

# Food Insecurity and Associated Factors Among Adult HIV Patients on Anti-Retroviral Therapy in Dessie Referral Hospital, South Wollo Zone, North Central Ethiopia

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## Research Article

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# Abstract

## Background

Food insecurity has a paramount negative impact on the overall nutritional and health status of people living with the human immune deficiency virus, hence leading to opportunistic infections, rapid disease progression, hospitalizations, poor treatment outcomes, and mortality. Both are intertwined and worsen one another in a vicious cycle through a mixture of nutritional, mental health, and behavioral pathways that heighten vulnerability to, and worsen the severity of, each condition. Nevertheless, little is known about the magnitude of food insecurity and associated factors among adults on antiretroviral therapy in sub-Saharan Africa countries including the current study area.

## Objectives

To assess the magnitude of food insecurity and associated factors among Adults on Antiretroviral Treatment in Dessie referral hospital South Wollo Zone, Northcentral Ethiopia

## Methods and Materials:

An institution-based cross-sectional study was conducted among 420 randomly selected adults living with HIV/AIDS receiving ART in Dessie referral hospital. Data was entered into Epi-data version 3.1 and exported to STATA version 16.0 for cleaning and analysis. Bivariate and multivariate binary logistic regression analysis was carried out to identify factors associated with the outcome variable. Odds ratio along with 95% confidence interval was estimated to measure the strength of the association and the level of statistical significance was declared at a p-value less than 0.05

## Results

The magnitude of food insecurity among adults on ART was 62.4% (95% CI: 57.6, 66.8). CD4 count <350 [AOR=3.51, 95% CI: 1.88, 6.52], average monthly household income  $\leq$  40 USD [AOR= 2.34, 95% CI: 1.42, 3.84], WHO clinical stage III&IV [AOR=2.85, 95% CI: 1.61, 5.04], not getting any support [AOR= 3.04, 95% CI: 1.45, 6.38] were factors significantly associated with food insecurity.

## Conclusion

Around two-thirds of the adult people living with HIV on ART at Dessie referral Hospital were experiencing food insecurity. Thus, social protection interventions targeting patients with CD4 <350, income less than 40 USD/month, WHO clinical stage III &IV, and those patients with no support are crucial interventions for food security.

# Introduction

The World Food Summit in 1996 defined food security as the status where “all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life” [1]. Food insecurity refers to the unavailability, inability to access, and inability to utilize safe and quality food which is nutritionally adequate and socially acceptable ways [1–3]. Globally it is estimated that over two billion peoples experienced food insecurity in both resource-rich and resource-poor settings. [2–4].

Starting from the discovery to know days Human Immune virus/Acquired Immunodeficiency syndromes (HIV/AIDS) is global public health problem that deteriorate household food insecurity by targeting the most productive and economic age group of the society by reducing work capacity and productivity. Evidence indicates that HIV infection itself weakens food security, compromises nutritional status and small weight loss are associated with decreased survival rates among people living with HIV due to reduced food intake, poor absorption of nutrients, and changes in the way the body uses nutrients it receives or has stored [5–9].

Food insecurity remains highly prevalent and has increasingly been recognized as a serious public health problem in developing countries [7]. The synergistic effect of both HIV infection and food insecurity harms the overall nutritional and health status of people living with HIV/AIDS leads to poor adherence to ART and upsurge transmission of HIV by increasing viral load and decreasing number CD<sub>4</sub> count of patients hence leading to increased HIV-related opportunistic infections, poor clinical outcome, increased hospitalizations finally leads for mortality [5–6].

Food insecurity on HIV/AIDS patients leads for both macronutrient and micronutrient deficiencies this will reduce immunity, increase in morbidity, increase drug abuse, accelerated HIV transmission, incomplete viral load suppression, increases probability of AIDS-defining illness and finally leads for mortality among HIV-infected persons. A community having a high HIV prevalence may face low production of food, increased cost of health care service and increased cost of labor the cumulative effect affects the society and the country as well. [6–7, 10–12]. Little is known regarding the magnitude of food insecurity and associated factors among adult’s people living with HIV on ART in resource-limited settings like the study area. Therefore, this study aims to assess the magnitude of food insecurity and associated factors among people living with HIV in Dessie referral hospital in the north-central of Ethiopia.

## Methods

### Study design and setting

The study was conducted from June 25 – July 25, 2021, in Dessie Referral Hospital, South Wollo Zone, North Central Ethiopia. Dessie is 500 km far from Bahir Dar, the capital of Amhara National Regional State, and 401km from Addis Ababa, the capital of Ethiopia. The city is found at a latitude and longitude of 11°8'N 39°38'E, with an elevation between 2,470 and 2,550 meters above sea level.. The town has 5

health centers, 1 primary hospital, and 1 referral hospital. Dessie referral hospital has 28 health professionals working in the ART unit. Currently, a total of 6303 patients were actively attending the ART clinic at Dessie referral hospital, and 4870 of whom were adults above 18 years of age.

## **Study design and population**

An institutional-based quantitative cross-sectional study design was conducted among adults aged 18 years and above and attending anti-retroviral therapy (ART) at Dessie referral Hospital South Wollo Zone. Participants with severe illness, mentally sick, pregnant and lactating mothers, and those with incomplete patient files were excluded from the study.

## **Sampling techniques and sample size determination**

The maximum sample size of 420 was obtained considering the assumption for double population proportion formula (39.2 proportion of rural residents with food insecurity based on the study conducted in Kembata Tembaro Zone, Southern Ethiopia, [13]. an adjusted odds ratio of 1.3, 1:1 exposed to non-exposed ratio, 95% confidence interval, 80% study power, 5% margin of error, and 10% non-response rate) using Open Epi version 2.3.

A systematic random sampling technique was used to select the study participants. Accordingly, a serial of 12 intervals (4870 adult patients attending ART /420 sample size) was included using the patient registration number as a sampling frame. The first respondent was selected by the lottery method.

## **Data collection tools and methods**

The standard tool, Household Food Insecurity Access Scale (HFIAS) developed by Food and Nutrition Technical Assistant (FANTA) and United Nations Program on HIV/AIDS was used to collect data on the level of food insecurity. The tool has nine questions asking about three domains of food insecurity: feeling the uncertainty of food supply, insufficient quality of food, and insufficient food intake and its physical consequences [14]. Data on socio-demographic variables and clinical characteristics of the participants were collected by using structured and pretested questionnaires developed by reviewing different works of literature. Information regarding socio-demographic characteristics and food insecurity was collected using face-to-face interview techniques and data on the clinical characteristics of the participants were collected from the patient medical files. Anthropometric data were collected using a calibrated weight scale and a non-stretchable tap-meter following standard operative procedure

## **Measurement**

Individuals were labeled to be food insecure if they answer "Yes" to all affirmative household food access scale of occurrence questions measured in terms of 9 items for at least four weeks (4) duration. This can be labeled as mild, moderate, and severe food insecurity tertian classification methods. When all respondents responded rarely (1) for frequency questions with a value interval between 1-9 inclusively. When all respondents responded sometimes (2) for frequency questions with a value interval between 10-

18 inclusively. When all respondents responded often (3) for frequency questions with a value of 27 ( $3 \times 27 = 27$ ) [14].

Dietary diversity is measured based on the number of reported different foods and food groups consumed in a household over 24 hours. This does not include food groups consumed outside the home. It is classified as adequate if the value is above the mean score and inadequate if it is below the mean score value depending on FANTA/FAO recommendations [15].

Body mass index was used to classify nutritional status: BMI < 18.5, underweight; BMI 18.5–24.9, normal; and BMI  $\geq 25$ , overweight and obese [16].

## **Data quality control**

The tool was adapted and modified into our context from previous different literatures and guidelines [14, 15, 16]. A three days intensive training was given for the data collectors and the supervisors by the principal investigator on the objective of the study, proper filling of the data collection tool and ways of approach during interviewing respondents. Before actual data collection pretest was done 5% of sample size at Kombolcha district hospital. The supervisors and the research team have checked the data for completeness and logical consistency on an ongoing basis.

## **Data processing and analysis**

All filled questioners were checked for completeness and consistency and double data entry will be done using the Epidata version.3.1 software. Then the data was exported to the STATA version 16.0 for cleaning and analysis. A descriptive analysis, frequency distribution, measure of central tendency, and measure of dispersion were used to describe the variables. Bivariate and multivariate binary logistic regression analysis was done to see the association between a dependent variable and explanatory variables. Accordingly, variables with a p-value of less than 0.25 during bivariate binary logistic regression analysis were entered into a multivariate binary logistic regression model to control for all possible confounders. All the assumption of logistic regression (model adequacy and multicollinearity of the independent variable) was checked using appropriate methods. The absence of multi-collinearity was checked by using standard error < 2. Model adequacy was checked by using the Hosmer and Lemeshow goodness of fit test having a P-value > 0.05. Odds ratios along with a 95% confidence interval were estimated to measure the strength of the association. The level of statistical significance was declared at a P-value less than 0.05.

## **Ethical considerations**

The study protocol was approved by the Haramaya University, College of Health and Medical Sciences Institutional Health Research Ethics Review Committee with reference no of IHRERC/180/2021. The permission and agreement consent was obtained from the Amhara Regional Health Bureau and Dessie referral hospital before the study. Informed, Voluntary written and signed consent was obtained from each study participant after informing the objective, confidentiality, right to withdrawal, benefit, and risks

of the study. The full right and confidentiality of the participants were well maintained. All methods were carried out in accordance with 'Declaration of Helsinki.

## Result

### Socio-Demographic characteristics

Out of 420 study participants, 407 have participated in the study making a response rate of 96.9%. More than three-fourth, 61.9% of the study participants were females and the mean ( $\pm$  SD) age of the participants was 35.21 ( $\pm$  8.78). More than two-thirds 70% of the participants were married and 63.9% were rural residents. Around 92.6% of respondents' families had less than five family sizes with a mean ( $\pm$ SD) family size were 3.6 ( $\pm$ 1.3). The majority, 75.9% of the participants was Muslim by religion and 98.3% were Amhara ethnic group. Around two-fifth, 42% of the participants were farmers and 40.8% were illiterate (unable to write and read). The mean ( $\pm$ SD) income of the study participants was 1385( $\pm$ 1177) ETB (55.4  $\pm$ 47.08 USD). (Table 1)

Table 1

Socio-demographic characteristics of adult people living with HIV on ART in Dessie referral hospital of south Wollo Zone, north-central Ethiopia 2021.

<b>Variables</b>		<b>Frequency</b>	<b>Percent</b>
Sex	Male	155	38.1
	Female	252	61.9
Age in years	18-25	59	14.5
	26-35	163	40
	36-44	111	27.3
	≥45	74	18.2
Residence	Urban	147	36.1
	Rural	260	63.9
Marital status	Single	58	14.3
	Married	285	70
	Divorced	32	7.9
	Widowed	32	7.9
Number of family members	≤ 5	377	92.6
	> 5	30	7.4
Educational status	Illiterate, unable to read and write	166	40.8
	Illiterate, able to read and write	68	16.7
	Primary (1-8)	80	19.7
	High school (9-12)	63	15.5
	Collage and above	29	7.1
Ethnicity	Amhara	400	98.3
	Tigrai	7	1.7
Religion	Protestant	17	4.2
	Orthodox	81	19.9
	Muslim	309	75.9

Variables		Frequency	Percent
Occupational status	Farmer	171	42.0
	Merchant	31	7.6
	Government employer	25	6.1
	House wife	66	16.2
	Daily labor	98	24.1
	Student	16	3.9
Head of household	Male	228	56
	Female	179	44
Living condition	Alone	60	14.7
	With parents	182	44.7
	With relatives	22	5.4
	With spouse	143	35.1
Average monthly income	≤ 40 USD	238	58.5
	>40 USD	169	41.5

## Nutritional characteristics

Among the total study participants, 19.66% had a BMI of < 18.5 kg/m<sup>2</sup> (underweight), 71.99% were in the normal range, and 8.35% have BMI ≥25 kg/m<sup>2</sup> (Overweight). One-third, 33.2% of the participants had actual daily meal patterns less than 3 times per day which is below the daily recommended meal frequency for PLHIV on ART. Dietary diversity score was assessed using 9 food items dietary diversity scale in the study group. Accordingly, 51.6% of the study participants have inadequate dietary diversity scores (Table2)

Table 2  
Health-related and immunological profiles of ART patients in Dessie referral Hospital of South Wollo  
Zone, North-central Ethiopia, June25-July25, 2021.

Variables	Category	Frequency	Percentage	
CD4+ T cell count	<350	251	61.7	
	350-500	68	16.7	
	>500	88	21.6	
WHO clinical stage	Stage I& II	315	77.2	
	Stage III&IV	92	22.5	
Duration on ART	<12 months	39	9.6	
	≥12 months	368	90.4	
ART regimens	1J(TDF+3TC+DTG)	311	76.4	
	1E(TDF+3TC+EFV)	81	19.9	
	2H(TDF+3TC+ATV/r)	15	3.7	
Developing OIs in the past six months	No	249	61.2	
	Yes	Disease	158	38.8
		TB	17	17.9
		Pneumonia	110	69.6
		Oral thrush	10	10.5
		Zoster	3	3.2
		Diarrhea	36	37.9
Any support from governmental or non-governmental organization	No	352	86.5	
	Yes Support	Money	28	60
		Food	16	29
		Loan	36	65
		Equipment	4	7
		Other		
Other person living with HIV on ART in the family	No	178	43.7	
	Yes	Persons	229	56.3
		Spouse	191	83.4

Variables	Category	Frequency	Percentage
	Child	36	15.7
	Parents	26	11.4
	Other relatives	3	1.3
Functional status	Working	377	92.6
	Ambulatory	30	7.4

## Clinical characteristics

The mean ( $\pm$  SD) CD4 T-Lymphocyte cell count of the study participants was 476.50 ( $\pm$ 235.33). More than one-fifth, 21.6% of the participants have a CD4 count  $>$ 500 cells/mm<sup>3</sup>. The majority of the study participants, 86% were in WHO clinical stage I&II and 77.2% were on a 1J (TDF+3TC+DTG) treatment regimen. Among the total participants, 56.3% of participants have HIV-positive family members with a spouse the most reported HIV-positive family members. The mean duration of participants on ART was 90.43 ( $\pm$ 48.97) months. Most of the respondents, 92.86% had working functional status and the ability to perform usual work inside or outside the home. Around two-fifths of the participants had an opportunistic infection/s of any kind in the last six months and the most reported opportunistic infection was pneumonia. The majority of respondents 86.5% did not have any support from governmental or non-governmental organizations (Table 1).

## Nutritional status of adults on ART

Among the study participants, 19.7% had BMI  $<$  18.5 (underweight), and 72% were in the normal range. Among the respondents, 33.2% reported their actual daily meal pattern to be less than 3 times which is below the daily recommended meal frequency for PLHIV on ART. Among study participant's 44.2%, 30%, and 57.7% escape breakfast, lunch, and dinner respectively. Dietary diversity score was assessed using 9 food items dietary diversity scale in the study group. Almost half, 51.6% of the study participants have inadequate dietary diversity. Other vitamin-rich fruits and vegetables were consumed by 82.4% of respondents. The primary source food for 57.7% of the respondents was own production.

## Health-related and immunologic factors among adults on ART

The median CD4 T-Lymphocyte cell count of the participants was 428 with the range of 1307. Almost one-fifth, 21.6% of the participants were with CD4 count  $>$ 500. The majority of the study participants, 86% were in WHO clinical stage I&II and 77.2% were on a 1J (TDF+3TC+DTG) treatment regimen. Among the

total participants, 56.3% of participants have HIV-positive family members and spouses were the most reported HIV-positive family members. The median duration of participants on ART was 84 months with a minimum of 3 months and a maximum of 204 months and a range of 201. Most of the respondents, 92.86% had working functional status and the ability to perform usual work inside or outside the home. Around two-fifths of the participants had an opportunistic infection/s of any kind in the last six months and the most reported opportunistic infection was pneumonia. The majority of respondents 86.5% did not have any support from governmental or non-governmental organizations. (Table 2)

## **The magnitude of food insecurity among adults on ART**

The overall magnitude of food insecurity in this study was 62.4% (95% CI: 57.6, 66.8]. Of which 74(18.1%), 95% CI: (16.7-20.8) were mildly food insecure 96 (23.5%), 95% CI: (21.1-25.2) were moderately food insecure 83 (20.4%), 95% CI: (18.3-22.7) were severely food insecure and 158(37.6.4%) 95% CI: (30.5-40.8) were food secured.

## **Factors associated with food insecurity among Adults on ART**

All variables with a P-value of  $\leq 0.25$  in bivariate analysis were included in the multivariate regression model. In multivariate analysis, CD4count <350, being WHO stage III&IV, absence of any support, and Low average monthly income were factors associated with food insecurity among adults attending ART. Participants with CD4 count <350 were 3.51 times more likely to have food insecurity than those with CD4 count  $\geq 350$  [AOR = 3.51, 95% CI (1.88-6.52)]. Participants with the average monthly household income of  $\leq 1000$  ETB were 2.34 times more likely to be food insecure than those with an income >1000ETB [AOR: 2.34, 95%CI (1.42-3.84)]. Those with advanced WHO clinical stage (III&IV) were 2.85 times more likely to have food insecurity than stage I&II participants [AOR=2.85, 95% CI (1.61-5.04)]. Those participants who did not get any support were 3.04 times more likely food insecure than those who get support [AOR: 3.04, 95% CI (1.45-6.38)] (Table 3).

Table 3

Multivariable logistic regression Analysis of factors associated with food insecurity in Dessie Referral Hospital of South Wollo Zone, North-central Ethiopia 2020

Variables	Category	Food security status		COR (95%CI)	AOR (95%CI)
		Insecure	Secure		
Sex	Male	115(28.2%)	40(9.8%)	1	1
	Female	138(34%)	114(28%)	0.42(0.39-1.12)	0.877(0.50-1.53)
Residence	Urban	111(27.2%)	36(3.3%)	1	1
	Rural	142(34.8%)	132(31.4%)	1.20(0.51-2.16)	0.77(0.45-1.32)
Head of household	Male	142(34.8%)	82(20.1%)	1	1
	Female	111(27.2%)	72(17.6%)	1.12(0.47-3.07)	0.71(0.40-1.27)
Monthly income	≤1000ETB	216(53%)	22(5.4%)	3.67(1.04-5.40)	<b>2.34(1.42-3.84)*</b>
	>1000ETB	123(30.2%)	46(11.3%)	1	1
WHO stage of disease	Stage I&II	96(23.5%)	219(53.8%)	1	1
	Stage III&IV	84(20.6%)	8(1.9%)	23.9(5.92-35.00)	<b>2.85(1.61-5.04)*</b>
Developed OIs in the last 6 months	Yes	68(16.7%)	89(21.8%)	2.59(1.01-3.29)	1.24(0.74-2.07)
	No	84(20.6%)	165(40.5%)	1	1
Support	Yes	46(11.3%)	9(2.2%)	1	1
	No	230(56.5%)	122(29.9%)	2.71(1.83-3.88)	<b>3.04(1.45-6.38)*</b>
CD4+ T cell count	≤350	140(34.3%)	111(27.3%)	2.22(2.07-6.53)	<b>3.51(1.88-6.52)*</b>
	350-500	29(7.1%)	39(9.5%)	0.84(0.45-2.03)	0.91(0.39-2.10)
	≥500	34(8.3%)	54(13.2%)	1	1
Dietary diversity	Inadequate	120(29.4%)	90(22.1%)	1.55(1.45-2.02)	0.65(0.38-1.09)
	Adequate	133(32.6%)	64(15.7%)	1	1

\* Significant at P-value <0.05, COR = Crude Odd Ratio, AOR=Adjusted odd ratio, CI= Confidence interval, OIs = opportunistic infections

## Discussion

The current study revealed the magnitude of food insecurity among PLWHA was found to be 62.4% (95% CI: 57.6, 66.8). Low CD4+ T cell count, WHO stage of III&IV, absence of any support, and monthly income were factors that were significantly associated with food insecurity.

The magnitude was consistent with the study done in Brazil 66.5% [17]. Higher than studies conducted in West Benga 50.9% [19], Kembata 57.3%[13], west shewa 19.5%[9] and study conducted in A/minch 35.2% [8] and lower than study conducted in Zambia 74% [20], Dakar, Senegal 84.6% [21], Congo 91.3% [22], Debre Markos 84.5% [23], Hawassa Referral Hospital 67.3% [18]. The variation could be due to the existence of different socioeconomic statuses, the health intervention measurement is taken, the difference in study years, and study setting

This study showed that CD4 was strongly associated with food insecurity. Respondents who had CD4 count <350 were 3.51 more likely to be food insecure than those who had CD4 count  $\geq$ 350. this result is supported by a study done in west Shewa [9]. Evidence indicated that food insecurity was associated with lower CD4 count and it tends to decrease CD4 counts recovery and predisposes patients to early death[9].

In this study participants who had low monthly income ( $\leq$  40 USD) were 2.34 times more likely to be food insecure than those who had > 40 USD. This finding is in line with the study conducted at Arbaminch[8], Debere markos[23], Kembata[13], Senegal[21], Zambia[20], Brazil[17]. The possible reason for this is adults who have low monthly income can't afford for purchasing sufficient, safe and nutritious food[24].

This study found that participants who are on WHO stage III and IV were 2.85 times more likely to have food insecurity as compared to WHO stage I and II. This finding is supported by research conducted in Arbaminch[8], Kembata[13]. As WHO staging increases the patient becomes physically weak and less productive and also prone for serious illness like advanced opportunistic infections this will result in long stay in bed and end up in food insecurity[8].

This study revealed that those participants who have no support (food, money, loan, or livestock) were 3.04 times more likely food insecure than those who have supported this finding is supported by a study done in kembata[13], Congo[22]. This could be due to Food and nutrition support result in increased immune system strength, which made persons more productive and earn more wage keep their food security status and also help to adherence to treatment, when adhere to treatment minimize risk of other opportunistic infections which challenge productivity.

## Conclusions

The magnitude of food insecurity among adult ART attendants was 62.4% of which 18.1% mildly, 23.5% moderately and 20.4% were severely food insecure. CD4count <350, being WHO stage III&IV, absence of any support, and Low average monthly income were factors associated with food insecurity among adults attending ART.

## **Declarations**

### **Ethics Approval and consent to participate**

The study protocol was approved by the Haramaya University, College of Health and Medical Sciences Institutional Health Research Ethics Review Committee with reference no of IHRERC/180/2021. Informed, voluntary written and signed consent was obtained from each study participants.

### **Consent for publishing**

Not Applicable

### **Availability of Data and Materials**

The data sets used and/or analyzed during the current study are available from the corresponding author on reasonable request

### **Competing interests**

The authors declare that they have no competing interests.

### **Funding statement**

The whole cost of the research was covered by the principal investigator.

### **Author's contributions**

AD, MD, BH, and AM: Conceived and designed the study; AD, MD, BH, and AM: adopted data collection instrument and acquisition of data; AD, MD, BH, and AM: Cleaned the data, analyzed the data, and interpreted findings; AM and BH: drafted the manuscript; AD, BH, and AM: Critical revision and approval of the final manuscript.

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