence rate is 0.29% in Ethiopia (WHO, 2017). The responses to the HIV/AIDS epidemic showed considerable progress and achieved encouraging results. However, the nature of the epidemic and its fuelling factors creates a complex challenge to the ability of health and other sectors to meet the targets for HIV/AIDS control in Ethiopia (WHO, 2017). Antiretroviral treatment coverage reached 62.3%, which is above the sub-Saharan African regional average (53%). However, prevention of mother-to-child transmission of HIV coverage was only 9.3% (WHO, 2017). In addition, The HIV/AIDS epidemic continues its impact on health, nutrition, food security and overall socioeconomic development of the population affected by the disease. 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 (FANTA, 2003). 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 (Pal *et al.*, 2012). The interaction of HIV/AIDS with nutritional status has been a distinguishing characteristic of the disease course since the earliest day of the epidemic. The term "slim disease" was often used in epidemic area such as Sub-Saharan African countries to reflect the wasting syndrome characteristically associated with HIV/AIDS and related disease (Serwadda *et al.*, 1985; Keou, 1992). People with HIV/AIDS often do not eat enough because the illness and the medicines taken for it reduce the appetite, modify the taste of food and prevent the body from absorbing it. The symptoms such as

a sore mouth, nausea and vomiting make it difficult to eat. Tiredness, isolation and depression reduce the appetite and the willingness to make an effort to prepare food and eat regularly (Tsitsi and Kurebwa, 2014). For people living with HIV (PLWHA), poor nutrition worsens the effects of HIV by further weakening the immune system. This may lead to a more rapid progression of the disease. Moreover, HIV interferes with the ability to access, handle, prepare, eat and utilize food, thus increasing the risk of malnutrition among people living with HIV (Mhiri C., 1992). A well-nourished person with HIV who has a controlled viral load is more likely to be able to withstand the effects of HIV infection, supporting immune status and possibly delaying the progression of HIV disease (WFP, 2005). The negative effects of malnutrition are often preventable but are usually not easily reversed. Nutrition-related alterations occur early in HIV infection. Nutritional care and support must be started at the early stages of the infection, ideally soon after diagnosis (Pal *et al.*, 2012). Maintaining adequate food consumption and nutrient intake levels and meeting the special nutritional needs to cope up with the disease and the ART are critical for PLWHA to achieve the full benefit of such a treatment (Wheeler *et al.*, 1999). In resource limited settings, many PLWHA lack access to sufficient quantities of nutritious foods, which poses additional challenges to the success of Anti Retroviral Therapy (ART) (Castleman *et al.*, 2004 and World Bank 2009).

HIV/AIDS and malnutrition effects are interrelated and exacerbate one another in a vicious cycle. HIV specifically affects nutritional status by increasing energy requirements, reducing food intake, and adversely affecting nutrient absorption and metabolism. Asymptomatic and symptomatic adults have increased energy requirements by 10% and 30% respectively to maintain body weight and physical activity (Stephen D., 2008, Daniel *et al.*, 2005, Bonnard *et al.*, 2006). Even if lots of efforts have been done to minimize prevalence of HIV/AIDS in Ethiopia, there is limited evidence about nutrition related intervention and nutritional status of people living with HIV/AIDS especially those taking ART drugs. Yet, good nutrition is expected to promote effectiveness of ART drugs and minimize progression of HIV in the body of patients. Thus, the major objective of this study was to assess nutritional status of adult HIV/AIDS patients taking ART and associated factors in Dilla University Referral Hospital, Gedio zone, Southern Ethiopia so that the finding can support future studies and interventions.

**METHODS AND MATERIALS:** Study design and study area: Facility based cross sectional study design at Dilla University Referral Hospital was conducted from February to March 2015. Dilla University referral Hospital is found in Dilla City administration which is located 360 kilometers away from the capital city, Addis Ababa, in the South of Ethiopia. It is a public hospital which is an affiliate of Dilla University providing training for health sciences student in a range of disciplines. Additionally, the hospital provides higher level of clinical care for nearly a million of catchment area populations. Since 2005, the Hospital has been providing highly active antiretroviral therapy (HAART) for PLWHAs. During this time there were a total of 3310 PLWHA on chronic HIV care and 1556 are on ART treatment (HAART). Of these, 49 are under 18 years old while 1507 are above. According to the national guideline, ART should be initiated for eligible patient. The eligibility of the patients is determined either if their CD4 cell count is  $< 500$  cells/mm<sup>3</sup> or if they fulfill WHO clinical AIDS stage III or IV (WHO, 2014). Dilla University referral Hospital is purposively selected for this study since there is limited report about nutritional status and feeding practice of PLWHAs who are attending ART services.

**Subjects and sampling:** The source populations for this study were all PLWHA in Dilla town and the surrounding area that were enrolled for ART follow-up service at Dilla University Referral Hospital. The study populations were people with the age of 18 years and above who were actively receiving ART and volunteer to participate in the study. The study participants were selected randomly using a computer generated simple random number based on patient ART unique identification number. Each patient was recruited (studied) only once, on his/ her first visit during the study period, if selected. Repeated visits were excluded by recording registration numbers of each client at the time of interview and checking thereafter for avoidance of possible repetition. Random selection of participants was done prior to patients presenting to clinic. A total of 398 individuals participated in the study calculated based on single population proportion formula:  $p=12.3\%$  (proportion of under nutrition among adult HIV positive individuals in the study area (Solomon *et al.*, 2013)  $z=1.96$  and  $d=3\%$  because estimated prevalence was  $<15\%$ . So, to increase the sample size,  $d$  (margin of error) should be less than 5%. Patients who were already attending ART and aged 18 years and older were included in the study. However, pregnant women, lactating mothers (6 months of postpartum) and those who were seriously ill were excluded from the study.

**Data collection:** The data was collected from primary and secondary data sources. The primary quantitative data was collected from the sample respondents using a pre-tested, semi-structured questionnaire and weight and height of the subjects was done using height measuring board and weight measuring scales. The survey questionnaire was translated first from English into Amharic, and then retranslated back to English by an expert to maintain its consistency. Data collectors were fluent both the Amharic and the local language (Gediofa). Data collectors were given a two days training on data collection prior to the start of data collection. Data on past or present opportunistic disease, WHO clinical stages of disease and chronic diseases was obtained from patient

charts and ART follow-up forms. CD4 T cell count was also obtained from the chart as the investigation was done on routine basis. The data collection process was followed daily by the supervisor and principal investigators. Weight of participant's was taken using standard beam balance and the scale was calibrated at zero before and after each measurement. Participants' weight was measured after removing heavy clothes and recorded to the nearest 0.1Kg. Height was measured using the standard scale. The subjects were asked to remove their shoes, stood erect, and positioned at the Frankfurt plane with feet together and knees straight. The heels, buttocks, shoulder blades and the back of the head (occiput) were in touch against the vertical stand of the stadiometer and the values were recorded to the nearest 0.1cm

**Socio economic status and Diet Diversity status:** Questions about monthly income, family size, marital status etc were used to assess socio-economic status where as Dietary diversity was assessed using the questions specifically about food consumption during the past 24 hr period containing Cereals, Oils/Fat, vitamin A rich fruits and vegetables, Legumes, Root/Tubers, dark green leafy Vegetables, flesh Meat including fish, organ meat, Milk/Milk products, Eggs and foods that are commonly consumed in the study area. Participants were asked to report/write down all the foods or drinks including the raw material used to prepare the food. All foods eaten by the individual of interest, consumed inside or outside the home, irrespective of where they were prepared were also reported by the study participants. Participants received 1 point if they consumed at least once during the last 24 hours of the foods within each subgroup and 0 points if they never consumed the food. The food items were grouped into nine according to FAO guide line for measuring individual and household dietary diversity (FAO, 2011). A Dietary Diversity Score (DDS) was calculated as the sum of the food groups consumed over 24 hours. The dietary diversity score ranged from one to nine. Diet Diversity was reported as highest when more than 6 food groups reported and medium when 4 to 5 food groups reported and low when less than or equal to three food groups reported.

**House hold food security status:** There were a total of 18 questions specifically prepared to assess food security status of the study participant which was adapted from FANTA version 3. Each of the questions was asked with a recall period in the last four weeks (30 days) before the survey. Responses were tallied for occurrence and frequency of occurrence which produced a score for each household. This score is classified into one of four categories: food secure, mildly food insecure, moderately food insecure and severely food insecure (FANTA, 2007).

**Data Analysis:** After completing the data collection processes, the data was coded, edited and entered into the statistical package SPSS version 17 and analyzed using descriptive statistics, Household food security status and dietary Diversity Score and principal component analysis (PCA). Descriptive and Inferential statistics: Categorical type of data was analyzed using percentage, frequency, distribution and ANOVA, While quantitative continuous types of variables was analyzed using minimum, maximum, mean and standard deviation. Binary and multiple logistic regression models were applied to estimate the effects of explanatory variables on respondent nutritional status.

**Ethical considerations:** In order to proceed to data collection, permission was obtained from the Hawassa University IRB. Objectives of the study were told and written consent was obtained from each respondent before proceeding to the interview. Seriously ill and malnourished patients during the study were recommended to the hospital to be transferred to the inpatient unit for further treatment. At the end of the interview each and every client was get nutrition counseling.

## RESULTS

In this study, a total of 389 patients on ART were included with 100% response rate. More than half (60.4%) of the study participants were female. The mean (SD) age of the study group was 39.72( $\pm$ 9.54) years. The largest numbers of the clients 235(60.4%) were adults in the age range of 30-44 years of age. Over half (60.2%) of the participants were orthodox by religion and 276 (71%) were married. From the total of respondents, 150(38.6%) can only read and write while, only 62(15.9%) got secondary education and above. Mean family size of the study participants was 4.74 with SD of 2.2. Majority 371(95.1%) of the study participants were urban resident. From the total respondents, majority 353 (90.7) patients had no social discrimination at working place, home or in the community and 199(51.2%) had care giver at home. Wealth status of the respondents range from richest to poorest almost evenly distributed among each wealth class from poorest to richest. Majority of the respondents (88.7%) were employed at the time of data collection. In addition, 62.2% of the study participants were food insecure, of which 21.3% were mildly food insecure, 26% were moderately food insecure and 14.9% were severely food insecure. Among 98 (25.2%) malnourished individuals 55 (56.1%) were adults in the age group of 30-44 years old, 63(64.3%) female and 35(37.7%) male were malnourished.

**Disease stages of the respondents:** About a third of the respondents (32.4%) in WHO clinical stage III while WHO clinical stage IV 99(25.4%) was the second. According to patient medical chart report, one hundred four patients (26.7%) currently had opportunistic infection, of which 65 patients (62.5%) had tuberculosis infection and accounted for the uppermost co-infection. Sixty (15.4%) had eating problem and over half (51.4%) of

patients were treated for more than thirty six months of duration while only 25 (6.4%) were treated for six to eleven months. Mean (SD) CD4+T cell count of patients' were  $473 \pm 244.17$ . The minimum CD4+ T cell count was  $31 \text{ cell/mm}^3$  while  $1547 \text{ cells/mm}^3$  was the maximum. Table 4-3 presents medical characteristics of the study participants. In addition, Mean CD4 T-cell count of female is a little bit lower than male ( $470 \pm 248.6$  Vs  $479 \pm 237.8$ ) respectively. But this was not a significant difference ( $p > 0.05$ ). There was also not a significant difference in mean BMI among different age groups of study participants ( $p > 0.05$ ).

**Dietary diversity status of the study participant:** Dietary diversity score of study participants was obtained using 24 hour recall, calculated and divided into 3 categories based on FAO guide line for measuring individual and household dietary diversity (FAO, 2011). The mean (standard deviation) for dietary diversity score of the previous 24 hr was  $4.51 \pm 1.42$ . One hundred eighty six (47.8%) of study participants had medium dietary diversity status (4-5 food groups) while 84 (21.6%) had low dietary diversity score ( $\leq 3$ ) food groups. Cereals 383 (98.5%) and other fruits and vegetables 325 (83.5%) were the most food group which were consumed by almost all of the study participants while organ meat 33 (8.5%) were the least.

**Diet diversity status of study participants (N=389)**

Dietary diversity status	Number	%
High dietary diversity score (>6) food groups	119	30.6
Medium dietary diversity score (4-6) food groups	186	47.6
Low dietary diversity score ( $\leq 3$ ) food groups	84	21.6
<b>Mean(SD) of dietary diversity score <math>4.51 \pm 1.4</math></b>		

**Nutritional Status of the subjects**

The overall prevalence of under nutrition (BMI  $< 18.5 \text{ kg/m}^2$ ) among PLWHA receiving ART in Dilla University referral Hospital was 25.2%. In addition, 73 (18.8%) patients were mildly, 13 (3.3%) moderately malnourished and 12 (3.1%) were severely malnourished. In this study prevalence of overweight and obesity was 3.6% and 0.8% respectively. One hundred ninety nine (51.2%) patients received nutritional counseling from ART nurses or adherence support group. From those, only 34 (17.0%) were undernourished. From a total of 98 (25.2%) undernourished patients, 65.3% didn't received nutritional counseling. Two hundred sixty nine (69.2%) didn't have nutritional support, out of them 57.1% were under weight.

**Factors associated with nutritional status of the respondents**

In this study, both the bivariate and multivariate logistic regression analysis was computed. Out of Ten (10) variables that showed significant association with under nutrition in the bivariate analysis, Five (Dietary diversity status, wealth quintiles, CD4 cell count, presence of care giver, WHO clinical stage and House hold food security access scale) were significantly associated with under nutrition when data were entered into the multivariate analysis. Four variables that showed significant association on the bivariate model (Presence of opportunistic infection, nutritional support, nutritional counseling and presence of eating problem) had no further statistical significant association with under nutrition on the multivariate logistic regression model.

Being in the middle and the fourth wealth quintiles were significantly associated with under nutrition as compared with the first wealth quintile. Patients who were in the middle wealth quintile were reduced the odds of under nutrition by 74% (AOR=0.26; 95%CI 0.09-0.74) while the fourth wealth quintile reduce the odds of under nutrition by 77% (AOR=0.23; 95%CI 0.08-0.66). WHO clinical stage was also significantly associated with under nutrition. Being in WHO clinical stage IV was increase the odds of under nutrition by 2.56times (AOR=2.56; 95%CI 1.04-6.26). CD4 cell count also had statistically significant association with under nutrition. Patients who had moderate CD4 count ( $200-350 \text{ cell/mm}^3$ ) and sever CD4 count ( $< 200 \text{ cell/mm}^3$ ) was increase the odds of under nutrition by 2.69 times (AOR=2.69; 95%CI 1.07-6.77) and 2.95times (AOR=2.95; 95%CI 1.04-8.39) respectively as compared with patients having normal CD4 cell count ( $> 500 \text{ cell/mm}^3$ ). Presence of care giver also had statistically significant association with under nutrition. Patients with care giver were reduced the odds of under nutrition by 92 % (AOR=0.08; 95%CI 0.03-0.17). Dietary diversity and household food security status had statistically significant association with under nutrition in both the bivariate and multiple logistic regression models. Patients who were severely food insecure were 2.82 times more likely to be undernourished as compared to those patients who were food secure (AOR=2.82; 95%CI 1.12-7.13). In addition to this, having inadequately diversified diet were increased the odds of under nutrition by 4.55 times (AOR=4.55; 95%CI 2.23-9.29).



**Table 1. Factors predicting Nutritional status of the study participants**

Variables	Underweight	Normal	COR(95%CI)	AOR(95%CI)
<b>Wealth quintiles</b>	<b>N<sub>u</sub> (%)</b>	<b>N<sub>n</sub> (%)</b>		
Poorest	45(45.9)	39(13.4)	1 <sup>r</sup>	1 <sup>r</sup>
Second	21( 21.4)	57 (19.6)	0.32(0.17-0.62)*	0.49(0.19-1.27)
Middle	11(11.2)	66(22.7)	0.14(0.07-0.31)*	0.26(0.09-0.74)*
Fourth	11(11.2)	67(23)	0.14(0.07-0.31)*	0.23(0.08-0.66)*
Highest	10( 10.2)	62(21.3)	0.14(0.06-0.31)*	0.43(0.15-1.29)
Total	98(100)	291(100)		
<b>Presence of care giver</b>				
No	87(88.8)	103(35.4)	1 <sup>r</sup>	1 <sup>r</sup>
Yes	11(11.2)	188(64.6)	0.07(0.04-0.14)*	0.08(0.03-0.17)**
Total	98(100)	291(100)		
<b>WHO stage of AIDS</b>				
Stage I	15(15.3)	73(25.1)	1 <sup>r</sup>	1 <sup>r</sup>
Stage II	15(15.3)	61(21)	1.19(0.54-2.64)	1.62(0.55-4.77)
Stage III	25(25.5)	101(34.7)	1.25(0.72-2.88)	1.02(0.39-2.60)
Stage IV	43(43.9)	56(19.2)	3.74(1.89-7.39)*	2.56(1.04-6.26)*
Total	98(100)	291(100)		
<b>Presence of OIs</b>				
No	56(57.1)	229(78.7)	1 <sup>r</sup>	1 <sup>r</sup>
Yes	42(42.9)	62(21.3)	3.14(1.92-5.12)*	1.75(0.84-3.67)
Total	98(100)	291(100)		
<b>Nutritional counseling</b>				
No	64(65.3)	126(43.3)	1 <sup>r</sup>	1 <sup>r</sup>
Yes	34(34.7)	165(56.7)	0.43(0.27-0.69)*	1.51(0.74-3.07)
Total	98(100)	291(100)		
<b>Nutritional support</b>				
No	58(59.2)	211(72.5)	1 <sup>r</sup>	1 <sup>r</sup>
Yes	40(40.8)	80(27.5)	2.05(1.27-3.29)*	0.59(0.28-1.26)
Total	98(100)	291(100)		

\*statistically significant association at ( $p < 0.05$ ), \*\* statistically significant association at ( $p < 0.001$ ),  
 COR=crude odds ratio, AOR=adjusted odds ratio, 1<sup>r</sup> reference.

Source: Field survey data

## Discussions

In this study, there were more female cases than male. This might be due to the high prevalence of HIV/AIDS infection among females than males (CSA, 2011). More urban residences were also participated than rural counterpart which could be attributed to the higher proportion of urban with HIV infection as seen in the DHS 2011 which was 4.2% for urban and 0.6% rural residences (CSA, 2011). Mean family size of the study participant was  $4.74 \pm 2.20$  which is almost similar to the national mean family size (4.9). The mean BMI of female ( $20.5 \text{ kg/m}^2$ ) and male ( $19.9 \text{ kg/m}^2$ ) were almost similar with the mean BMI of the general Ethiopian women population  $20 \text{ kg/m}^2$  and the general Ethiopian male population  $19 \text{ kg/m}^2$ , respectively (CSA, 2011).

## Factors affecting nutritional status of PLWHA

Socio-economic factors have an effect on nutritional status of people living with HIV/AIDS (PLWHA) receiving ART. Many studies indicate that wealth status of study participants had direct relationship with under nutrition. In this study, being in the middle and fourth wealth quintiles reduces the odds of under-nutrition by 74% and 77% as compared to that of the study participants who were in the lowest wealth quintile (AOR=0.26, 95% CI 0.09-0.74) and AOR=0.23 95%CI 0.08-0.65), respectively. This is consistent with a research done in Gondar University referral hospital which revealed that poor economic status as risk factor to develop under nutrition as compared to that of the rich (Belayneh et al., 2010). Solomon et al. also reported that, medium economic status reduce the odds of under nutrition by 60% (AOR=0.40 95%CI 0.14-0.95).

CD4-T cell count had strong positive correlation with BMI of study participants, which indicates that when CD4 T cell count increases, BMI will be also increase and the reverse is true. This result is consistent with similar study conducted in Boston explained that improved CD4 cell counts help to reduce the incidence of opportunistic infections and this in turn reduces the occurrence of under nutrition. The Boston study also found that, each  $100 \text{ cell/mm}^3$  decrease in CD4 count is associated with a 1.9kg decrease in body weight (Mangili et al., 2006).

In the current study, prevalence of house hold food insecurity is 62.2%. This result is consistence with a study done in Jimma University Referral Hospital on 319 PLWHA which was 63 % (Ayele *et al.*, 2012). But this result is lower than similar study conducted in Hosanna health care settings which indicate that overall prevalence of food insecurity were 68 % (Mekuria *et al.*, 2015). This might be due to the difference in socio-economic characteristics of the study participants. In another study, the proportion of mild, moderate and severe food insecurity was 4.6%, 32.5% and 42% respectively (Dereje *et al.*, 2015.). Asnakew *et al.*, 2015 also found that the degree of food insecurity was 76.5%, 17.5% and 5.8% occurred as in mild, moderate and severe form.

In the current study, food insecurity has significant association with under nutrition. Being severely food insecure increased the risk of under nutrition by 2.82 times (AOR=2.82 95%CI 1.12-7.13). This might be because of the fact that food insecure study subjects might based their diets on less nutritious and cheap foods or eat one types of meal for long periods of time or even they stay the whole day without food due to lack of money to purchase. This is evidenced by a study done in Jimma university specialized hospital, which revealed that increasing food insecurity status in the study group were associated with reducing food diversity status (Ayele *et al.*, 2012). Similar study conducted in Humera hospital Northern Ethiopia also found that significant association between under nutrition and food security status of PLWHA ( $p=0.001$ ). According to this author, respondents with household food insecurity were 1.9 times more likely to have significant weight loss as compared to those who were food secure (AOR = 1.90;95%CI: 1.11-3.25) (Tsegazeab *et al.*, 2013). Another study conducted in Malawi also found that food insecurity is an important contributing factor to the development of wasting in PLWHA (Bahwere *et al.*,2011). A study in Hosanna health care settings reported that, being food insecure increased the odds of under nutrition by 2.51 (AOR=2.51;95%CI 1.31, 4.81)(Mekuria *et al.*,2015).

WHO clinical stage IV of AIDS has significant association with under nutrition. Patients who were in WHO clinical stage IV of AIDS increase the odds of under nutrition by 2.56 times (95%CI 1.04-6.26) as compared to that of patients in WHO clinical stage I. This study is also supported by the same study done in Hosanna town health care settings. Patients who were WHO clinical stage IV were 5.23 times more likely to be malnourished (Mekuria *et al.*, 2015). Similarly, a study done in Uganda shows that PLWHA taking ART at WHO clinical stage IV were characterized by sever wasting, chronic fever, chronic diarrhea and weight loss greater than 10% from baseline and weight gain was observed among individuals with less advanced disease (Rawat *et al.*, 2010). This is due to the fact that malnutrition is usually encountered at the advanced phase or end of the HIV infection course(WHO,2005). According to our study, there was not statistically significant association in getting nutritional support and nutritional status of study participants even though 56(57.1%) of undernourished individuals were from 269 (69.2%) of subjects who didn't get nutritional support. This finding was opposite with a study done in Zambia which was found that Interventions using supplements or food at time of ART commencement may improve treatment outcomes and providing food support to food insecure patients increased ART adherence by 40% and increased weight during the first 6 months of treatment (Megazzini KS *et al.*, 2006). Similarly, a study done in Uganda found that PLWHA receiving food assistance at baseline WHO stage II and III had a significant weight gain (0.26 kg and 0.2 kg respectively) as compared to their matched controls with the same baseline WHO stage who did not received food assistance. Those with the most advanced disease stage at baseline (WHO stage IV) had the highest weight gain point estimate over the one year period (1.9 kg) (Rawat *et al.*, 2010). This difference in our study might be due to the difference in study design.

In the current study, mean standard deviation of dietary diversity score was  $4.51 \pm 1.42$ . This score is a little bit lower than a study done in Uganda, Kampala ( $4.99 \pm 1.37$ ) (carol, 2004). This might be due to the small sample size in the Uganda study (169) as compared to the current study and or the difference in socio-economic and cultural characteristics of the study participants. Diet diversity result also indicates that majority of study participants 186(47.8%) have moderate dietary diversity score. Eighty four (21.6%) respondents had low dietary diversity status which was much lower than a study done in hosanna health care settings in which larger proportion of the respondents (67.9%) had inadequately diversified food(Mekuria *et al.*,2015). This might be due to the difference in socio economic status of study participants. Cereals and fruits and vegetables were the most food groups which were consumed by the study participants (98.5% and 83.5%) respectively which were good. Similar study conducted in jimma also supports this finding which was found that 98.1% and 62.7% of cereals and vegetables were consumed by the study subjects (Ayele *et al.*, 2012). Our study found that consumption of cereals which are generally cheaper was higher than animal products such as organ meat, egg and fish (98.5%vs8.5% and 17.7% respectively). This might be due to that most clients were food insecure and was normally eat a staple and cereals at main meals which are relatively cheaper than animal products.

In the current study, malnutrition ( $BMI < 18.45 \text{kg/m}^2$ ) was significantly associated with dietary diversity status. Patients having inadequate dietary intake were increase the odds of under nutrition by 4.55 times (AOR=4.55; 95%CI 2.23-9.29). This result was in line with the same cross-sectional study done in hosanna health care settings which was founded that, a positive relationship between under nutrition and dietary diversity status (Mekuria *et al.*, 2015). This author explained that, clients who were taking adequate diversified food were 56% less likely to be malnourished than those who have inadequate diversified food (AOR = 0.44, 95% CI: 0.23

- 0.84) .Tsegazeab *et al.* also supports this finding. As Tsegazeab and his colleagues finding, patients having inadequate dietary diversity were 2.83 times more likely to be undernourished as compared with their counterparts.

### **Nutritional status of study participants**

In the current study, prevalence of under nutrition (BMI <18.5kg/m<sup>2</sup>) was 25.2%. This prevalence is much higher in similar study done in Dilla university referral hospital which was 12.3 % ( Solomon *et al.*, 2013). This high prevalence of malnutrition in the current study might be firstly, due to the year of study and secondly, this high rate of under nutrition in this study could be due to high prevalence of household food insecurity (62.2%) leading to lack of access to adequate, safe and nutritious food resulting to under nutrition. Another research conducted in Ghana report that, prevalence of under nutrition (BMI<18.5kg/m<sup>2</sup>) was 7.9 % ( Theodosia *et al.*, 2014) .The first reason for this small prevalence in Ghana might be due to the small sample size they use (63).The Second reason might be due to the characteristics of study participants. In the Ghana study, participants were those groups of patients who were not eligible for ART whose CD4 cell counts were  $\geq 300$ cell/mm<sup>3</sup> or they are only from stage I and II. Exclusion of advance stages of AIDS might be undermine the prevalence of under nutrition since stage of AIDS increase, immunity of patients will decrease and prone patients to many opportunistic infection. This might cause reduce dietary intake, reduce nutrient metabolism and absorption and finally expose patients to malnutrition (Carole, 2004) and malnutrition is usually encountered at the advanced phase or end of the HIV infection course (WHO, 2005).

Malnutrition could occur in different forms and degrees. When considering degrees of malnutrition, it varies in different settings and circumstances. In the current study, from the total 25.2% of undernourished patients, 16.7%, 5.7% and 2.8% were in mild, moderate and severe under nutrition respectively. In another study Molla *et al.* and Dereje *et al.*, it was 64.4%, 19.2%, and 16.4% and 16.1%, 6.2%, and 3.0% respectively. Zecharia *et al.*, in Malawi also report those different degrees of malnutrition as 22% mild, 14% moderate and 21% severe malnutrition was occurred among PLWHA.

**Conclusion:** Based on the finding of this study, household food insecurity was high (62.2%) among PLWHA. In addition, 25% of the subjects had chronic energy deficiency which will aggravate their health status. Thus, further work is recommended in relation to improving dietary practices of PLWHA in the area.

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