

# Level of Dietary Diversity and Associated Factors among Adult Patients on HAART at Public Health Facilities of Ambo town, West Shoa Zone Ethiopia

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## ABSTRACT

**Background:** Nutrition and HIV are strongly related to each other, any immune impairment as a result of HIV/AIDS leads to malnutrition, and malnutrition leads to immune impairment. HIV infected patients are at nutritional risk at any time of their illness. In developing countries HIV/AIDS, food insecurity and malnutrition are common. Dietary diversity scores have been positively correlated with increased micronutrient adequacy of diet in adults. Thus this study aims to assess level dietary diversity and associated factors among Adults on HAART at Public Health facilities of Ambo town.

**Methods and Materials:** The study was conducted at Ambo Town, West Shoa Zone Ethiopia. A facility-based cross-sectional study was conducted from January 26-February 26, 2019. A total of 313 study participants were included in the study. Systematic random sampling technique was applied to reach the study subjects. A structured questionnaire which included socio-demographic and health-related factors were prepared based on objectives of the study after reviewing different kinds of literature. Questionnaires on Dietary diversity were adopted from FAO 2010. Data were coded and entered to Epi-data version 3.1 and exported to SPSS version 21 for analyses. Frequency, mean and standard deviations from descriptive statistics and analytic statistics such as bivariate and multivariable logistic regression analysis were computed to determine the effect of various factors on the outcome variable.

**Result:** In this study, 310 HIV positive adults on HAART follow up at Public health facilities of Ambo town were participated in the study making a response rate of 99%. This study shows 71% of adults had low individual dietary diversity score. It was noticed that HIV positive Males were 57% less likely to have low dietary diversity than females (AOR at 95% CI=0.43 (0.21-0.87). Adult patients those who were separated from their husband/wife were about 68% less likely to have low dietary diversity than widowed HIV positive adults (AOR at 95% CI=0.32 (0.11-0.88). Monthly income was also seen to be the factors significantly associated with dietary diversity.

**Conclusion and Recommendation:** This study revealed that about 71% of adult patients on HAART had low dietary diversity score which indicates severe nutrient inadequacy among the study participants. Therefore the town administration, NGO's working on HIV and other stakeholders should work on empowering females and sustainable income generating projects for HIV patients.

**Keywords:** Dietary diversity; Ethiopia; HIV/AIDS

**Acronyms and Abbreviations:** ART: Anti Retro Viral Therapy; BMI: Body Mass Index; EPHI: Ethiopian Public Health Institute; FAO: Food and Agricultural Organization of United Nation; HAART: Highly Active Antiretroviral Therapy; HIV: Human Immunodeficiency Virus; : Individual Dietary Diversity Score; MOH: Ministry of Health;

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PLWHA: People Living with HIV/AIDS; SPSS: Statistical Package for Social Sciences; USAID: United State Agency for International Development; WFP: World Food Program

## INTRODUCTION

HIV prevalence is increasing worldwide because people on antiretroviral therapy are living longer, although new infections decreased from 3.3 million in 2002, to 2.3 million in 2012. Global AIDS-related deaths peaked at 2.3 million in 2005 and decreased to 1.6 million by 2012. An estimated 9.7 million people in low-income and middle-income countries had started antiretroviral therapy by 2012 [1]. Sub-Saharan Africa has been devastated by the HIV/AIDS epidemic. While only 10% of the world's population lives in sub-Saharan Africa, an estimated 70% of all HIV infected adults and children are found here [2]. According to the most recent UNAIDS estimates, 71% of the estimated 2.1 million Adults live with HIV in 2016 lived in just 10 high-burden countries, including nine in Sub-Saharan Africa and India [3]. In Ethiopia, there are over 718,550 people living with HIV, about 1.2% of the total population of the country. In addition, about 34% of young adult's deaths and 632,670 orphanages were due to HIV/AIDS [4,5].

HIV was found to affect nutritional status by increasing energy requirements, reducing food intake, and adversely affecting nutrient absorption and metabolism [6]. Failing to meet nutritional needs may lead to decreased immunity and increased susceptibility to opportunistic infections (OIs), which can lead to further malnutrition [7]. Additionally, nutrient intake can improve antiretroviral absorption and tolerance. Receiving appropriate nutrition can help improve PLHIV's quality of life. Poor nutritional status in PLHIV speeds the disease progression, increases morbidity, and reduces survival time [8].

Dietary diversity is a qualitative measure of food consumption that reflects household access to a wide variety of food and is also a proxy of the nutritional adequacy of an individual's diet [9-11]. The IDDS aims to capture nutritional adequacy and many studies amongst people of different age groups have shown that its increase is related to increased nutrient adequacy of the diet [12]. Dietary diversity scores have been positively correlated with increased mean micronutrient density adequacy of complementary foods and micronutrient adequacy of the diet in adults [13].

Even then there is a complex interaction between dietary diversity/intake, immune function, and HIV/AIDS and malnutrition. Few studies have been conducted regarding this significant public health problem throughout the country. Therefore, the aim of this study was to assess the level of dietary diversity and associated factors among HIV positive adults attending ART clinics at Ambo town Public health facilities, West Shoa Zone, Ethiopia.

## METHODS AND MATERIAL

### Study area and design

The study was conducted in Ambo Town, West Shoa Zone, Oromia regional state, Ethiopia. Ambo town is found at 110 Km to the West direction of Addis Ababa Capital city of Ethiopia. The town covers a total area of 3025 square kilometers and altitude of 2169 meter above sea level, with Woinadega type of climatic condition. There are four public health facilities which provide ART service in the town, namely Award Health Center, Ambo Health Center, Ambo General Hospital, and Ambo University Referral Hospital. During the study period of this work, there were 3006, 215, 54 and 43 ART attendants at Ambo General Hospital, Ambo Health Center, Ambo University Referral Hospital and Award Health Center respectively. The study was conducted from January, 26-February, 26/2019. The institution-based cross-sectional study design was used in this study.

### Study populations and sample size

All adults on HAART at public health facilities of Ambo town are source population. All randomly selected adults on HAART are included in this study. The following assumptions were considered while calculating the sample size. Ninety-five percent confidence level (CI=95%),  $p=28.7\%$  representing the prevalence estimates of adult low dietary diversity on HAART [14], 10% on response rate. Finally, the sample size is calculated using the single population formula.

$$n = \frac{(Z\alpha/2)^2(P)(1-p)}{d^2} = \frac{(1.96)^2(0.287)(1-0.287)}{0.05^2} = 314$$

Hence the estimated population size is less than 10,000 (i.e there were only about 3,318 patients who are attending ART clinics at Ambo Town), using the following correction formula

$$nf = \frac{ni}{1 + ni/N} = \frac{314}{1 + 314/3318} = 284$$

Finally adding 10% nonresponse rate, the final sample size becomes 313.

### Sampling technique and data collection

First study subjects are allocated to each institution proportion to the patient load. Then systematic random sampling technique was applied using a registration card as a frame to select the eligible study subjects. A structured questionnaire which included socio-demographic and health-related factors were prepared based on objectives of the study after reviewing different kinds of literature. Questionnaires on Dietary diversity were adopted from FAO 2010. Finally, the questionnaire was translated into the local language to facilitate the data collection process.

## Measurements of dietary diversity

Individual dietary diversity scores indicate nutrient adequacy. Studies in different age groups have shown that an increase in individual dietary diversity score is related to increased nutrient adequacy of the diet. Dietary diversity scores have been validated for several age-sex groups as proxy measures for macro and micronutrient adequacy of diet [12-16]. Determination of the dietary diversity score of the respondents was completed primarily by listing all food items consumed by respondents (both in and out of home). Based on the Food and Agriculture Organization (FAO,2010) recommendation, foods eaten by the respondents were classified into 9 food groups: Starchy staples, dark leafy green vegetables, other vitamin A rich fruits and vegetables, other fruits and vegetables, organ meat, meat and fish, eggs, legumes, nuts and seeds, milk and dairy products. Participants received 1 point if they consumed at least once during the last 24 hours any of the foods within each subgroup, and 0 points if they never consumed the food. The IDDS was calculated as the sum of food groups consumed over 24 hours. The total individual food scores were first categorized into two categories, where 0-4 were considered low dietary diversity scores and 5 or more food groups were considered high dietary diversity scores.

## Data processing and analysis

Data were coded and entered to Epi-data version 3.1 and exported to SPSS version 21 for analyses. Frequency, mean and standard deviations from descriptive statistics and analytic statistics such as bivariate and multivariable logistic regression analysis were computed to determine the effect of various factors on the outcome variable. Variables having a p-value less than or equal to 0.05 on bivariate logistic regression were the candidate for multivariable logistic regressions. Statistical significance was declared at  $p < 0.05$ . The strength of association between independent and dependent variables was assessed using the adjusted odds ratio with a 95% confidence interval.

## Ethical consideration

Ethical clearance was received from the Ethical Review Committee of the College of Medicine and Health Sciences of Ambo University. Verbal consent was obtained from the study subjects after they had been informed about the objectives and procedures of the study.

## RESULTS

### Socio-demographic characteristics

In this study, 310 HIV positive adults on ART follow up at Public health facilities of Ambo town were participated in the study making a response rate of 99%. Out of these, 201 (64.8%) were females and the mean age of the respondents was 38.32 (SD=  $\pm$  9.937). One hundred sixty-nine (54.5%) participants were Orthodox Christians followers, 173 (55.8%) were married and 133 (42.9%) had completed their primary and secondary

education. A majority of the respondents (77.4%) source of food was obtained from the market by purchasing (Table 1).

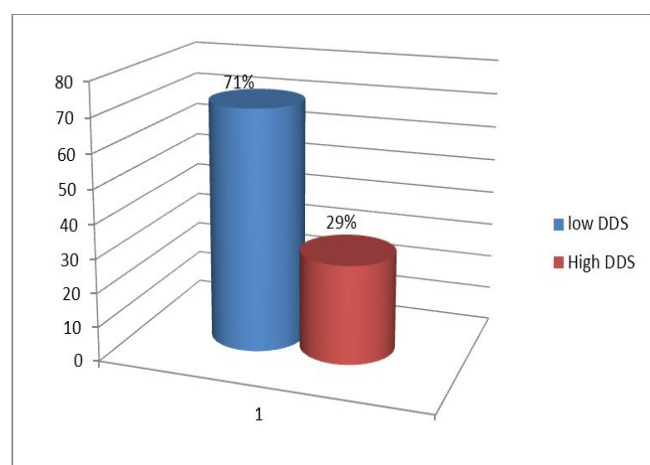
**Table 1:** Socio-economic and demographic factors characteristics of patients on HAART at Public Health Facilities of Ambo town, West Shoa Zone, Ethiopia 2019 (n=310).

Variable	Category	Frequency	Percent %
Sex	Male	109	35.2
	Female	201	64.8
Religion	Orthodox	169	54.5
	Muslim	12	3.9
	Protestant	120	38.7
	Catholic	3	1.0
	Wakefata	6	1.9
Family size	<5 people	200	64.5
	$\geq$ 5 people	110	35.5
Educational status	Not read and write	96	31
	read and write only	66	21.3
	1o and 2o education	133	42.9
	College/University	15	4.8
Occupation	Unemployed	81	26.1
	Government employed	34	11
	Merchant	62	20
	Student	20	6.5
	Farmer	57	18.4
	Daily laborer	56	18.1
Marital status	Married	173	55.8
	Divorced	60	19.4
	Single	30	9.7
	widowed	47	15.2
Owner of living house	Rent	141	45.5
	Private	169	54.5

Current residence	Urban	235	75.8
	Rural	75	24.2
Smoke cigarettes	Yes	3	1
	No	307	99
Use of alcohol	Yes	13	4.2
	No	297	95.8
Have a home garden	Yes	50	16.1
	No	260	83.9
Time to go market	<=30 minute	210	67.7
	>30minute	100	32.3
Who decides to buy food for the family	Husband	100	32.3
	wife	193	62.3
	First son	8	2.6
	Another family member	9	2.9

### Measurements of dietary diversity of the study participants

This study revealed that majorities, 220 (71%), of the patients on HAART who were included in our study had low dietary diversity score (Figure 1). Most of them, 307 (99%) consume starchy staples foods made of grains, roots, and tubers. Organ meats were the least 41 (13.2%) consumed food by the study subjects (Table 2).



**Figure 1:** Dietary diversity score of patients on HAART at Public Health Facilities of Ambo town, West Shoa Zone, Ethiopia 2019 (n=310).

**Table 2:** Food groups consumed by patients on HAART at Public Health Facilities of Ambo town, West Shoa Zone, Ethiopia 2019 (n=310).

Food groups	Frequency (yes)	Percent %
Starchy staples	307	99.0
Legumes, nuts, and seeds	199	64.2
Organ meats	41	13.2
Milk and dairy products	56	18.1
Meat, and fish	59	19.0
Eggs	80	25.8
Dark leafy green vegetables	175	56.5
Another vitamin A rich fruits and vegetables	66	21.3
Other fruits and vegetables	188	60.64

### Health-related characteristics of the study subjects

Majorities, 299 (96.4%), of the study participants, were categorized under the WHO clinical stage I, where 226 (72.9%) of them had CD4 count greater than 350 mg/dl. In addition, about 25 (8.1%) of the study participants have reported opportunistic infection like diarrhea, oral trash, and pulmonary tuberculosis. Finally about 73 (23.5%), 25 (8%), and 2 (0.6%) were underweight, overweight and obese respectively (Table 3).

**Table 3:** Health-related Characteristics of patients on HAART at Public Health Facilities of Ambo town, West Shoa Zone, Ethiopia 2019 (n=310).

Health related characteristics	Category	Frequency	Percent %
WHO clinical Stage	Stage I	299	96.5
	Stage II	7	2.3
	Stage III	3	1
	Stage IV	1	0.3
CD4 Count	<200 cells/microlitre	21	6.8
	200-350 cells/microlitre	63	20.3
	>350	226	72.9
BMI	<18.5 kg/m <sup>2</sup>	73	23.5
	18.5-24.9 kg/m <sup>2</sup>	210	67.7
	25-29.9 kg/m <sup>2</sup>	24	7.7

	>30 kg/m <sup>2</sup>	3	1
Opportunistic infection	Yes	25	8.1
	No	285	91.9
Types of opportunistic infection	Tuberculosis	5	1.6
	Diarrhea	7	2.3
	Trash (genital and oral)	5	1.6
	Zoster	8	2.6

### Factors associated with dietary diversity of the study subjects

Multivariate analysis of this study revealed that Sex (Gender), marital status and Monthly income were significantly associated with Dietary diversity of patients on HAART. It was noticed that HIV positive Males were 57% less likely to have low dietary diversity than females (AOR=0.43) (0.21-0.87). Adults those who were separated from their husband/wife were about 68% less likely to have low dietary diversity than widowed HIV positive adults (AOR=0.32 (0.11-0.88)). Furthermore, Monthly income was also seen to be the factors significantly associated with dietary diversity. Those who earn a monthly income of <1371.13 Ethiopian birrs were 1.87 times more likely to have low dietary diversity than those who earn  $\geq$  1371.13 Ethiopian birrs (AOR=1.87 (1.02- 3.44) (Table 4).

**Table 4:** Factors associated with Dietary Diversity of patients on HAART at Public Health Facilities of Ambo town, West Shoa Zone, Ethiopia 2019 (n=310).

Variables		Frequency (%)	Non-Optimum DDS	Optimum DDS	Crude OR (95% CI)	Adjusted OR (95% CI)
Sex	Male	109 (35.2)	80	29	0.83 (0.49-1.4)*	0.43 (0.21-0.87)**
	Female	201 (64.8)	140	61	1	1
Family size	<5	200 (64.5)	137	63	0.7 (0.41-1.19)	1.27 (0.67-2.4)
	$\geq$ 5	110 (35.5)	83	27	1	1
Monthly income	<1371.13 (mean)	166 (53.5)	132	34	2.47 (1.49-4.09)*	1.87 (1.02-3.44)**
	$\geq$ 1371.13 (mean)	144 (46.5)	88	56	1	1
Current residence	Urban	235 (75.8)	160	75	1.87 (1.00-3.51)*	1.35 (0.57-3.19)
	Rural	75 (24.2)	60	15	1	1
Educational status	Not read and write	96 (31.0)	86	10	1	1
	Read and write	66 (21.3)	49	17	2.98 (1.26-7.02)*	3.7 (1.44-9.59)
	Primary school	132 (42.9)	80	53	5.69 (2.7-11.96)*	7.65 (3.1-18.8)
	Collage/university	15 (4.8)	5	10	17.2 (4.89-60.48)*	22.5 (4.4-115)
Marital status	Married	173 (55.8)	131	42	0.62 (0.31-1.24)*	0.43 (0.18-1.01)
	Separated	60 (19.4)	44	16	0.7 (0.3-1.61)*	0.32 (0.11-0.88)
	Single	30 (9.7)	14	16	2.21 (0.86-5.65)*	0.89 (0.23-3.35)
	widowed	47 (15.2)	31	16	1	1
Owner of house	Rent	111 (18.8)	106	35	1	1
	Self	284 (48.1)	114	55	0.68 (0.41-1.12)*	1.63 (0.85-3.11)
Drink alcohol	Yes	13 (4.2)	9	4	1.09 (0.32-3.63)*	1.01 (0.52-4.32)
	No	297 (95.8)	211	86	1	1

Have a home garden	Yes	50 (16.1)	32	18	1.46 (0.77-2.78)*	1.3 (0.57-3.19)
	No	260 (83.9)	188	72	1	1
CD4 count	<200	21 (6.8)	19	2	1	1
	200-350	63 (20.3)	41	22	0.255 (0.32-3.63)*	3.77 (0.7-20.3)
	>350	226 (72.9)	160	66	1.3 (0.72 -2.35)	2.53 (0.50-2.8)
Opportunistic infection	Yes	25 (8.1)	17	8	1.16 (0.48-2.8)*	1.97 (0.65-5.93)
	No	285 (91.9)	203	82	1	1
BMI	<18.5	75 (24.2)	49	26	1	1
	18.5-24.9	204 (65.8)	151	53	0.66 (0.37-1.16)*	0.73 (0.36-1.48)
	>=25	31 (10)	20	11	1.03 (0.43-2.48)	(0.39-3.08)

\*: p-value<0.3; \*\*: p-value<0.05

## DISCUSSION

The analysis of this study found that majorities, 220 (71%) of the respondents had low dietary diversity score. This finding reported higher prevalence of low dietary diversity score than previous studies conducted in Ethiopia at Dilchora Hospital and Hiwot Fana Hospital with 28.7%, Metema Hospital with 58.8%, Butajira Hospital with 38.8% and Jimma University Specialized Hospital with 55.8%, of the study subjects having low level of dietary diversity score [14,17-19]. Similarly, this finding is also higher than studies conducted in other African countries like Uganda and Rwanda with 59% and 43%, of study participants having low dietary diversity score respectively [20,21]. This indicates the high level of nutrient inadequacy of foods consumed over a given period of time by study subjects in the study area. The variation of the report can be explained by the fact that socio-demographic and agricultural factors differences in the study areas. West Shoa Zone (i.e study area) was among areas identified by FAO as a food deficit zone as well as reported to be an area which has weak cereal and crop marketing chain [22,23].

The result of this study revealed that the most predominantly consumed food groups by the study participants were starchy staples. About 307 (99%) of the respondents have consumed foods made of grains, roots, and tubers (starchy staples). This finding is similar to previous studies conducted in the country (Ethiopia) [18,19,24]. However, organ meats were the least consumed food groups among the study participants in the study area. Only 41 (13.2%) of the study participants have reported consumption of organ meats in the last 24 hour prior to data collection. This may be due to unavailability of organ meats and economical problem, as organ meats are more expensive than starchy staples found in the study area.

In this study, a significant association was observed between sex (gender) and dietary diversity score. Males were 57% less likely to have low dietary diversity than females (AOR=0.43

(0.21-0.87)). This result is in line with known facts that females have more difficulty than men in accessing resources including land, credit, and agricultural commodities reported somewhere else [25,26]. It may be explained further by; females were less likely to be employed and unable to decide in households and therefore couldn't get access to foods that meet their needs.

Monthly income was also other predictors of dietary diversity among the study participants. Those who earn a monthly income of <1371.13 Ethiopian birrs were 1.87 times more likely to have low dietary diversity than those who earn  $\geq$  1371.13 Ethiopian birrs (AOR=1.87 (1.02- 3.44)). This result is similar to studies conducted at Butajira and Jimma Hospital [17,19]. The reason might be when the income level of an individual decrease the ability to buy sufficient and diversified food will decrease, and then it leads to poor nutrient adequacy of the diet of an individual.

A significant association was also seen between marital status and dietary diversity score. Adults those who were separated from their husband/wife were about 68% less likely to have low dietary diversity than widowed HIV positive adults (AOR=0.32 (0.11-0.88)). This is because due to separation, the number of independents in the household may decrease and therefore when the number of independents in the households decreases there may be access to sufficient diversified diet among the remaining family members as explained somewhere else [20].

## CONCLUSION AND RECOMMENDATION

This study revealed that about 71% of adults on HAART had low dietary diversity score which indicates severe nutrient inadequacy among the participants. Sex, marital status, and monthly income were among factors associated with dietary diversity score. Therefore the town administration, NGO's working on HIV and other stakeholders should work on empowering females and sustainable income generating projects for HIV patients.



## FUNDING STATEMENT

There was no funding source for this study.

## AUTHORS' CONTRIBUTION

KT: Conceptualized the paper, searched literature, trained field researchers for data collection and wrote the results and discussion sections; TT, ET and DA: Contributed to the design of the study and provided advice regarding methods, data interpretation and analysis; KT: Also has critically reviewed the result and prepared the manuscript for publication; Finally all authors have proofread the final manuscript.

## COMPETING INTERESTS

The authors declare that they have no competing interests.

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