Full Length Research Paper

Under nutrition and associated factors among adult on highly active antiretroviral therapy in Wolaita Sodo teaching and referral hospital, southern nation's nationalities people's region, Ethiopia

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Malnutrition can be defined as a state of nutrition in which there is a deficiency, excess or imbalance of energy, protein and other nutrients. This study was conducted to assess the magnitude of under nutrition and associated factors among adult on highly active antiretroviral therapy (HAART) in Wolaita Sodo teaching and referral hospital, SNNPR, Ethiopia. Institutional based cross sectional study design was used among randomly selected 519 adult patients on HAART at Wolaita Sodo University referral Hospital. Data were collected using a pretested structured questionnaire and weight and height measurements were taken to determine the levels of nutritional status. Data were entered on to Epi Info version 3.5.1 and exported to SPSS version 16.0 for cleaning and further analysis. Both binary and multivariable logistic regression analyses were performed to identify the factors associated with nutritional status of people on HAART. Odds ratios along with 95%CI was estimated to measure the strength of association and p value less than 0.05 was used as a cut-off point to declare level of statistical significance. The magnitude of underweight (BMI <18.5 kg/m^2) was 26.6% 95%CI: (22.8 to 30.4%). Multivariable logistic regression analysis revealed that, not having food aid (AOR=2.76, 95%CI: (1.77-4.30)), low baseline CD4 count (AOR=2.12, 95%CI: (1.31-3.42)) being male (AOR=1.80, 95%CI: (1.10-2.93)) and lack of formal education (AOR=2.48, 95%CI: (1.48-4.17) were significantly associated with under nutrition. The burden of underweight was high among adult on HAART lack of food aid and formal education, decrease in CD4 count and male gender have influenced nutritional status of the study participants. Nutritional assessment, management and nutritional support and timely initiation of ART should be the key intervention during the course of chronic HIV care. Follow up and ART service provision monitoring are also important to improve the nutritional status of HIV/AIDS patient.

Key words: Under nutrition, body mass index (BMI), highly active antiretroviral therapy, underweight.

INTRODUCTION

Malnutrition can be defined as a state of nutrition in which a deficiency, excess or imbalance of energy, protein, and other nutrients causes measurable adverse effects on tissue/body form (body shape, size and composition) (underweight) and it is a serious public health problem that has been linked to a substantial increase in the risk of mortality and morbidity (Ministry of Health, 2012). Malnutrition is emerging as an important barrier to

adherence to care and treatment recommendations for people on HARRT. HIV affects nutritional status by increasing energy requirements, reducing food intake, and adversely affecting nutrient absorption and metabolism (Nachega et al., 2007).

Globally, 35.3 million people were living with HIV at the end of 2012. An estimated 0.8% of adults aged 15 to 49 years worldwide are living with HIV currently. The burden of the epidemic continues to vary considerably between countries and regions. Sub-Saharan Africa remains most severely affected, with nearly 1 in every 20 adults living with HIV and accounting for 71% of the people living with HIV worldwide. Prevalence has remained at this level since 2005 (Ministry of Health, 2012). In Ethiopia in 2011, adults living with HIV was estimated at 1.2 million (Central Statistical Agency of Ethiopia, 2011).

The effect of HIV/AIDS pandemic on nutritional status of infected people is widely known. The common known effects are severe muscle wasting and underweight (Central Statistical Agency of Ethiopia, 2011). More than 800 million people worldwide are chronically undernourished from which 200 million are living in SSA, and greater than 33 million are living with HIV infection. The primary goals of antiretroviral therapy are preventing HIV-related morbidity and mortality, and improving quality of life by restoring immunologic function through suppression of viral load. The accesses to ART, is estimated at 9.7 million people in low- and middle-income countries who are receiving antiretroviral therapy. According to the WHO, in the African region, 63% of people eligible for treatment were able to access life-saving medicines in 2012 (Federal Ministry of Health, 2011).

However, morbidity and mortality related to HIV infection in the developing world remain unacceptably high, despite major advances in HIV therapy (Tsegaye and Worku,2011). Thus, improving the nutritional status of patients on HAART is considered as a key strategy to reduce the progress of the disease and to improve the lives of the patients. The efforts to improve nutritional status require a sound knowledge on the magnitude and causes of malnutrition among HIV patients on HAART.

Despite enormous problem of HIV patients on HAART and malnutrition in the country, there are limited study conducted in the country context in general and no study found particularly in the studies area. This research was intended to provide such vital information that can be used as inputs in the efforts to improve nutritional status of HIV patients on HAART.

The latest FAO estimates, shows world hunger has reduced but still about 805 million are considered to be chronically undernourished globally (FAO, 2014). About 925 million hungry people live in Asia and the Pacific, the world's most populated region. Also, sub-Saharan Africa (SSA) is home to 26% of the world's under-nourished population. In Ethiopia, just as in SSA, approximately 26% of the general population is without adequate nutrition (FAO, 2014; Federal Ministry of Health, 2008).

HIV and malnutrition are interconnected in a vicious cycle, although both HIV and mal-nutrition can separately cause progressive damage to the immune system and increased weakness to infection, morbidity and mortality through opportunistic infections. Moreover, with fever, diarrhea, loss of appetite, nutrient mal-absorption, and weight loss there is a growing recognition of malnutrition as a potential cause of worse health outcomes among people living with HIV/AIDS (PLWHA) Figure 1.

Among people infected with HIV, malnutrition has been associated with worse HIV treatment outcomes including reduced antiretroviral therapy adherence. Malnutrition increases vulnerability to HIV infection by driving risky sexual behaviors, contributing to practices that increase mother-to-child transmission, increased orphans, decreased labor productivity and contribute to general under-nutrition and micronutrient deficiencies that impair mucosal integrity and host defenses (Koethe and Heimburger, 2010).

PLWHA taking ART treatment must also receive special nutrition care and support because HIV-related medications can reduce the overall quality of health and malnutrition. ART can cause side effects like nausea, vomiting, change in or loss of taste or appetite, and diarrhea, all of which can lead to reduced intake, absorption of nutrients and cause weight loss. It can also cause metabolic side effects that lead to nutrition-related conditions, such as heart and bone problems. Conversely, food can negatively affect the absorption, distribution, metabolism and excretion of HIV medications (Koethe and Heimburger, 2010).It is known that Ethiopia is one of the countries hit hardest by HIV epidemic besides malnutrition and it occurs in severe forms and affects many people either before or while taking ART (Weiser et al., 2012). There is little evidence in Ethiopian context in general and in the study area in particular regarding the nutritional status of peoples living with HIV/AIDS and on HAART. Therefore, the purpose of this study is to assess under nutrition and associated factors of adult on HAART in WSU referral and teaching hospital.

Objective

The objective of the study is to assess the magnitude of under nutrition and associated factors among adult HIV

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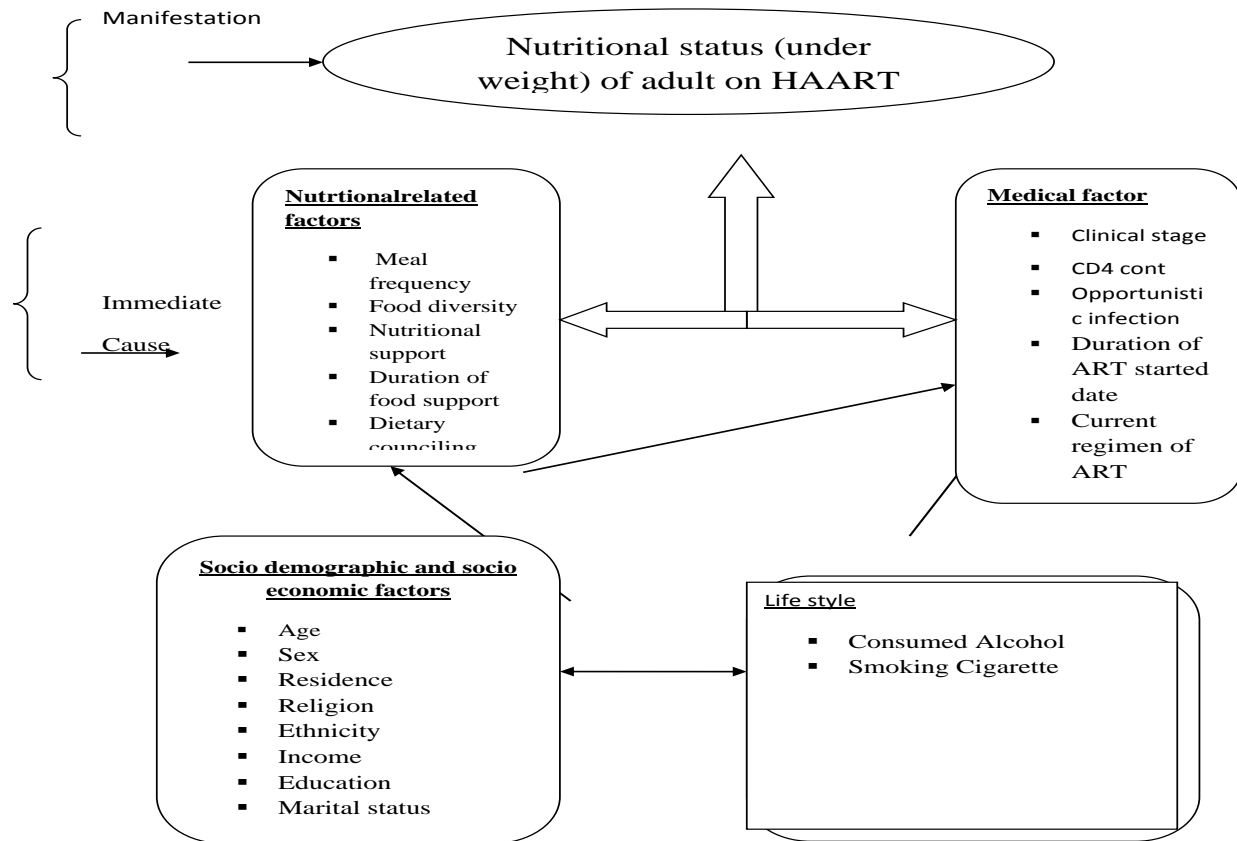
Figure 1. Conceptual frame work of associated factores on nutrtional status among adult on highly active antiretroviral treatment (HAART), 2015. Modified from UNICEF malnutrition framework.

patients on HAART in Wolaita Sodo teaching and referral Hospital, southern Ethiopia

METHODS AND MATERIALS

Study setting

The study was conducted in Wolaita Sodo University teaching and referral hospital which is located in the Wolaita zone of South Nation's Nationalities and People Regional State (SNNPRS), Ethiopia (Figure 2). It is located 329 (via Hosanna) and 390 km (via Shashamane) away from Addis Ababa and 170 km from the regional capital, Hawassa. Wolaita Sodo hospital was established in 1913, currently it is serving as teaching center in addition to its curative and rehabilitation service. The hospital serves a population of about 2 million people in Wolaita zone and neighboring zones such as Dawuro zone, Gamo Gofa zone and Kambata Tambaro zone. The hospital has a total capacity of about 170 inpatient beds in four major departments (medical ward, gynecology and obstructive ward, surgical ward and pediatric ward) and other units. Over 90,000 people visit outpatient department per year. ART service at Soddo Hospital started in 1997 by the government in collaboration with partners. At the time about 28 ART users were enrolled. Currently, ART patients taking treatment and pre ART in this clinics are 2271 (Wolaitasodo University Hospital Administration Office, 2015). Institutional based cross-sectional study design was used. Study was conducted from August 1 - 30, 2015. Source populations were adults whose age were ≥ 18 years who were actively taking ARV drugs, and those who were following HIV/AIDS in Wolaita Sodo teaching and referral hospital. Study populations were all randomly selected adults whose age was ≥ 18 years and actively taking ARV drugs, and those who were following HIV/AIDS who had been on ART.

Inclusion and exclusion criteria

PLWHIVA of age ≥18 years, who were actively taking ARV drugs were included in the study and pregnant and lactating women and seriously ill client who were unable to speak were excluded. Dependent variables are nutritional status of adults with HARRT (BMI). Independent variable are age, sex, marital status, education, residence, occupation, religion, ethnic group, presence/absence of nutritional support, income, source of drinking water, smoking cigarette, consumed alcohol, CD4, appetite, clinical stage, ART status, duration of ART started, regimen of ART, presence of opportunistic infection (OIs), meal frequency and dietary diversity.

Sample size determination

The required sample size was determined using single population proportion formula $n = \frac{Z^2 P(1-P)}{d^2}$, where: n is the sample size, z is the standard normal distribution set at 1.96, d is the desired the target population, by taking p=31, the study was done on

Wolaita zone map

Figure 2. The study area map. Source: from zonal administration office.

Table 1. Sample size determination for associated factors (for second objective).

Exposure variables	OR	Ratio	Power	CI	P	10% non-response rate	Total sample size
Opportunistic infection	2.62	1:1	80%	95%	63	198	208
Clinical stage IV count	5.23	1:1	80%	95%	7.76	110	121
Food Diversity	0.44	1:1	80%	95%	18	472	519

degree of accuracy/precision and p is the estimated proportion of malnutrition and associated factors among adult individuals on HAART in Hosanna (Mekuria et al., 2015). The computed sample size was 328 and by taking 10% non-response rate, the sample size is 361 (Table 1). Therefore the maximum sample size was 519. It is from the second objective and would be used for better representativeness and enough power to detect all associated factors.

Data collection procedure

Data were collected using pre-tested structured questionnaire developed in English after reviewing relevant literatures. The questionnaire was developed in English and then translated into Amharic. The contents of the questionnaires included socio-economic and demographic factors, factors related to medical and feeding practices. To collect the data, one Bsc nurse and the principal investigator supervised the survey and three data collectors who have at least diploma in nursing with previous experience collected the data to maintain uniformity from health institution. It was learnt that on average, 70 patients come every

day for the follow up. Thus, it was anticipated that 1400 patients will visit the clinics over one month survey period. The required sample size, 519 was attained in a month by systematically including every third patient. The first subject was selected from the first visitors using the lottery method and then every 3 patient was interviewed. Data collection process was strictly followed day to day by the supervisor and principal investigators. Dietary diversity was calculated using questionnaire adopted from FAO (2011) guidelines. A food frequency and diversity questionnaire was used to obtain information about usual food consumption pattern of the client and a total dietary diversity score will be calculated from a 24 h recalled list of food items consumed over the previous day. Based on a set list of 9 food items, a score lower than 4 was classified as low dietary diversity and food frequency is score the individual eat less than three per day is poor food frequency. All medical factors were assessed according to ART follow up on registration book.

Weight of participants was measured by using standard beam balance and the scale was checked before and after each measurement. Then, ten volunteers weight was measured after removing heavy clothes and shoe, recorded to the nearest 0.1 kg by principal investigator and all measurements were taken twice by one nurse (data collector) and supervisor and the reliability was

taken. In a similar way, height of the participant was measured by data collectors and the measured value was cross checked to avoid inter-observer and intra-observer bias/error. The World Health Organization uses BMI to grade nutritional status in the following manner, underweight (BMI= <18.5 kg/m^2), normal (BMI = 18.5-24.9 kg/m^2), over weight (BMI 25-29.9 kg/m^2) and obesity (>=30 kg/m$^{2)}$. Height of participant was measured using the standard measuring scale to the nearest 0.1 cm.

Data quality control

Training was given to the data collectors and supervisor for two days before the actual data collection on the aim of study, and data collection tool and procedures in order to minimize inter and intra observer errors.

In addition, the training also focused on the art of interviewing and clarifying questions that were unclear to the respondents. Two days before the actual study begun the questionnaire was pre tested, 5% of clients in the nearest health center (not included in sample) and some modifications were made based on findings of the pretest. Close supervision of data collectors was done to check completeness of questionnaire during data collection.

Data processing and analysis

Data were checked for completeness, coded, and entered into EPI INFO version 3.5.1 and exported to SPSS window version 16 for further analysis.

The basic descriptive summaries of patients' characteristics and outcome of interest were computed. Accordingly, simple frequencies, measure of central tendencies and measure of dispersions were computed. Finally, all explanatory variables of results (P value < 0.25) with the outcome variable were entered into multivariable Logistic regressions analysis was done to examine the combined effect of each independent variables on dependent variables. The strength of association between predictor and outcome variables was reported using odds ratios along with 95% CI. P value ≤0.05 was considered to declare level of statistical significance.

Results dissemination plan

This research was aimed at assessing nutritional status of adult on HAART and associated factors.

The finding of this research was used as inputs to ART programs at local and/or national levels such studies could help inform policy maker in the study area on ways of improving or maintaining adherence to and scale up the treatment level to reduce morbidity, mortality and improving nutritional status of the PLWAH. Furthermore, effort will be made to publish the result in scientific journals.

Ethical clearance

Prior to data collection, ethical approval was obtained from ethical review committee of WSU, College of Health Sciences and Medicine, School of Public Health.

Permission was obtained from WSU hospital administrators. Verbal consent was sought from each participant after the purpose of the study was explained and after they were told that they can withdraw at any time and/or refrain from responding to questions they do not like.

RESULTS

Socio-demographic characteristics

A total of 500 adults PLWHAs on ART participated in the study making a response rate of 96.3%. Out of these, 312 (62.4%) were female. 182 (36.4%) of the participant were in the age group of 18 to 35 years, while the majority, 194 (38.2%) were between 36-44 years and the rest 127 (25.4%) were in the age group of forty five and above years. Majority of the respondents, 274 (72.2%) from Wolaita ethnic group and 274 (54.8%) were protestant. In terms of marital status, more than half of the respondents, 271(54.2%) were married, 28 (5.6%) were not married at all, 92 (18.4%) were divorced and109 (21.8%) were widowed. Regarding the educational status, most of the respondents have attended elementary school, 245 (49.0%) and secondary school, 117 (23.4%), slightly over 41 (8%) have gone to college and university. On the other hand, 8 (1.6%) could read and write only, while about 89 (18%) of the respondents could not read or write.

Concerning the occupational status, most of the respondents, 124 (24.9%) were merchants (Table 2).

Economic and life style conditions of the respondents

273 (54.6%) of the respondents live with their spouse and 8.2% were living alone. Majority of the respondents, 452 (90.4%) reported that they fetch water from pipes while the rest fetch water from various sources.

Regarding life style of respondent, 8 (1.6%) reported that they smoke cigarette, 14 (2.8%) reported that they consume alcoholic beverages and majority of the respondents, 195 (39.0%) reported that they earn monthly incomes of birr ≥2000 (Table 3).

HIV/AIDS and ART related characteristics

Majority, 185 (37.0%) of the respondent were on AZT+3TC+NVP regimen type of ART. Regarding WHO clinical stage, majority, 59.8% of the respondents were at clinical III and 63.2% were at base line CD4 count <200. Majority, 468 (93.6%) of respondents reported that they have disclosed their HIV status. Regarding the starting dates of ART medication, most of the respondents (44.8%) reported that they started between 2004 and 2008 (Table 4).

Medical and health related conditions

86 (17.2%) of the respondents reported that they had poor appetites.

Among the patients with opportunistic infections, 188 (37.6%) were diagnosed with tuberculosis, 107 (21.4%) were diagnosed with diarrhea, 100(20.0%) were

Table 2. Socio-demographic characteristics of respondents, PLWHA on HARRT IN WSU Referral Hospital from August 1-30, 2015.

Variable (N=500)	Frequency	%
Age of respondent		
18-35	182	36.4
36-44	191	38.2
≥45	127	25.4
Sex		
Male	188	37.6
Female	312	62.4
Residence		
Urban	409	81.8
Rural	91	18.2
Ethnicity		
Wolayita	356	71.2
Amhara	57	11.4
Gamo	28	5.6
Gurage	22	4.4
Hadeya	15	3.0
Oromo	16	3.2
Kenbata	6	1.2
Religion		
Protestant	274	54.8
Orthodox	206	41.2
Muslim	12	2.4
Catholic	8	1.6
Marital status		
Married	271	54.2
Never married	28	5.6
Divorce	92	18.4
Widowed	109	21.8
Educational status		
Cannot read and write	89	17.8
Read and write	8	1.6
Elementary (1-8)	245	49.0
High school (9-12)	117	23.4
College and above	41	8.2
Current occupation		
Merchant	124	24.8
House wife	94	18.8
Daily laborer	94	18.8
Governmental employee	70	14.0
Non-governmental	45	9.0
Farmer	38	7.6
Others*	35	7.0

*Others= no job (28) and pension (7).

Table 3. Economic and lifestyle conditions of PLWHA on HARRT in WSU Referral Hospital from August 1-30, 2015.

Characteristics (N=500)	Frequency	%
Live with		
Parent	43	8.6
Relative	21	4.2
Spouse	273	54.6
Spouse and children	122	24.4
Alone	41	8.2
Source of drinking water		
Tap	452	90.4
Spring	25	5.0
River	14	2.8
Well	9	1.8
Smoking cigarette		
Yes	8	1.6
No	492	98.4
Consumed alcohol		
Yes	14	2.8
No	486	97.2
Family size		
≤5	341	68.2
>5	159	31.8
Monthly income		
≤500	39	7.8
501-1500	160	32.0
1501-2000	106	21.2
≥2001	195	39.0

diagnosed with oral candidiasis, 174 (34.8%) of them had gastro intestinal symptoms (Table 5).

Access to food and diet

Nearly half of the respondents confirmed that they had received food aid from the government, 101 (41.1%) and non-government institutions, 145 (58.9%). The main types of the support were plumy nut, 55 (22.4%) and oil plus other cereals, 191 (77.6%). Close to 64% agreed that they had received nutritional counseling. Majority, 444 (88%) reported that they consumed three or more meals the day prior to the survey. In terms of diet diversity, nearly had consumed diversified diets, while half have not (Table 6).

The proportion of respondents who have consumed food from various categories is depicted. As can be seen, the most commonly eaten foods were cereals, tubers (99%) and legumes pulses, legumes and nuts (68%) and

Table 4. HIV/AIDS and ART users profile in WSU Referral Hospital, South Ethiopia, from August 1 – 30, 2015.

Variables (N=500)	Frequency	%
ART regimen		
1c((AZT+3TC+NVP)	185	37.0
1d((AZT+3TC+EFV)	65	13.0
1e(TDF+3TC+EFV)	184	36.8
1f(TDF+3TC+NVP)	50	10.0
2b(TDF+3TCLPV/r)	6	1.2
2c(TDF+3TC+LPV/r)	10	2.0
Previous Clinical stage		
Stage I	8	1.6
Stage II	150	30.0
Stage III	299	59.8
Stage IV	43	8.6
BaselineCD4 count		
<200	316	63.2
>200	184	36.8
Any medicine rather than ART		
Yes	142	28.4
No	358	71.6
Disclose HIV status		
Yes	468	93.6
No	32	6.4
ART started date		
2004-2008	224	44.8
2009-2011	149	29.8
2012-2015	127	25.4

Table 5. Health/medical conditions of respondents, WSU Referral Hospital, South Ethiopia, from August 1 -30, 2015.

OI and other health problem (N=500)	Frequency	%
Poor appetite		
Yes	86	17.2
No	414	82.8
Chronic Diarrhea		
Yes	107	21.4
No	393	78.6
Gastritis		
Yes	174	34.8
No	326	65.2
Oral Candediases		
Yes	100	20.0
No	400	80.0
TB treatment on ART		
Yes	188	37.6
No	312	62.6

Table 6. Access to food and diet among respondents WSU Referral Hospital, South Ethiopia, from August 1-30, 2015.

Dietary characteristics (N=500)	Frequency	%
Food aid		
No	246	49.2
Yes	254	50.8
Food aid N=254		
From government	109	42.91
Non-government	145	57.09
Types of food ration N=254		
Plum nut	63	24.80
Oils and other cereals	191	75.20
Dietary counseling		
Yes	319	63.8
No	181	36.2
Meal frequency		
Low (1-2)	56	11.2
High (3-5)	444	88.8
IDDS		
Better (≥3Food group)	253	50.6
Low (≤2 food group)	247	49.4

the least eaten foods were mainly eggs and organ meat which were reported to have been eaten by less than 2%.

Prevalence of malnutrition among people on HAART

Prevalence of malnutrition among PLWHAs on ART was 133 (26.6%) (95%CI: 22.8 to 30.4%). About 300 (60%) were in the normal ranges; while 56 (11.2%) were in the overweight range and further, 11 (2.2%) were in the obese category.

Factors associated with under nutrition

Multivariable logistic regression analysis confirmed that being male, not having food aid and informal educational, low baseline CD4 count, were potential predictors of under nutrition after controlling for confounding factors.

The odds of being underweight were 1.8 times higher for males than for female counterparts. Those who had no formal education were 2.48 times more likely to be

Table 7. Factors associated with under nutrition among PLWHA on HAART in WSU teaching and referral Hospital from August 1- 30, 2015.

Variables (N=500)	Nutritional status		COR (95% CI)	AOR (95% CI)
	Underweight	Normal		
Age				
18-35	46	136	1.09 (0.645-1.855)	1.35 (0.75-2.43)
36-44	57	134	1.375 (0.823-2.294)	1.56 (0.90-2.70)
≥45	30	97	1	1
Sex				
Male	56	132	1.29 (0.86-1.94)	1.80 (1.10-2.93)*
Female	77	235	1	1
Residence				
Rural	29	62	1	1
Urban	104	305	0.72 (0.45-1.19)	0.19 (0.83-2.48)
Educational status				
Have no Formal education	38	59	2.08 (1.30-3.13)	2.48 (1.48-4.17)*
Have Formal education	95	308	1	1
Base line CD4 count				
≤200	99	217	2.01 (1.29-3.13)	2.12 (1.31-3.42)*
>200	34	150	1	1
Previous clinical stage				
I &II	26	132	0.41 (0.190-0.88)	0.58 (0.26-1.321)
III	93	206	0.94 (0.47-3.1.85)	1.32 (0.516-2.21)
IV	14	29	1	1
Monthly income				
≤500	10	29	1.13 (0.52-2.45)	0.92 (0.40-2.10)
501-1500	53	107	1.63 (1.07-2.49)	1.25 (0.79-1.98)
>1500	70	231	1	1
Food aid				
No	87	159	2.47 (1.63-3.74)	2.76 (1.77-4.30)**
Yes	46	208	1	1

*P<0.05, **p<0.001

underweight than those who had formal education. Those who had not received food aid were 2.76 times more likely to be under weight than those who had received. Finally, the odds of being underweight were 1.8 times higher among those who had baseline CD4 count less than 200 cell/mm^{3} than their counterparts (Table 7).

DISCUSSION

The study showed that sizeable proportion, 26.6%, (95%CI: 22.8 to 30.4%) of people on antiretroviral therapy suffered from under nutrition with BMI < 18.5 kg/m^{2} in the Wolaita Sodo teaching and referral hospital. The prevalence of underweight observed in this study is higher than that of similar studies conducted in Fellege Hiwot, 25.5% (Daniel et al., 2013; Weinberg et al., 2015), Dilla, 12.3% (Solomon et al., 2013) and 10.3% among women in sub-Saharan Africa (Uthman, 2008). In contrast, the current study finding is lower than the findings in Butajera, 78.1% (Dereje et al., 2015), Humera, 42.3% (Hailemariam, 2013) Gonder, 42.5% (Wasie et al., 2014; Tadios and Davey, 2006), Hosanna, 31.2% (Mekuria et al., 2015) Hospitals and Botswana which was 30% (Nnyepi, 2009). The difference might be residence, study setting, socio culture, economic and/or year of

the current study.

Descriptively, from the total participants, females accounted for 312 (62.6%), and from which 77 (24.7%) were under nutrition. Males accounted for 188 (37.6%); 56 (29.8%), of them were under nourished. Males are 1.8 times more odds of getting under weight than the counterpart (AOR=1.80; 95% CI, (1.10-2.93). This finding is different from previous study conducted in Felege Hiwot referral hospital (Daniel et al., 2013). This might be that most males have hard working condition, most of them are merchant and they did not have food on time. Also, this might be due to direct or indirect effects of nutritional and social factors that contribute to under nutrition.

Those who had baseline CD4 count less than 200 mm^3 are 2.12 times odds of being under weight than their counterparts {AOR=2.12; 95% CI, (1.31-3.42)}.

An earlier similar study conducted in Dilla university hospital (Solomon et al., 2013; Daniel et al., 2012) showed that CD4 count of <250 cells/mm^3 and (Mekuria et al., 2015), was significantly associated with under nutrition. Similarly, other studies done in Arbaminch hospital on ART users and in Somalia Jejega hospitals indicate that baseline CD4, 50 cell/mm^3 count was associated with underweight (Belay et al., 2014; Bereket et al., 2014). This agreement was the same as a study done in Haiti(Mekuria et al., 2015).

The predictors showed that in adult HIV-infected patients, initiating ART was higher, advanced in base line low CD4 count (Belay et al., 2014; Tadesse et al., 2014). This might be explained by the fact that those who have low CD4 count were prone to opportunistic infections which is more risk for underweight for patients with HIV patients on ART.

Those who had not received food aid were 2.76 times odds of underweight than their counterparts AOR=2.76; 95% CI, (1.77 to4.30). This is consistent with previous study finding in Haiti (Louise et al., 2010; Tadios and Davey, 2006), Gonder (Wasie et al., 2014) and Humera (Hailemariam, 2013; Moges and Amberbir, 2011). This might be due to the fact that those who get food aid have food security and it increases adherence of the client in which the clients go to ART clinic frequently than non-food aid users.

The study noted that informal education was with the odds of 2.48 times more likely to be under weight than those who had formal educational status. It is argued that the society have higher ability that improve their nutritional status than those with no formal education {AOR=2.48; 95% CI, (1.48-4.17)}.

In this study, meal frequency, diversity of food and opportunistic infection were not significantly associated as compared to other studies. The possible justifications might be the coincidence of the data collection with a harvest season
where food is more available and the prices are relatively low.

CONCLUSION

The magnitude of under nutrition was high among adult people on HAART having no food aid, low base line CD4 count, being male and informal education influenced nutritional status of the study participants.

Due attention needs to be given to those people on HAART. Given these observations, there is a need to routinely screen PLWHA for the risk of developing under nutrition to facilitate early detection and intervention on HAART

RECOMMENDATIONS

The following recommendations are given in accordance with the above result:

1. ART treatment should be accompanied by nutrition support through governmental and non-governmental organizations. Only ART is not enough to improve the health status of PLWHA
2. In the study area, additional nutritional supported must be provided to address the problem of malnutrition on HAART users.
3. The ART clinic should be sensitized to increase awareness about the benefit of nutrition on HAART.
4. Awareness creation is important to PLWHA in low CD4 count and early initiation of ART treatment could be advisable.
5. Education is an important factor influencing an individual attitude, therefore, improvement of education in people is very essential.
6. Stakeholders should monitor the management provided by health professionals on ART and related to nutrition to minimize the causes of under nutrition.
7. Due attention should be given to the mildly malnourished cases because they think they are healthy.
8. Attention must be given to male to improve nutritional intake.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

ABBREVIATIONS

AIDS, Acquire Immune Deficiency Syndrome; **ART,** Anti Retro Viral Treatment; **ARV,** Anti Retro Viral; **BMI**, Body Mass Index; **EDHS,** Ethiopia Demography and Health Survey; **FAO**, Food and Agriculture Organization; **HAART,** Highly Active Antiretroviral Treatment; **HIV**,Human Immune Deficiency virus; **OI**, Opportunistic Infection; **PLWHA,** People Living With HIV AIDS;**SNNPR,** South National Nationality People of Region; **SPSS**, Statistical Package for Social Science; **TB**, Tuberculosis;

WFP, World Food Program; **WHO,** World Health Organization; **WSU,** Wolaita Sodo University,

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