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NUTRITIONAL STATUS AND ASSOCIATED FACTORS OF HUMAN IMMUNODEFICENCY VIRUS POSITIVE ADULTS TAKING HIGHLY ACTIVE ANTI RETROVIRAL TREATMENT IN JIMMA TOWN SOUTH WEST ETHIOPIA

Melese, S.T.[1*] and Selam, B.G[2]

[1]Jimma University, Institute of Health, Public Health Faculty, Department of Nutrition and Dietetics, Jimma, Ethiopia. P. O. Box 378, Jimma University, Ethiopia; [2]Department of Pathology, Yekatit, 12 Hospital Medical College, Addis Ababa, Ethiopia

*Correspondence: sinmele@gmail.com

ABSTRACT

This institution-based cross-sectional study was conducted to assess the nutritional status of adults living with Human Immunodeficiency Virus (HIV) and on Highly Active Antiretroviral Treatment at Jimma University Specialist Hospital. Using the systematic sampling technique, a total of 242 HIV/AIDS patients were recruited for anthropometric dietary survey and biochemical parameters' evaluation. Socio-demographic data was collected using a semi-structured and pre-tested questionnaire, while weight and height of the participants were measured with a beam balance and stadiometer respectively. The data obtained were analyzed using SPSS for Windows (version 20.0). Bivariate analyses were done and all covariate variables which had association with the outcome variables at p-value of 0.25 were selected for multivariate analyses. Both descriptive and multivariable logistic models were used for comparison after adjusting for various variables. Bivariate and multivariable logistic regression analyses were used to identify independent predictors of nutritional status as measured by body mass index <18.5 kg/m^2. P-values <0.05 were considered statistical significant. Results showed a response rate of 100% with significant differences in the probability of normal nutrition status between males and females, and between the stage of HIV and nutritional status.

Keywords: Nutritional status, HIV/AIDS, Highly Active Antiretroviral Therapy

INTRODUCTION

An estimated 33.2 million people worldwide were living with HIV/AIDS in 2007; with 2.5 million new infections and 2.1 million AIDS related deaths in same year. Though HIV/AIDS is a global pandemic sub Saharan Africa was & continues to be the region most stricken by the disease. Nearly 68% of adults & 90% of children affected by the disease reside in this area (WHO, 2007). According to the 2007 single point HIV prevalence for 2010 about 2.4 %(~1.2 million) of Ethiopian adults are living with HIV of which 397,818 need ART (FMH, 2007).

In sub Saharan Africa 212 million people or 25% of the global total were estimated to be undernourished in the year 2005 (Koethe *et al*., 2010). Ethiopia has one of the world's highest incidences of undernourished individuals. Approximately 49% of the population is without adequate nutrition. Ethiopia has high levels of food insecurity and is prone to acute food insecurity, primarily from draught, environmental degradation, and insufficient access to and availability of food (FDRE, 2008). HIV /AIDS added on food shortage and malnutrition has brought some sub Saharan African countries to a brink of crisis (Friis, 2005).

Malnutrition especially weight loss recognized since the beginning of the HIV pandemic has several causes in people living with HIV including but not limited to decreased food intake partly due to elevated proinflammatory cytokines, oral and gastrointestinal lesions can make food ingestion painful or difficult, systemic manifestations of HIV like fever, dyspnea and fatigue contribute to progressive disability and interfere with an individual's ability to obtain and ingest food, malabsorption of nutrients due to intestinal infection & bowel wall edema following hypoalbuminemia ,other social situations likely do also contribute to the development of malnutrition in people living with HIV (Piwoz *et al*., 2000).

Rapid progress in developing antiretroviral therapy (ART) led in 1996 to the introduction of highly active

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antiretroviral therapy (HAART). This revolutionized the treatment of HIV infection. HAART is a combination of at least three antiretroviral (ARV) drugs (WHO, 2004). HAART restores immunologic function, but does not eliminate weight loss and wasting, which continue to be strong independent predictors of mortality. Because low micronutrient concentrations are caused by similar mechanisms and several micronutrient concentrations are lower among patients with HIV wasting syndrome, micronutrient deficiencies may also persist in the era of HAART. Studies in Malawi found that patients with mild malnutrition were twice as likely to die in the first three months of initiation of HAART and those with severe malnutrition were seen to have a six fold increment in mortality rate (Paton *et al*., 2006).

The twin global epidemics of HIV infection and food scarcity disproportionately affect sub-Saharan Africa, and a significant proportion of patients who require antiretroviral therapy (ART) are malnourished because of a combination of HIV-associated wasting and inadequate nutrient intake. HIV infection affects nutritional status through increased energy expenditure due to the catabolic state following viral infection itself and OI's, reduction in food intake due to anorexia and gastrointestinal lesions that preclude enteral feeding and nutrient malabsorption due to intestinal pathologies. These and other complicated metabolic alterations result in malnutrition even in those on HAART which hasten death in PLWHA (Koethe *et al.*, 2010).

Despite the paramount impact of issues related to nutrition in PLWHA there is no large study on the subject in Ethiopia like the rest of sub Saharan Africa. In ART clinics in Ethiopia BMI is used to assess nutritional status and patients are weighed at each visit to assess changes in nutritional status(FDRE ,2008) ,even though BMI is a good means to assess nutritional status weight change alone do also has many shortcomings to determine nutritional status (Koethe *et al*.,2010).

The Study done In West African cohorts In ATARAO, 250 participants were retained for analyses; of which, 36% had a BMI < 18.5 kg/m^2, nearly 60% were anemic and 47.4% hypoalbuminemic at time of treatment initiation. At baseline, low hemoglobin, hypoalbuminemia and low CD4 levels were associated with a BMI <18.5 kg/m^2 (Sicotte *et al*., 2015).

The study done in Ethiopia out of 340 patients, 42 patients died during the follow-up. Twenty-five (59.5 %) deaths were from malnourished group. Age, baseline CD4, sex, baseline HAART and marital status were significant predictors of immunologic recovery at different time points. Malnutrition was associated with lower CD4 recovery and greater hazard of death (Hussen *et al*., 2016).

The prevalence of under-nutrition (body mass index [BMI] ≤18.5 kg/m^2) among patients on ART was 30%. The mean BMI was 20.3 with standard deviation ± 2.9 kg/m^2 (Dedha *et al*., 2017).

In this study comprehensive nutritional assessment was done using anthropometric, dietary survey and biochemical parameters to determine the level and type of malnutrition among People living with Human Immunodeficiency Virus who are on Highly Active Antiretroviral Treatment at Jimma Health center for an informed planning of intervention strategies.

So this research is intended to show the prevalence and pattern of nutritional alterations in PLWHA using anthropometric, dietary and biochemical parameters to equip stake holders working on HIV/AIDS to have informed plan & action. The study will also help as a base for future extensive studies.

METHODS AND MATERIALS

Study area and period, The study was conducted at Jimma University; the town is located 354 km south west of Addis Ababa and has population of 207,573 (2012E.c) people living the town. They belong to different ethnic groups of the country, the climate condition of the area is Woinadega and the town has two hospitals. The study was conducted in October 2016.The establishment of the College of Health Sciences of Jimma University (JU) can be traced back to 1983 with the birth of the then Jimma Institute of Health Sciences (JIHS).The very beginning of the establishment of JIHS is marked as a continuation of the Ras Desta Damtew Health Assistant Training School established in 1967 by the Ethio-Netherlands health project in the premises of Jimma Hospital. On this foundation, the School of Nursing was established in 1983.Subsequently, the School of Medicine as well as the School of Pharmacy emerged in1985; the School of Medical Laboratory Technology and the School of Environmental Health launchedin1987and1988, respectively. JU was established as a public higher education institution in December 1997 in Jimma Institute of Health Sciences by

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splitting the health section in to two faculties namely Faculty of Public Health, Faculty of Medical Sciences; and adding two new faculties namely, Faculty of Business and Economics, and Faculty of Technology, which are the founding organs of the present Jimma University.

Then the College of Health Sciences was finally established by the amalgamation of the former Faculty of Public Health and Medical Faculty by the business process reengineering undertaken in the university in June 2009. The redesign has also aligned Jimma University Specialized Hospital (JUSH) to be managed under this college as the hospital's medical services are being provided by doctors of the college while clinically teaching students. With the aim easing the college management, restructuring is being made under the name of College of Health Sciences.

Study Design: An institution-based cross-sectional study was conducted, Source population all HIV infected adults (older than 18 years) on HAART at Jimma and Study population those randomly selected HIV infected adults (older than 18 years) on HAART at Jimma University Specialized Hospital was recruited in the study. The Exclusion Criteria was pregnant ladies, those that have acute diarrhea (onset of diarrhea in two weeks preceding data collection), those that currently have edema and those that are currently taking diuretics.

Sample Size Determination and Sampling Technique: Sample size was calculated as follows:

$$n = \frac{Z^2 P(1-p)}{d^2}$$

Where:-
n=the minimum sample size required
p =the expected prevalence of malnutrition 50% = 0.5
d=the margin of sampling error tolerated 5% = 0.05
z=the standard normal variable at confidence interval at 95% = 1.96

$$N = \frac{1.96^2 x 0.5(1-0.5)}{0.05^2} = \underline{\underline{384}}$$

According to Jimma University Specialized Hospital there are 655 PLWHA on ART at the hospital, using finite population correction formula i.e.

$$Nf = \frac{n}{1+\frac{n}{N}}$$

Where Nf = sample size for the study
N =the minimum sample size required
N = total population of the study
Nf =384/1+384/655 = 242

Sampling Technique, A systematic random sampling technique was used to select study participants, subjects Unique ART number was used for randomization.

Data Collection: Data Collectors were three Diploma holders in Nursing who was given a three day training & One Senior laboratory technician .Pre-tested questionnaires was used to collect from each study subject on demographic characteristics, risk factors, anthropometric and biochemical measurements such as blood glucose and lipid profile. All physical measurement data (weight, height, waist circumference and blood pressure) was collected by the research team using calibrated equipments. Blood sample for biochemical tests for High Density Lipoprotein Cholesterol (HDL-C), Low Density lipoprotein, total cholesterol, hemoglobin, and bioelectrical impedance analysis was collected and analyzed by qualified laboratory technologists.

Anthropometry measurements: Body weight was measured all three times by a digital scale (Seca, Hamburg, Germany, Model 770) with an accuracy of ± 100 g. Subjects were weighed barefoot in very light clothing. Standing height was measured once without shoes to the nearest 0.5 cm with the use of a stadiometer with the shoulders in relaxed position and arms hanging freely. Body Mass Index (BMI) was calculated by dividing weight (kg) by height squared (m^2). Waist and hip circumferences was measured three times, during study/

Weight was taken using a digital electronic scale. The subjects were asked to remove their footwear and heavy clothes and stand on the center of the scale with the weight evenly distributed between the feet. The subjects were waited until the reading on the scale is stable. Then the weight was measured to the nearest ± 100g. Height was measured using a stadeometer. The subjects were asked to remove their footwear and head gear and then stand up straight on the stadiometer. It was

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ensured that the head, scapula, buttocks and hill touched the measuring board. The rod was kept straight throughout the procedure. The subjects were asked to keep their head up with their eyes focused straight ahead. The headpiece of the stadiometer was be lowered gently until it is firm on top of the head of the participant. The headpiece will pressed gently on to the head to ensure that it is in contact with the head. Height was be measured to the nearest ±1cm.BMI was be calculated by dividing subjects weight in kilograms over the Square of height in meters. MUAC will be measured at the midpoint of upper arm, i.e. between the acromion and olecranon. The midpoint was located after bending the arm to a 90-degree angle at the elbow. During measurement it was ensured that, the upper arm is hanging down the side of the body and is relaxed. MUAC was measured to the nearest ± 0.1.Waist to hip circumference ratio, Waist circumference measured mid way between lower end of rib cage and Anterior superior iliac spine was divided by hip circumference measured At the most lateral prominence of hip joint.

Dietary Survey: Past nutritional intake was assessed using a questioner containing24 hour dietary recall i.e subjects was asked to recall what they consumed in the previous 24 hour and dietary history i.e subjects was asked about their dietary habit. Biochemical Methods Blood sample was taken to determine levels of hemoglobin, albumin, high Density Lipoprotein (HDL), low Density lipoprotein (LDL) and total cholesterol. Bioelectrical impedance analysis (BIA), BIA was done using the machine and interpreted by the machine.CD4+ Count at initiation of HAART and recent CD4+ Count was reviewed from subjects chart. HAART regimen and other drug which is currently being taken are reviewed from subject's chart. Any past or current diagnosis of OI was reviewed from subjects chart.

Data Processing and Analysis: Data entered into EPI data version 3.1 were exported to SPSS (Version20.0)for statistical analysis. A two-sided P value ≤0.05 was considered to indicate statistical significance. Statistical analyses were performed using a computer software package (SPSS for Windows, version 20.0(SPSS, Chicago, IL, USA). Bivariate analyses were done and all covariate variables which had association with the outcome variables at p-value of 0.25 were selected for multivariate analyses. Multivariable logistic models were used to isolate independent predictors of nutritional status.

Data Quality assurance: Data were double entered into EPI data version 3.1,Trained Nurses, Medical Laboratory technicians were involved in the collection of socio-demographic, biochemical and physical characteristics from the individuals. Proper functioning of instruments, laboratory reagents, and technical performance was checked by using quality control samples (serum pool). Standard operating procedures (SOPs) were followed starting from sample collection up to result reporting. All laboratory procedures were handled by laboratory technologists. Before data analysis cleaning was done.

Operational Definitions:

- BMI Classification (WHO, 2008)
  - Normal BMI >18.5 Kg/m^2
  - Moderate – BMI 16-18.5 Kg/m^2
  - Severe- BMI <16 Kg/m^2
- MUAC classification (WHO, 2008)
  - Severe <16 cm
  - Moderate 16-21 cm
  - Normal > 21 cm

Anemia (WHO, 1968)
- Hemoglobin < 12.0mg/dl for Females
- Hemoglobin <13.5mg/dl for males

Waist to Hip Circumference (Risk of atherosclerosis) (Expert Panel on Detection E., 2001)
Male>1 and for Female >0.9
Central obesity: Waist circumference >102 cm (Male), >88 cm (Female)
Dyslipidemia (Increased risk of atherosclerotic vascular diseases (Expert Panel on Detection, E., 2001)
Hypertriglyceridemia: Triglycerides >150 mg/dl
Low HDL cholesterol: <40 mg/dl and <50 mg/dl, respectively for Male and Female
Total cholesterol > 240 mg/dl
High LDL >160 mg/dl

Ethical Consideration: Before stating the research ethical review committee of Jimma University College of Health Sciences approved this research project. A letter of supports was obtained from the college Health Sciences of Jimma University and given to the head of Jimma University Specialized Teaching Hospital. The nature of the study was fully explained to the study participant. After getting permission from the study participant, written consent was obtained from each study participant .Each study participant was informed about the research and reassured that confidentiality of information would maintained during data collection, analyses, interpretation and publication of results.

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RESULT

Socio-Demography Characteristics of Respondents

A total of 242 HIV/AIDS positive clients on HAART responded to the questionnaire making the response rate 100%. Females accounted 171(70.7%), a large proportion 146(60.3%) of the participants were in the age group between 30-44 years with mean age of 36.4 ± 9.8, the majority 120(49.6%) were protestant and 105 (43.4%) were Oromo in ethnicity. A total of 103(42.6%) of the respondents were married. Most were urban dwellers 217(89.7%); and half of the respondents151 (50.7%), have monthly income range 151- 650 ETB (Table 1A and 1B).

Table 1A: Socio-demographic characteristics of the respondents at Jimma University Specialized hospital Jimma town South West Ethiopia, October 2016 (1).

1	**Age group**		
	18-29	52	21.5
	30-44	146	60.3
	≥45	44	18.2
2	**Sex**		
	Male	71	29.3
	Female	171	70.7
3	**Residence**		
	Urban	217	89.7
	Rural	25	10.3
4	**Religion**		
	Muslim	83	34.3
	Orthodox	37	15.3
	Protestant	120	49.6
	Other (Catholic,Wakifeta)	2	0.8%
5	**Ethnicity**		
	Oromo	105	43.4
	Amhara	63	26.0
	Tigre	14	5.8
	Keffa	35	14.5
	Dawiro	20	8.3
	Other(Yem,Guragi,Wolita,)	5	2.1
6.	**Educational Status**		
	Never been to school	47	19.4
	Informal Education	6	2.5
	Formal School	189	78.1

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Table 1B: Socio-demographic characteristics of the respondents at Jimma University Specialized hospital Jimma town South West Ethiopia, October 2016 (2).

S/n	Variable	Frequency	%
7	**Employment**		
	Government employee	64	26.4
	Self employed	107	44.2
	Unemployed	71	29.3
8	**Marital Status**		
	Married	103	42.6
	Single	32	13.2
	Divorced	64	26.4
	Widowed	43	17.8
9	**Monthly income**		
	<150 birr	82	27.9
	150-650 birr	151	50.7
	651-1400	43	14.4
	> 1400	18	6.0

Nutrition and HIV/AIDS related characteristics of the respondents

Clinical stage at start of ART: Regarding the nutrition and HIV/AIDS related characteristics of participants; Majority 97(40%) of the respondents were in clinical stage III followed by stage I which was 69(28.5%) (Figure 1).

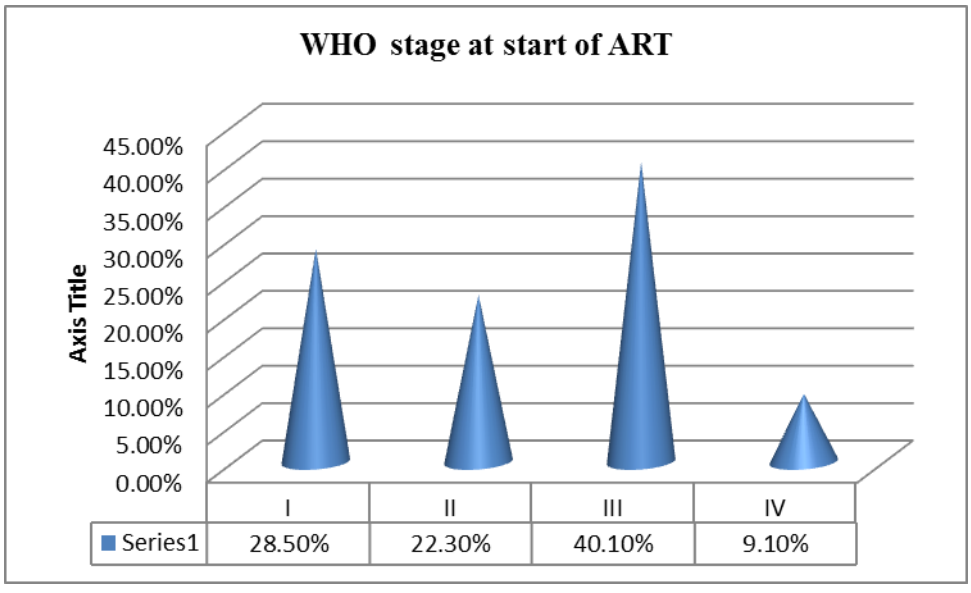

Figure 1: WHO clinical stage at start of ART among HIV positive adults on HAART in Jimma University Specialized Hospital, Jimma town South West Ethiopia, October 2016.

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Substance use: Thirty four (14%) of the respondents had history of substance use. The most widely used substance was Khat 20(8%) followed by alcohol 17(7%) (Figure 2).

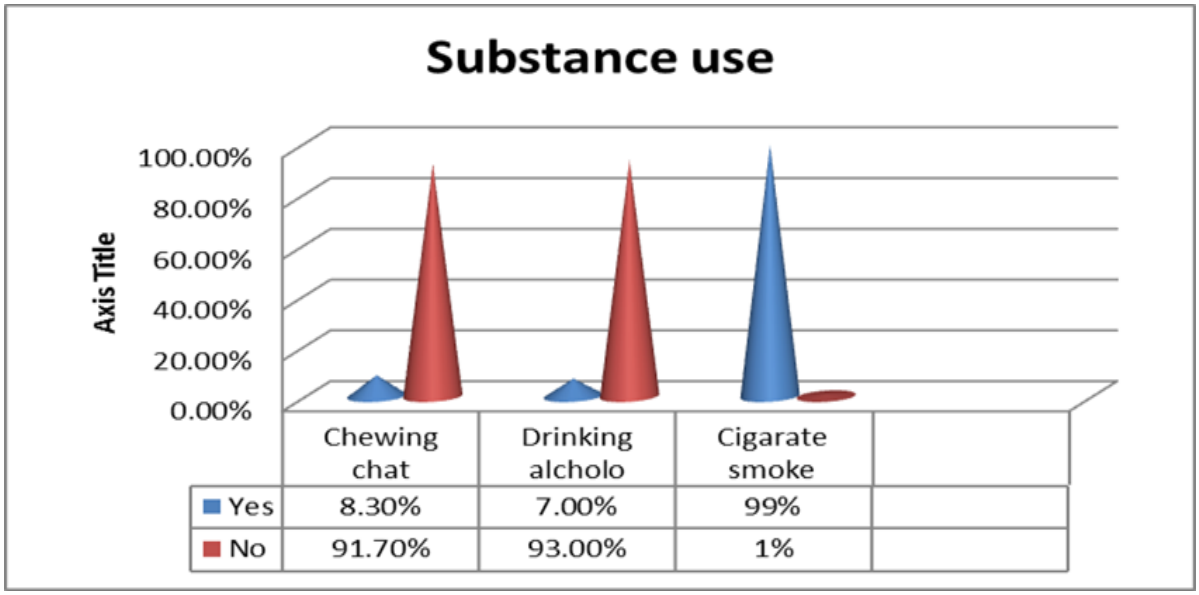

Figure 2: Distribution of substance use among HIV positive adults on HAART in Jimma University Specialized hospital, Jimma town South West Ethiopia, October 2016.

CD4 count of the respondent: One hundred forty five (59.9%), 74(30.6%), 53(21.9%), and 29(12%) had CD4 count less than or equal 200 cells/µL, at zero, six, twelve, twenty four and recent months respectively (figure3) from the start of HAART.

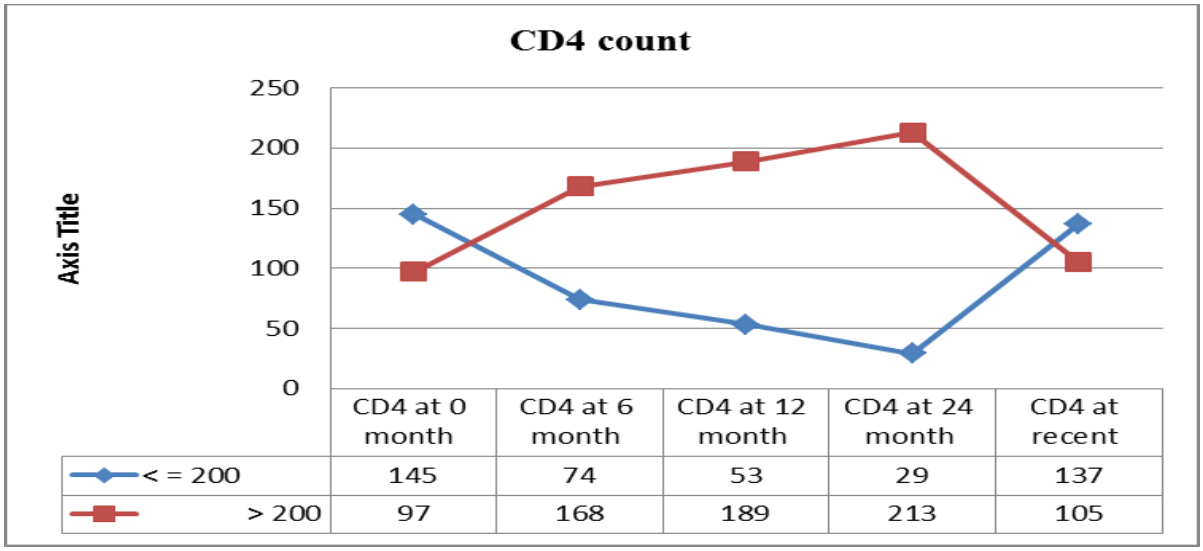

Figure 3: .Trends of CD4 count among HIV positive adults on HAART in Jimma University Specialized Hospital, Jimma town South West Ethiopia, October 2016.

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HAART regimen of the respondents: Majority 236(97.5%) of the respondents were under first line HAART regimen .out of this184(76%) were taking Zidovudine/Lamuvudir/Nevirapine (AZT/3TC/NVP).Only 6(2.5%) respondents were under second line HAART regimen taking Abacavir/Didanosine/ Lopinavir/ Ritonavi (Figure 4).

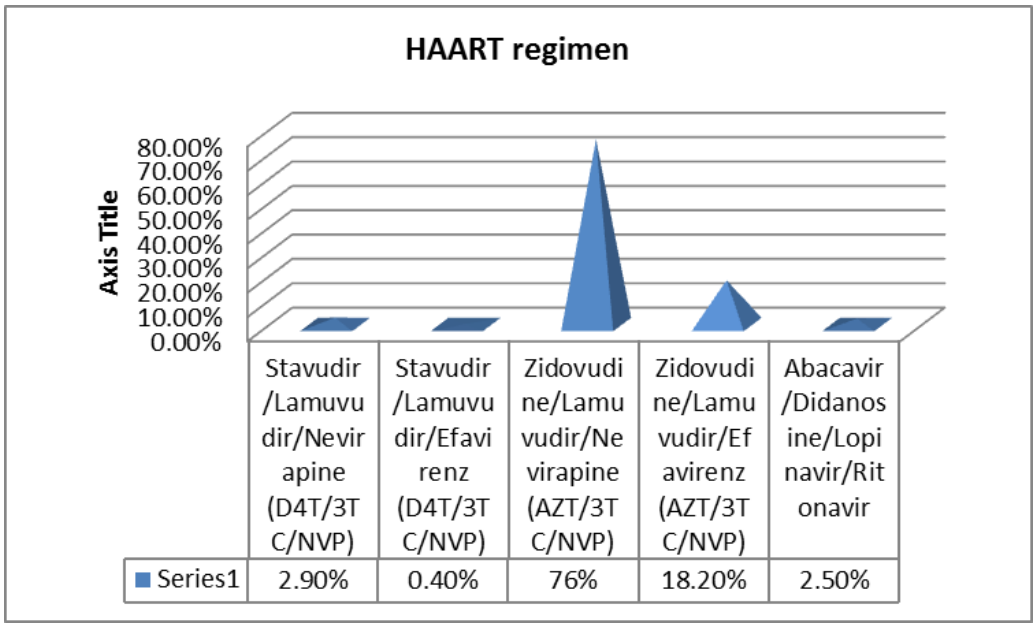

Figure 4: HAART regimen of the respondents among HIV positive adults on HAART in Jimma University Specialized Hospital, Jimma town South West Ethiopia, October 2016.

Nutritional status of the respondents based on BMI: Regarding to respondent's nutritional status, the mean BMI was 17.4kg/m2±2.6, 17.9±2.9, 17.9±3.4, 17.7±3.9 and 18.5±2.7 at zero, six, twelve, twenty four and recent months respectively from the initiation of HAART Chronic energy deficiency (BMI<18.5Kg/m2) was found in 170(70.2%), 150(62%), 144(59.5%),151(62.4%) and 159 (65.7%) of patients at zero, six, twelve, twenty four and recent months respectively(figure 4) since the beginning of HAART (Figure 5).

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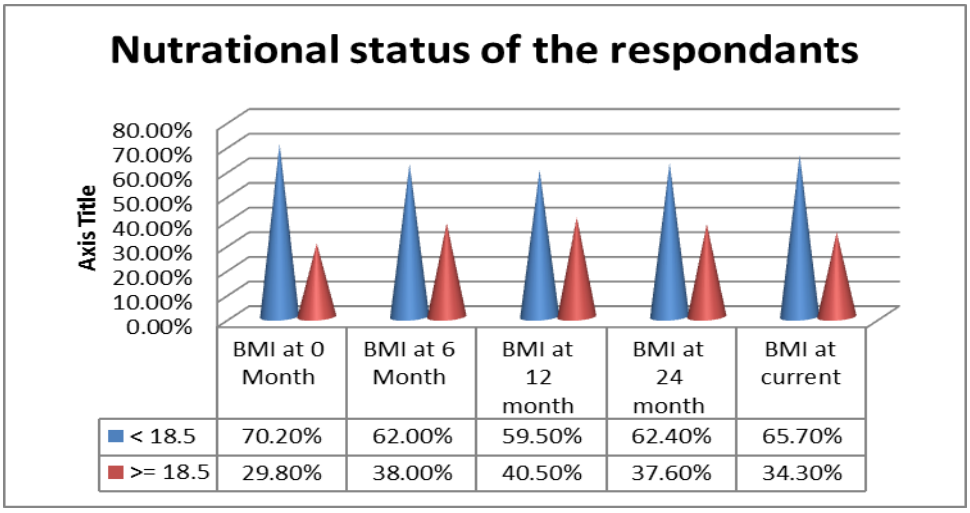

Figure 5: Nutritional status using BMI of HIV positive adults on HAART in Jimma University Specialized Hospital, Jimma town South West Ethiopia, October 2016.

Nutritional status of the respondents based on waist to hip circumference ratio: Almost all 66(93%) the male respondents were normal waist to hip circumference ratio whereas females, 70(40.9%) of females were not (Figure 6).

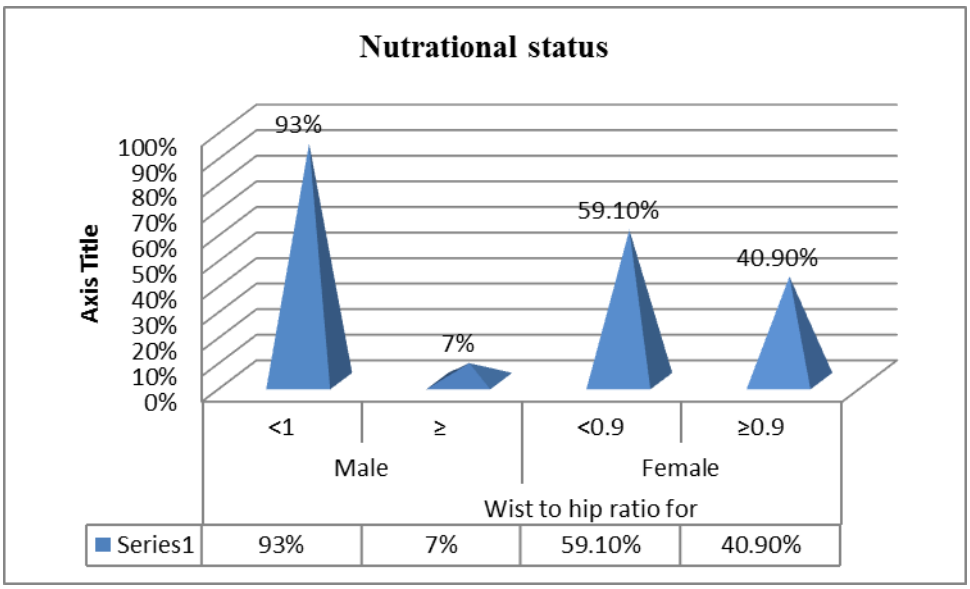

Figure 6: Nutritional status based on waist to hip ratio of the of HIV positive male and female adults on HAART in Jimma University Specialized Hospital, Jimma town South West Ethiopia, October 2016.

Nutritional status of the respondents based on the history of food consumption 24 hours prior to survey: The foods were classified into the following groups: Fats and oils (butter, lard, oil, etc.), milk and milk products (milk, cheese, yogurt, curd, etc.), Protein sources (meat, poultry, fish, chicken, egg, dry bean, nuts, peas, etc.), vegetables (cabbage, kale, green paper, tomato, spinach, etc.),

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fruits (mango, banana, papaya, orange, guava, avocado, etc.) ,Cereal (wheat, teff, rice, etc) and discretionary calories (soft drink, chocolate, candy, sugar, etc.). Nutrient intake focused on diversity and variety of nutrient intake obtained from 24-hour dietary recall (Figure 7).

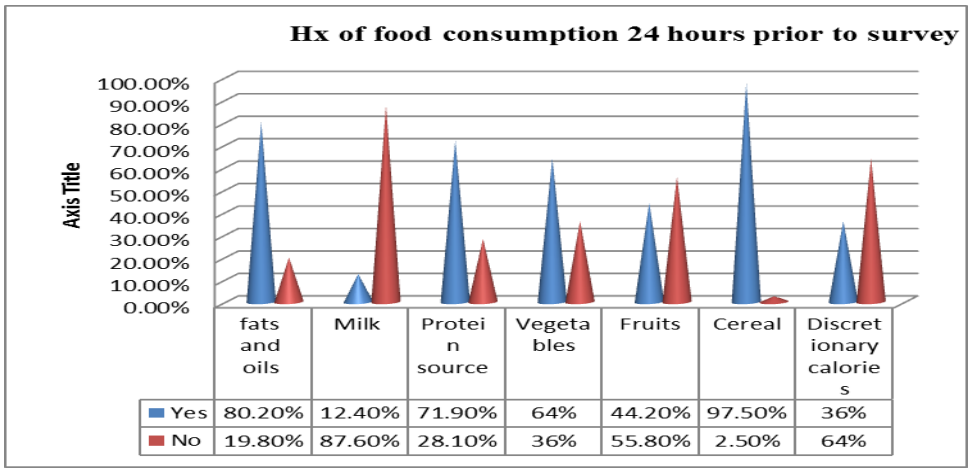

Figure 7: History of food consumption 24 hours before the survey among HIV positive adults on HAART in Jimma University Specialized Hospiatl, Jimma town South West Ethiopia, October 2016.

There were varieties of nutrients consumed from the different food groups. This included 194 (80.2%), 30(12.4%), 174(71.9%), 155(64.0%), 107(44.2%), and 87(36%) were consumed from fats and oils, milk and milk products, protein sources, vegetables, fruits, cereals and discretionary calories respectively. This result suggests that majority of the patients consumed a variety of nutrients from the cereal sources and this may be due to the source being available and affordable compared to the other sources like milk.

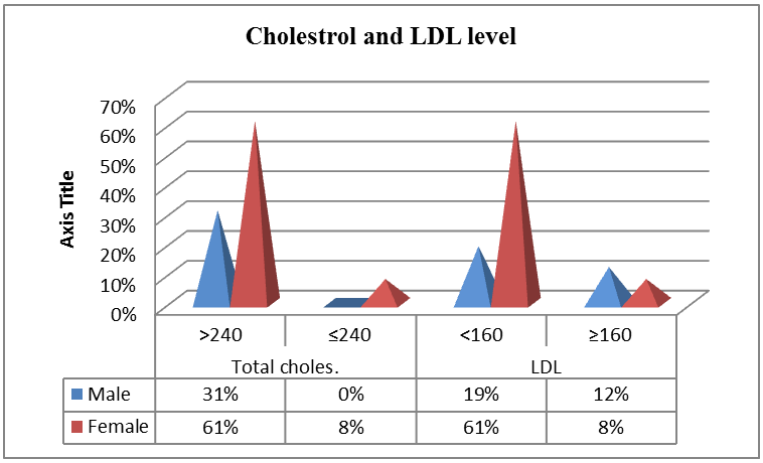

Figure 8: Cholesterol and LDL level of the respondents among HIV positive adults on HAART in Jimma University Specialized Hospital, Jimma town South West Ethiopia, October 2016.

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The biochemical and Bioelectrical impedance analysis of HIV positive adults on HAART in Jimma University Specialized Hospital, Jimma town South West Ethiopia, October 2016 (Tables 2A and 2B; Figure 8) and the association of nutritional status with the selected variables of HIV positive adults on HAART in Jimma University Specialized Hospital, Jimma town South West Ethiopia, October 2016 (Table 3) are shown below.

Table 2A: Biochemical and Bioelectrical impedance analysis of HIV positive adults on HAART in Jimma University Specialized Hospital, Jimma town South West Ethiopia, October 2016 (1)

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S/n	Variable	Frequency	%
1.	Hemoglobin level for men		
	<13.5	2	22
	≥13.5	7	88
2	Hemoglobin for women		
	<12	8	24
	≥12	25	76
3	Total body fat mass in kg for men		
	<4.2	2	22
	4.2-12	6	67
	>12	1	11
4	Fat mass in percent for women		
	<11.4	12	36
	11.4-21.2	15	46
	>21.2	6	18

Table 2B: Biochemical and Bioelectrical impedance analysis of HIV positive adults on HAART in Jimma University Specialized Hospital, Jimma town South West Ethiopia, October 2016 (2).

S/n	Variable	Frequency	%
5	Total body fat in in kg for men		
	<8	2	22
	8-20	6	67
	>20	1	11
6	Total body fat in in kg for women		
	<21	8	24
	21-30	8	24
	>30	17	52
7	HDL for men		
	<40	4	44
	≥40	5	56
8	HDL for women		
	<50	21	64
	≥50	12	36

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Table 3: Association of nutritional status with the selected variables of HIV positive adults on HAART in Jimma University Specialized Hospital, Jimma town South West Ethiopia, October 2016.

Variables	BMI current		Crude OR (95% CI)	Adjusted OR(95%CI)
	>=18.5	<18.5		
Sex				
Male	37	34	3(1.66,5.26) *	0.3(0.15,0.73)**
Female	46	125	1	1
Age				
18-29	23	29	1.4(0.61,3.16)*	0.3(0.10,0.99)
30-44	44	102	0.8(0.37,1.53)	0.8(0.32,2.01)
≥45	16	28	1	1
Marital status				
Married	35	68	0.9(0.14,1.82)	1.9(0.76,5.17)
Single	6	26	0.4(0.13,1.15)*	3.5(0.86,14.91)
Divorced	26	38	1.2(0.52,2.55)	0.9(0.33,2.41)
Widowed	16	27	1	1
Residence				
Urban	75	143	1(0.49,2.56)	0.3(0.13,0.91)
Rural	8	16	1	1
Monthly income				
<150	10	63	0.2(0.05,0.52)*	5.6(1.53,21.67)**
150-650	49	69	0.7(0.25,2.02)	1.3(0.43,4.21)
651-1399	16	19	0.8(0.26,2.75)	1.1(0.29,4.32)
≥1400	8	8	1	1
CD4 count				
≤200	24	113	0.2(0.09,0.29)*	1.3(0.26,6.21)**
>200	59	46	1	1
WHO stage at start of RT				
Stage I	17	52	1.5(0.44,4.95)	0.5(0.13,1.86)
Stage II	21	33	2.9(0.85,9.64)*	0.3(0.07,1.05)**
Stage III	41	56	3.3(1.02,10.47)	0.3(0.09,1.19)
Stage IV	4	18	1	1

DISCUSSION

In this study Nutritional status based on hemoglobin levels for men, 2(22 %%) and for women 8(24%) % of the respondents were found to be anemic. HIV and malnutrition are connected in an intricate way that either one leads to the severe form of the other. In this study the proportion of malnutrition (BMI<18.5Kg/m2), in HIV/AIDS clients who attend ART was 159(65.7%). This was much lower than as we compared to the study done in India (72%) (Sati *et al*., 2004), and greater than study done in Boston (18%) (Uthman, 2008), Bahir Dar (25.5%) (Daniel *et al*., 2013) and in Addis Ababa (18%) (FHAPCO, 2008) and Nekemte (27%) (Kenea *et al*., 2015), in SSA (10.3%) (Mangili *et al*., 2006). The difference may be due tosocio-economical, sample size, socio culture, year of study and awareness creation made regarding HIV and nutrition.

Descriptively, from the total participants, females accounted about 171(70.7%), and from whom 125 (73.1%) were malnourished. Males accounted 71(29.3%), of them 34 (47.9%) were malnourished. From the total malnourished, the proportion of malnutrition was much higher in females. Logistic regression analysis result showed the strong

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association between sex and level of malnutrition where being female was 0.3 times more likely to be malnourished than males, AOR= 0.3, 95%CL (0.15, 0.73).this might be due to cultural related problems .Compared to the other study done in Felege Hiwot Referral Hospital, Bahir Dar, Ethiopia, males are more likely to be malnourished than females (Daniel *et al*., 2013). This might be due to the difference in study area and also may be due to socioeconomically differences.

Treatment of HIV – infected patients with antiretroviral therapy (ART) leads to improvement in CD+4 count and decreased viral load. A study conducted Singapore in 2006 HIV referral hospital on 394 HIV positive adults showed that the prevalence of underweight (BMI< 18.5kg/m2) to be 12% for those who started HAART before 1997 compared to a 30% prevalence in those who started in 1999. The same study showed the prevalence of underweight to be 70% in those having $CD^{+}4$ count less than 50/µl compared with 8% prevalence in those having $CD^{+}4$ count less than 200/µl. The result indicates that the prevalence of malnutrition which has a vicious cycle with HIV is strongly associated CD4+ count which is one indicator of risk of OI's hence survival (Paton *et al* ., 2006).Similarly this study showed that there is a statistically significant difference. Those who have less than or equal to 200 CD4 count were 1.3 times less likely to have normal nutritional status than those who have greater than 200 CD4 count.

The findings of this study indicated that, stage of HIV showed a significant effect on respondent's nutritional status. Among those who were found in the stage II were 0.3 times more likely to have normal nutritional status than those who were in the in the other stage, AOR=0.3,95%CL(0.07,1.05).This study was inconsistent with the study done in Nekemt referral hospital, with no association between nutritional status and the stage of HIV (Kenea *et al* ., 2015). This might be due to the sample size difference and also may be due to life style difference.

LIMITATIONS OF THE STUDY

Not biochemical test and bioelectrical impedance measurements done for all study participants, Use of only 24 hours dietary recall to assess dietary intake may not be reflective of the usual intake of the study subjects due to its inherent limitations.

CONCLUSION

As nutritional status change over time meticulous monitoring of nutritional status of PLWHA is mandatory to improve survival wellbeing & productivity of PLWHA. If both qualitative and quantity study done will be good to identified the associated factors among PLWHA .the government should be give attention for them in order to reduce the consequence associated to the problems .

CONFLICTS OF INTEREST

The authors announce that they have no conflicting interests.

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AUTHOR'S CONTRIBUTIONS

The authors' responsibilities were as follows: MST & SBGdesigned the study. SBG supervised collected and ensured quality of the data. MST & SBG analyzed and interpreted the data. All authors critically reviewed the manuscript. After all authors gave final approval of the paper to be published, MST, the corresponding author did the analysis & drafted the manuscript had the responsibility to submit the manuscript for publication.

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