Food Insecurity and Associated Factors among Adult HIV Positives Attending Antiretroviral Therapy in Public Health Facilities of Kembata Tembaro Zone, Southern Ethiopia

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Abstract

Background: Food insecurity is prevalent among people living with Human Immunodeficiency Virus (HIV) Acquired Immune Deficiency Syndrome (AIDS) in sub-Saharan Africa countries. There, more than half of HIV-infected individuals are food insecured. Even though some studies have been done on the nutritional status of HIV patients, few have addressed the magnitude of food insecurity and the associated factors among adults on antiretroviral therapy in resource-limited countries like Ethiopia. Therefore, the main aims of this study is assess the magnitude of food insecurity and the associated factors among adults on Antiretroviral Therapy (ART) in Public Health facilities in Kembata Tembaro Zone, Southern Ethiopia.

Methods: An institutional based cross-sectional study was conducted from January 09 to February 09, 2018 on 415 adult HIV positives attending antiretroviral treatment at randomly selected five public health facilities in Kembata Tembaro Zone. The study subjects were selected from each facility proportionally and by simple random sampling technique. A pretested structured questionnaire was used to collect the data. Bivariate and multivariate logistic regression analysis were made to identify the independent factors associated with the households' food insecurity. Adjusted Odds Ratio (AOR) with 95% Confidence Interval (CI) was estimated to measure the strength of association. Level of statistical significance was declared at p-value < 0.05.

Results: The magnitude of food insecurity was 57.3% (52.4-62.1), of which 13.3%, 26.6% and 17.4% mild, moderate were and severely food insecured respectively. Monthly income <1000 Ethiopian Birr (ETB) (AOR=10.88; 95% CI:6.6, 18), presence of opportunistic infections (OIs) (AOR=2.16; 95% CI: 1.04, 4.5), presence of another family member with HIV (AOR=2.33; 95% CI:1.4, 3.86), absence of support from organization (AOR=2.36; 95% CI: 1.3, 4.2) and clinical stage III and IV (AOR =2.99; 95% CI:1.44, 6.2) were factors associated with food insecurity.

Conclusion: Food insecurity is a significant problem among HIV positives. These result could call multi-sectoral collaboration to alleviate the problem among ART attendants, strengthen screening and treating patients for opportunistic infections (OIs) and also integrate ART programs with food security intervention.

Keywords: *Food Insecurity, Human Immunodeficiency Virus, People Living with HIV, ART, Ethiopia*

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Introduction

Food security is the status where all people at all times have access to sufficient, safe, nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO. *et al*., 2015).

It is built on the three pillars of food availability, access, and utilization (Wunderlich and Norwood, 2006).Whether households receive enough food, its distribution within the household, and whether that food fulfills the nutritional needs of all the household

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members are factors of food security clearly linked to health (FAO *et al*., 2015). Food insecurity, is defined as "the limited or uncertain availability of nutritionally adequate and safe foods, or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" (Wunderlich and Norwood, 2006).

Food insecurity has a negative impact on the overall nutritional and health status of people, especially on those people living with HIV/AIDS. Poor nutrition, poor health, low labor productivity, low income, and livelihood insecurity are among the most common impacts (USAID, 2014). Different reports show that not having food to take with medication is one of the most common reasons why patients discontinue ART (World Bank, 2007b). Particularly in the times of drought and other crises that have an impact on food availability and access, also leads to an increase in high-risk sexual behavior, including transactional sex for coping to food insecurity that leads to increased HIV exposure or infections. Food insecurity can increase susceptibility to HIV in that the risk of infection and the virus' rate of progression are an increase (USAID, 2014). To overcome the problem of food insecurity among vulnerable group, especially people living with HIV, efforts have been made to connect food health systems through the provision of nutrition and food assistance for better health outcomes, such as nutritional recovery for malnourished people living with HIV and with other opportunistic infection (World bank, 2007a).

HIV/AIDS has become one of the world's most serious health and development challenges (Henary, 2017). HIV/AIDS itself, as well as alcohol use, is likely to result in or worsen the food insecurity, along with the medication adherence, of many households and communities affected by the virus because it reduces not only the assets at hand but also the productivity of the victims (Ivers *et al*., 2009).

Food insecurity is prevalent among People Living with HIV/AIDS (PLWHA) in Sub Sahara African (SSA) countries. There, more than half of HIV-infected individuals are food insecured. Many studies done in Africa showed that about 52.2 % to 92 % of the people living with HIV/AIDS are struggling to have access to safe, sufficient and nutritious food for themselves and their families (Semali *et al*., 2011; Musumari *et al*., 2014; Hong *et al*., 2014; Akilimali *et al*., 2016). According to Studies done in Nigeria, Senegal, Namibia and Tanzania, the factors associated with food insecurity among HIV patients are low. Educational and economic status; housewife/unemployed occupation; low socioeconomic status; older age; benefiting from food assistance; delaying drugs to prevent hunger; skipping drugs; taking two/less meal, lower household health care, lower CD4 count, longer duration on ART and exchanging sex for food (Semali *et al*., 2011; Hong *et al*., 2014; Benzekri *et al*., 2015; Sholeye *et al*., 2017).

According to 2016 Ethiopian situational report of The Food and Agriculture Organization of the United Nations (FAO), 9.7 million (about 10%) of the general population were food insecure and need urgent action. The contributing factors were EL NINO driven drought, high food price, population displacement, lack of employment and loss of livelihoods (FAO, 2016). According to Studies done in different regions of Ethiopia, the prevalence of food insecurity among people living with HIV/AIDS ranged from 19.5% to 87.4% that is, they have been 9 times more affected than the general population. Some of the factors were lower income, being female, higher/advanced HIV clinical stage, developing opportunistic infections, poor adherence to drugs, and absence of food support (Ayele *et al.*, 2012; Asnakew, 2015; Dereje *et al.*, 2014; Belachew *et al.*, 2015; Belijo and Mensa, 2016).

In order to alleviate food security problem among people living with HIV/AIDS in Ethiopia the government has coordinated and integrated food assistance and HIV program at all levels, and has established linkage between community based nutrition intervention for PLWHA and likelihood support and food assistance interventions but the problem still exists especially in developing countries (FMOH, 2013-2015).

Even though some studies have been done on nutritional status of HIV patients, few have addressed the magnitude of food insecurity and the associated factors among adults on antiretroviral therapy in resource-limited countries like Ethiopia, and there is paucity of study done on food insecurity among HIV positives in our study area. Therefore this study was aimed to filling this gap by assessing the magnitude of food insecurity and the associated factors among people living with HIV.

Materials and Methods

Study area, design and period

Institution-based cross-sectional study was used from January 09-February 09/2018, in Kembata Tembaro Zone, Southern Ethiopia. The zone is one of the central ones in The Southern Nations Nationalities and Peoples' Regional State (SNNPR) and Durame is its capital town. The town is 119km from Hawassa, the capital of SNNPR and 306km from Addis Ababa, the capital of Ethiopia. There are 31 health centers, 3 primary hospitals and 1 general hospital in the zone. Six public health centers and four public hospitals including Durame General Hospital provide ART service in the zone. About 971 people living with HIV were receiving ART from these health facilities, according to Zonal Health Department report (KTZHD, 2016).

Source population was all the adult PLWHA on ART in the public health facilities in Kembata Tembaro Zone. The study population was all the adult PLWHA who were attending ART services at selected public health facilities in the zone**.** All those on ART and aged 18 years and above were included in this study and those who were seriously ill and incomplete clinical records were excluded from the study.

Sample size determination and sampling procedure

The sample size for the magnitude of food insecurity was calculated using a single population proportion formula with the following assumptions: the prevalence of food insecurity among HIV patients to be 19.5% (Belijo and Mensa, 2016), Confidence level at 95% to be 1.96, degree of precision (d) 0.04, and 10 % for non-response. The final sample size was 415. From ten public health facilities in the Zone, which were actively provide ART service, five were included in study. Considering the study participants from health centers and the hospitals were homogenous and by using a simple random sampling technique (lottery method) three health centers, namely, Doyo-gana HC, Damboya HC and Hadaro HC and, two Hospitals, (Durame General Hospital and Shinshicho Primary Hospital) were included in the study. The sample size was propositionally allocated to each selected health facility and the study participants were selected randomly using a lottery method based on patient ART unique identification number (MRN).

Data collection methods

Data were collected via face to face interview using a structured, pre-tested questionnaire and record review. The questionnaires was initially prepared in English and translated into Kabatissa and Amharic languages, and then back to English by language experts and researchers to keep the consistency of the questionnaires. Five diploma nurses working in the ART clinic of the health institution collected the data and two health officers supervised the collection process. Socio-demographic and behavioral data were collected from all eligible participants using the pre-tested structured questionnaire. The household food security level was assessed by using a Household Food Insecurity Access Scale (HFIAS) developed by Food and Nutrition Technical Assistance (FANTA) and United Nations Programme on HIV/AIDS (UNAID) for Measurement of Food Access and which is validated in developing countries like Ethiopia (Coates *et al*., 2007 , Seifu *et al*., 2015). Dietary diversity within the past 24 hours was assessed by using 12 food item questions developed for Household Dietary Diversity Scale (HDDS) by FANTA (FAO, 2008).

The study subjects' weight was measured using a standard digital weight scale that is used in the medical set up and recorded to the nearest 0.1kg. It was calibrated against known weight regularly. During the measurement the study participants put on light clothes and shoes were taken off. Similarly, height measurements were carried out while the participant removed his/her shoes, stand erect, looking straight in a horizontal plane with feet together and knees straight and the measurements were recorded to the nearest 0.1cm.

Measurements

The households' food insecurity/security in the past four weeks was measured by Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access. It was calculated based on nine questions of food access and it was categorized into 0=Food Secure, 1=Food Insecure. The participants who scored ≤2 affirmative answers were considered food secure; the participants who scored more than 2 affirmative answers were considered food insecure (Coates et al., 2007). A household's dietary diversity (HDD) referred to the

economic ability of a household to access a variety of foods in the past 24 hrs. Twelve of the questions in the questionnaire were to assess dietary a diversity. The participants were asked to report the frequency of consumption of each food in the past 24 hours. Those who consumed one of the foods in each subgroup at least once in the given period received 1 point and 0 point otherwise. The mean household dietary diversity score in the study subjects was calculated. In this study food insecurity was dependent variable. The independent variables were: socio-demographic factors: Age, sex, family size, number of children, educational status, ethnicity, religion, residence, marital status, head of household, household income, occupational status. Nutritional factors: absence of food support, food aid/ration from the organization, dietary counseling. Health-related and immunologic factors: CD4 count, WHO clinical stages, ART regimen, duration on ART, ART adherence, functional status, opportunistic infection, another family member with HIV at home. Behavioral factors: alcohol intake, cigarette smoking and khat chewing.

Food secure: the households those experiences none of the food insecurity (access) conditions or just experience worry, but rarely in the past 4 weeks were labeled as 'food secured' (Coates et al., 2007).

Food insecure: household that experiences at least one food insecurity (access) conditions in the past four weeks were labeled as 'Food insecure' (includes all stages of food insecurity; mild, moderate and severe) (Coates et al., 2007).

Mildly food insecure: worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely (Coates et al., 2007).

Moderately food insecure: household sacrifices quality more frequently, by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the size of meals or number of meals, rarely or sometimes. But it does not experience any of the three most severe conditions (Coates et al., 2007).

Severely food insecure: household experiences any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating), even as infrequently as rarely (Coates *et al.,* 2007). Finally food security status were dichotomized as food secure, and all mild, moderate and sever food insecure as food insecure.

Dietary diversity: is the number of reported different foods and food groups consumed in a household over a 24-hour period. This does not include food group consumed outside the home. It is classified as adequate and inadequate based on mean value.Which score below the mean value was inadequate and above mean value was adequate dietary diversity based on FANTA/FAO recommendations (FAO, 2008).

Support: An activity or intervention that encourages strengthens, or otherwise helps client care for her/himself, in this case, those who got money, loans, food ration and or livestock from organization that taking ART drug were considered supported.

Data Quality Control

The questionnaire was adapted and modified into our context from previous different literatures. Before the data collection, the questionnaire was pre-tested on 5% of the sample size (21 HIV positive clients on ART) at Halaba Health Center; moreover, a two-day training was given to the data collectors and supervisors by the principal investigators, on the objective of the study, in the proper filling of the questionnaire and how to approach and interview respondents. To minimize measurement error, TEM was done before actual data collection with ten participants and take acceptable value for Intra-evaluator and Inter-evaluator less than 1.5% and 2% respectively (Perini *et al*., 2005). Calibration of weight scale was done using objects with known weight.

Data processing and analysis

All filled questioners were checked for completeness and consistency and data entry was done using the EpiData 3.1 software. Then the data were exported to the SPSS version 20.0 for further analysis. Descriptive statistics (Frequency distribution, proportion, mean & standard deviation) were used to summarize the variable. Bivariate logistic regression analysis was done to see the association between the dependent variable and the explanatory variables. The variables with a p-value of less than 0.25 in the bivariate analysis were entered into the final multivariate logistic regression model to control for all possible confounders. Most of assumption of logistic regression (model adequacy and multicollinearity of the independent variable) were checked

using appropriate methods. Model adequacy was checked by using Hosmer and Lemeshow goodness of fit test and the model was fitted at P-value≥0.05. Odds ratios along with 95% confidence interval were estimated to measure the strength of the association. Level of statistical significance was declared at P-value less than 0.05.

Ethical considerations

The study was approved by the Haramaya University, College of Health and Medical Sciences Institutional Health Research Ethics Review Committee (IHRERC). The permission and agreement consent was obtained from Southern Nations Nationalities and Peoples Regional Health Bureau, Kembata Tembaro Zone Health Department and selected health institutions prior to the study. The study participant were informed on the purpose of the study and the importance of their participation in the study, and then informed, voluntary written and signed consent was obtained. The study participants were informed that the information they give is confidential and their names should not be written on the questionnaire. Each participant was informed that his or her participation is voluntary to participate in the study. The risk of participating in this study is very minimal, but only taking a few minutes from your time.

Result

Socio-Demographic Characteristics

Out of the 415 study participants initially sampled in the study, 403 participated, making a response rate of 97.1 %. Of them 214 (53.1%) were females and 43.7% were in the age group of 26-35 years (the largest group and with the mean (±SD) age of 36.8(±8.8) years, with a minimum age of 18 years and maximum age of 70 years. Many of the participants were married (67.5%), 60.8% urban dweller, 24.8% farmers and 71.2% had male-headed household. More than half of the family 220 (54.6%) earned less than 1000 ETB per month (Table 1).

Dietary diversity, meal frequency and nutritional status

Many of the respondents, (62.0%) reported that their actual daily meal pattern was less than three times. The average dietary diversity score which was assessed using 12 food items Dietary Diversity Scale was 6.21 (SD±1.9). More than half (58.8%) of the respondents were classified in the inadequate dietary diversity. Two-third of the study subjects (65.8%) said their primary source of food was purchased, and one fourth (25.8%) had a Body Mass Index (BMI) < 18.5 (Table 2).

Health-related and immunologic characteristics

About half of the respondents, (51.9%) had CD4 count >500cell/mm^3. Most of the study participants, 325 (80.6%) were in WHO clinical stage (stage I and II), and 362(89.8%) were in good adherence or missed less than 2 doses during the last 30 days. The mean of their duration on ART was 67 months and SD (±35.7) with a minimum of 6 months and maximum of 144months. Seventy-three (18.1%) were identified to have opportunistic infections of any kind. The most reported opportunistic infection was pneumonia, 35 (47.9%). One-fourth of the participants 97 (24.1%) got support from health organization, and the most reported support was in the form of money, 54 (55.7%) (Table 3).

Table 1: Socio-demographic characteristics of adults on ART in public health facilities of Kembata Tembaro Zone, Southern Ethiopia 2018 *(n=403).*

Variables	Category	Frequency	Percent
Sex	Male	189	46.9
	Female	214	53.1
Age in years	18-25	30	7.4
	26-35	176	43.7
	36-44	110	27.3
	≥45	87	21.6
Residence	Urban	245	60.8
	Rural	158	39.2
Marital status	Single	44	10.9
	Married	272	67.5
	Divorced	16	4
	Widowed	71	17.6
Family size	≤ 5	270	67
	> 5	133	33
Educational status	Unable to read and write	63	15.6
	Read and write	25	6.2
	Elementary	199	49.4
	Secondary and above	116	28.8
Ethnicity	Kambata	322	79.9
	Hadiya	37	9.1
	Wolaita	20	5
	Gurage	12	3
	others*	12	3
Religion	Protestant	328	81.4
	Orthodox	51	12.7
	Catholic	17	4.2
	Muslim	7	1.7
Occupational status	Farmer	100	24.8
	Merchant	92	22.8
	Government employer	54	13.4
	Housewife	85	21.1
	Daily labor	35	8.7
	Student	13	3.2
	Self-employe**d**	24	6
Sex of head of household	Male	287	71.2
	Female	116	28.8
Average monthly income	≤1000	220	54.6
	>1000	183	45.4
Living condition	Alone	29	7.2
	With others**	374	92.8

**Tigre, Amhara, Oromo* ***parents, relatives, spouse*

Behavioral factor

Most of the participants reported that they did not smoke cigarette (88.3%), not drink alcohol (82.6%), and not chew khat (80.6%) (Table 4).

The magnitude of food insecurity

The overall food insecurity in this study was 231 (57.3%; 95% CI: 52.4, 62.1). Of which, 54 (13.3%; 95% CI: 10.2, 16.9) were mildly insecure, 107 (26.6%, 95% CI: 22.3, 31.0) were moderately insecure, 70 (17.4%; 95% CI: 14.1, 21.3) were severely insecure. One hundred seventy two (42.7%; 95% CI: 38.2, 47.6) were food secured.

Table 2: Dietary diversity, nutritional status, and meal frequency among adults on ART in public health facilities in Kembata Tembaro Zone, Southern Ethiopia, 2018 *(n=403).*

Variable	Category	Frequency	Percent
Household dietary diversity	Inadequate	237	58.8
	Adequate	166	41.2
Meal frequency	≤ 3times	250	62.0
	>3 times	153	38.0
BMI	< 18.5	104	25.8
	≥ 18.5	299	74.2
Primary household source of food	Own production	122	30.3
	Purchased	265	65.8
	Borrowed, gift	15	3.7
	Food aid	1	0.2

Table 3: Health-related and immunological profiles of ART patients in public health facilities at Kembata Tembaro Zone, Southern Ethiopia, 2018 (n=403).

Variables	Category	Frequency	Percentage
CD4+ T cell count (cell/mm^3)	<200	48	11.9
	200-350	68	16.9
	351-500	78	19.4
	≥500	209	51.8
WHO clinical stage	Stage I&II	325	80.6
	Stage III&IV	78	19.4
ART regimens	1st line	371	92.1
	2nd line	32	7.9
Duration on ART	≤12 months	25	6.2
	>12 months	378	93.8
Developing current or past six months OIs	No	330	81.9
	Yes	73	18.1
Dietary counseling	No	99	24.6
	Yes	304	75.4
Adherence to ART	Good	362	89.8
	Poor	41	10.2
Functional status	Working	374	92.8
	Ambulatory	29	7.2
Other person living with HIV on ART in the family	No	217	53.8
	Yes	186	46.2
Any support other than medication	No	306	75.9
	Yes	97	24.1
Type of support	Money	54	55.7
	Food	51	52.6
	Loan	15	15.5
	Equipment	2	2.1

Factors associated with food insecurity among Adult on ART

In the bivariate logistic regression analysis; educational status, current residence, having children, low average monthly income, developing OIs, AIDS clinical stage III and IV, other family member infected with disease and absence of any support were associated with food insecurity. In the multivariable logistic regression analysis, those who developed OIs were two times more likely to be food insecure than their counter parts (AOR= 2.16; 95% CI: 1.04, 4.50). Participants who had other family members infected with HIV were 2.3 times more likely food insecure than their counter parts (AOR=2.33; 95% CI: 1.40-3.86). The adults whose households' average monthly income was ≤ 1000 ETB were 10.8 times more likely to be food insecure than those with an income >1000 ETB (AOR=10.88: 95% CI: 6.60,18.00). Participants who did not get organizational support were 2.36 times more likely food insecure than those of get support

(AOR=2.36; 95% CI: 1.3, 4.2). Those advanced WHO clinical stage III and IV were 2.99 times more likely to be food insecure than those stage I and II (AOR=2.99; 95% CI: 1.44, 5.61) (Table 5).

Table 4: Behavioral factors of adult patients taking ART at Public Health Facilities in Kembata Tembaro Zone, Southern Ethiopia 2018. (n=403)

Behavioral related factors	Category	Frequency	Percentage
Cigarette smoke	Yes	47	11.7
	No	356	88.3
Alcohol intake	Yes	70	17.4
	No	333	82.6
Khat chewing	Yes	78	19.4
	No	325	80.6

Table 5. Factors associated with food insecurity in Public Health Institutions of Kembata Tembaro Zone, Southern Ethiopia 2018. *(n=403)*

Variables	Category	Food security status		COR	AOR
		Food insecure	Food secure	(95%CI)	(95%CI)
Residence	Urban	123(50.2%)	122(49.8%)	1	1
	Rural	108(68.4%)	50(31.6%)	2.14(1.4-3.25)	1.4(0.82-2.38)
Have child	Yes	204(59.5%)	139(40.5%)	1.79(1.03-3.11)	1.3(0.6-2.68)
	No	27(45%)	33(55%)	1	1
WHO stage of	Stage I and II	167(51.4%)	158(48.6%)	1	1
disease	Stage III and IV	64(82.1%)	14(17.9%)	4.32(2.33-8.02)	2.99(1.44-6.20)*
Developed OIs	Yes	57(78.1%)	16(21.9%)	3.19(1.76-5.79)	2.16(1.04-4.50)*
	No	174(52.7%)	156(47.3%)	1	1
Diseased another	Yes	126(67.7)	60(32.3%)	2.24(1.49-3.36)	2.33(1.40-3.86)*
family member	No	105(48.4%)	112(51.6%)	1	1
Monthly income	≤1000	179(81.4%)	41(18.6%)	10.99(6.9-17.5)	10.88(6.6-18.00)*
	>1000	52(28.4%)	131(71.6%)	1	1
Education	No formal	47(74.6%)	16(25.4%)	3.74(1.9-7.35)	2.10(0.92-4.84)
	Read &write	15(60%)	10(40%)	1.9(0.79-4.6)	1.05(0.35-3.60)
	Elementary	118(59.3%)	81(40.7%)	1.85(1.17-2.95)	1.3(0.71-2.33)
	Secondary &above	51(44%)	65(56%)	1	1
Any support	Yes	40(41.2%)	57(58.8%)	1	1
	No	191(62.4%)	115(37.6%)	2.36(1.48-3.77)	2.36(1.30-4.20)*

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

Discussion

The magnitude of food insecurity among ART patients in this study was 57.3%. The magnitude is comparable with the ones found in studies done in Tanzania (52.2%) (Semali *et al*., 2011), Democratic Republic of Congo (57%) (Musumari *et al*., 2014) and Jimma Ethiopia (63%) (Ayele *et al.*, 2012). However, it is lower than reported from studies done in British Colombia, Canada (73%) (Anema *et al.,* 2016), Brazil

(70.6%) (Charão *et al.,* 2012), Senegal (87.2%) (Benzekri *et al.*, 2015) and Nigeria (71.7%) (Sholeye *et al.*, 2017). It is also lower than the magnitudes found in Ethiopia; Fiche Zonal Hospital (87.4%) (Belachew *et al*., 2015), Butajira Hospital (78.1%) (Dereje *et al.*, 2014) and Hossana (67.5%) (Asnakew, 2015). However , the prevalence is higher than those found by studies done in Bengal (49.1%) (Dasgupta *et al*., 2016)and Iran (48%) (Kalantari *et al.*, 2016). It is also higher than the ones founds by studies done different parts of Ethiopia; Arbaminch (19.5%) (Belijo and Mensa, 2016), Tigray 40.4% (Tsegazeab *et al*., 2013) and West Shoa Zone (35.2%) (Delelegn *et al*., 2016). A possible explanation may be differences in the socio-economic status, study time and area, the health intervention measurement taken and sample size of the studies. In this study monthly income was strongly associated with food insecurity. The participants who had low monthly income were more likely to be food insecure than those who had >1000 ETB.

This finding is in line with findings in British Columbia, Canada (Anema *et al*., 2016), Tanzania (Semali *et al*., 2011), Butajira (Dereje *et al.*, 2014), Fitche (Belachew *et al*., 2015), Arba Minch (Belijo and Mensa, 2016) and Jimma (Ayele *et al.*, 2012). The possible reason for why food insecurity was more common among those household with lower monthly income may be due to that income diminishes in the household may cause inadequate quality and quantity of food intake due to unable to purchase variety and preferences type of food.

This study indicated that the participants who were on WHO stage III and IV were 2.99 times more likely to be food insecure as compared with those in stage I and II. This finding is similar to the ones reported from studies conducted in Bengal (Dasgupta *et al.*, 2016) and Arba-Minch (Belijo and Mensa, 2016). This may be explained as advanced WHO AIDS stages increase the patient becomes physically week and CD4 count decreases and the patient becomes less productive. And also adverse clinical effects among PLWHA, including declines in physical health status, decreased viral suppression increased the incidence of serious illness and end up in food insecurity.

This study also revealed that the participants who had opportunistic infection were 2.16 times more likely to be exposed to food insecurity as compared to those who did not develop opportunistic infections. This is consistent with the ones found in Fitche Zonal Hospital in Northern Ethiopia (Belachew *et al*., 2015) and Arba-Minch Southern Ethiopia (Belijo and Mensa, 2016). This may be due to the frequent illness like opportunistic infection caused significant incapacity to work more and disability which leading to reduced productivity, the decrease of savings and inability to earn more incomes, hence income decrease that household is unable to purchase the right quantity and preferred food which lead to food insecurity.

The study subjects who had other family members with HIV were 2.33 times more likely to be food insecure than those who had not. This finding is consistent with the study done Bengal (Dasgupta *et al.*, 2016). This may be many people with HIV/AIDS in a single household leads to additional costs related to medical care and more missed days of work due to illness leads to food insecurity. When a person is sick, the household not only has to manage without their labour input but also with the loss of labour from caregivers hence many persons are suffering HIV in one household.

This study showed that the absence of any support was significantly associated with food insecurity. The participants who did not have any type of support (food, money, loan or livestock) were 2.36 times more likely to be food insecure than those had support. This finding is supplemented with the study done in Hosanna (Asnakew, 2015). This could be due to those who got support from government or other none governmental organization were less likely to be food insecure. In addition food and nutrition support, results in increased immune system strength, and this makes persons more productive and earns more money, which in turn keep their food security status and also helps adherence to treatment. Adhering to treatment minimize the risk of other opportunistic infections which challenge productivity.

Since these study used participant interview about events in the past one month there could be recall bias by participants and also there may be social desirability bias. This was minimized by probing the respondents about the event. Anthropometric measurement error is also another limitation. To minimize this; data collectors were well trained, standardization of anthropometric measures was done and the instruments were calibrated.

Conclusion

The magnitude of food insecurity among adult ART attendants was 57.3%. Of which, 13.3%, 26.6%, 17.4% were mildly, moderately and severely food insecure respectively. Low average monthly income, being WHO stage III and IV, developing an opportunistic infection, the presence of another family member with HIV and absence of any support were the factors associated with food insecurity among the adults attending ART. These results could call multi-sectorial collaboration to alleviate the problem among ART attendants, strengthen screening and treating patients for opportunistic infections (OIs) and also integrate ART programs with food security intervention.

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Conflict of interest

The authors declare that they have no any conflict of interest.

Author's contributions

MM designed the study, collected, analyzed and interpreted the data, and also drafted the manuscript. GE participated in the conceptualization of the study, design, analyses, and interpretation of results as well as drafting and review of the manuscript. YD participated in the conceptualization of the study, design, analyses, and interpretation of results as well as drafting and review of the manuscript.

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