MALNUTRITION AND ASSOCIATED FACTORS AMONG ADULT HIV INFECTED INDIVIDUALS RECEIVING HIGHLY ACTIVE ANTI-RETROVIRAL THERAPY AT ART CLINICS OF HOSANNA TOWN, SOUTHERNETHIOPIA

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ABSTRACT

Background: In resource limited settings, many human immune deficiency virus infected individuals lack access to sufficient quantities of nutritious foods, which poses additional challenges to the success of antiretroviral therapy. Morbidity and mortality related to human immune deficiency virus infection in the developing world remain unacceptably high, despite major advances in human immune deficiency virus therapy and increased international funding for care. The major contributing factor is malnutrition.

Objective: To determine magnitude of malnutrition (body mass index < 18.5kg/m2) and associated factors among adult people on antiretroviral therapy at antiretroviral therapy clinics of Hosanna town.

Methods: Institutional based cross-sectional survey was conducted from March 20 to April30, 2014 on 340 adult people on antiretroviral therapy at antiretroviral therapy clinics of Hosanna town. Sample clients were selected by simple random sampling technique. Data were collected by face to face interview using structured pretested questionnaire, record review using check list and anthropometric measurements. Bi-variate analysis and multivariable logistic regression models were done using SPSS version 16 to identify factors associated with malnutrition.

Results: Overall, the prevalence of malnutrition with (BMI < 18.5kg/m2) in this study was 31.2 %.Household food insecurity (AOR= 2.51, 95% CI: 1.31- 4.81), inadequate diversified diet (AOR= 0.44, 95% CI: 0.23- 0.84),low meal frequency(AOR= 0.29, 95% CI: 0.11- 0.76), clinical staging four (AOR= 5.23, 95% CI: 1.42- 19.35), clinical staging three (AOR=3.91, 95% CI: 1.57, 9.73), presence of opportunistic infections (AOR= 2.62, 95% CI: 1.49- 4.59) and nutritional support(AOR= 0.45, 95% CI: 0.23- 0.89) were independent predictors of malnutrition**.**

Conclusion: Malnutrition (BMI < 18.5kg/m2) was high in adult people on antiretroviral therapy at antiretroviral therapy clinics of Hossana town. Only antiretroviral therapy is not enough to improve the health status of people on HAART. Further, intervention initiatives should focus on improving household food security, diversity of diet, meal frequency, clinical staging and prevention and control of opportunistic infections in adult HIV infected individuals receiving highly active antiretroviral therapy.

Key words: Human immune deficiency virus, antiretroviral therapy, malnutrition

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ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ARV	Antiretroviral
BMI	Body mass index
CDC	Centre of Disease Control
EDHS	Ethiopian demographic and health survey
FANTA	Food and Nutrition Technical Assistance
FHAPCO	Federal HIV/AIDS Prevention and Control Office
HAART	Highly Active Antiretroviral Therapy
HIV	Human Immunodeficiency Virus
MOH	Ministry of Health
NGO	Non- Governmental Organizations
OIS	Opportunistic infections
PLWHA	Peoples living with HIV/AIDS
RCQHC	Regional Centre for Quality of Health Care
SARA	Support for Analysis & Research in Africa Project
SNNPR	Southern Nations and Nationality People Regions
SSA	Sub Saharan Africa
UNAIDS	Joint United Nations Program on HIV/AIDS
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
WFP	World Food Programmes
WHO	World Health Organization

1. INTRODUCTION

1.1 BACK GROUND

Malnutrition literally means “bad nutrition” and technically includes both over and under nutrition. In the context of developing countries, under-nutrition is generally the main issue of concern, though industrialization and changes in eating habits have increased the prevalence of over nutrition. Nonetheless, within the context of World Food Programme (WFP) programs and assessments, malnutrition refers to under-nutrition unless otherwise specified (1). Likewise, in this study the issue is the under nutrition.

It is the outcome of a group of factors such as poverty, inadequate access to food, illiteracy, large family size, poor environmental sanitation, chronic illness such as AIDS, lack of safe drinking water, lack of awareness on nutritional related issue (2). It is also results from imbalance of nutrient intake with physiological demand for growth, maintenance and reproduction (3).

People living with HIV are at a higher risk of malnutrition as HIV specifically affects nutritional status by increasing energy requirements, reducing food intake, and adversely affecting nutrient absorption and metabolism. Malnutrition in turn weakens the immune system and increase vulnerability to infections and speeds up the progression of HIV disease. Asymptomatic and symptomatic adults have energy requirements by 10% and 30% respectively to maintain body weight and physical activity (3-5).

Globally, the number of people accessing ART has been increasing; as a result more people living with HIV are leading healthier and productive life (6). ARV treatment and good nutrition are important parts of preventing opportunistic infections (7, 8). Good nutrition does not cure AIDS or prevent HIV infection, but it could break the vicious cycle and improve the health and the life-quality of people living with HIV/AIDS, by maintaining body weight and strength, replacing losses of vitamins and minerals, improving the function of the immune system and the body’s ability to fight infection, extending the period of infection to development of the AIDS-disease, improving response to treatment, reducing

time and money spent on health care and then keeping HIV-infected people active and productive (9).

1.2 STATEMENT OF THE PROBLEM

The HIV epidemic remains one of the main public health challenges especially in low and middle income countries. At the end of 2010, globally an estimated 34 million people were living with HIV/AIDS with 2.7 million new HIV infections and the annual number of people dying from AIDS related causes was 1.8 million. The majority of adults newly infected with HIV are in sub-Saharan Africa (SSA). In SSA, an estimated 1.9 million people become infected with HIV in 2011. Ethiopia is one of the seriously affected countries in SSA with a large number of people (approximately 800,000) are living with HIV/AIDS and 44,751 AIDS-related deaths (10). According to the 2011 EDHS, HIV prevalence in Ethiopia is 1.9% for women and 1.0% for men with an overall prevalence of 1.5%. This is essentially unchanged from the HIV Prevalence reported in 2005 (1.4%) (11).

The effect of HIV/AIDS pandemic on nutritional status of infected people is widely known. The common known effects are severe muscle wasting and underweight (12).

More than 800 million people worldwide are chronically undernourished from which 200 millions are living in SSA, and greater than 33 million are living with HIV infection (10). A meta-analysis study conducted in Sub-Saharan countries reported that the pooling prevalence estimates of HIV-related under nutrition(BMI < 18.5 kg/m2) for women was 10.3% and the prevalence in Ethiopian was 13.2%; similar data for African men not available (13).

The availability of HAART has extended the lives of many people with HIV/AIDS & greatly reduced morbidity and death due to AIDS & related complications (6).However, morbidity and mortality related to HIV infection in the developing world remain unacceptably high, despite major advances in HIV therapy and increased international funding for care (14).

Poor nutritional status and food insecurity may hasten progression to AIDS; undermine adherence and response to antiretroviral therapy. Research shows that, within households affected by HIV, there is an increased risk of food insecurity as sick members are unable to

work, income declines, expenditure on health care increases and care-giving burdens increase (15).

The HIV epidemic has had a severe and wide ranging impact upon households in sub-Saharan Africa. Many families have lost their chief income earners, who have died, or are too sick to work. This puts a heavy financial burden on families who have to pay ever increasing medical costs, forcing many into poverty .The epidemic damages businesses through absenteeism, falls in productivity, labour force turnover, and the subsequent added costs to operations. Moreover, company costs for healthcare, funeral benefits and pension fund commitments rise as people take early retirement or die from AIDS-related illnesses .The total economic loss from HIV/AIDS worldwide is estimated at US $25 billion per year and rising (16).

Inadequate dietary intake to meet the increased metabolic demands associated with HIV infection is likely to affect nutritional status in PLWHA, further lowering their immunity and hastening disease progression hence increased morbidity and mortality (17).

In resource limited settings, many PLWHA lack access to sufficient quantities of nutritious foods, which poses additional challenges to the success of Anti Retroviral Therapy (ART) (18, 19).

A low BMI at the start of ART was an independent predictor of early mortality in the 1st 90 days of therapy in several analyses from sub-Saharan Africa (20).

Limited evidences exist that show the prevalence of malnutrition and identify associated factors among adult people on HAART in Ethiopia and no previous studies conducted at Hosanna ART clinics.

Therefore, this study explored magnitude of malnutrition and associated factors among adult people on antiretroviral therapy at ART clinic of hosanna town, Hadiya zone, Southern Ethiopia.

2. LITERATURE REVIEW

2.1 MALNUTRITION AND HIV/AIDS

Nutritional status is a major predictor of survival & functional status among people living HIV/AIDS. Nutritional problem may occur at any stage of the disease & can contribute to immune impairment, accelerate disease progression, increase the frequency & severity of opportunistic infections, & impede the effectiveness of medications (2).

Studies in SSA showed the association between malnutrition and mortality among HIV/AIDS patients which were receiving ART. In rural Malawi, Study have shown that individuals who are severely malnourished [body mass index (BMI) < 16.0 kg/m2] have been found to have six times higher risk of dying in the first 3 months of ART treatment than those with a normal nutritional status **(**21). In Zambia, patients who started ART with a BMI, 16.0 had 2-fold higher mortality when compared with those above this BMI threshold (22). In Tanzania, patients with a BMI, 16.0 at ART initiation had a mortality rate double that of patients with a BMI 18.5 (23).

A Study conducted in china among Hospitalized HIV/AIDS patients revealed malnutrition (BMI < 18.5 kg/m2) was 37.2% (24). Prevalence of malnutrition (BMI < 18.5 kg/m2) among Hospitalized AIDS patients hospitalized AIDS patients of a study done in Brazil was 43 %(25).

Southern Africa has the highest prevalence of undernourishment (37%), followed by East Africa (35%), Central Africa [30% (excludes Democratic Republic of the Congo)], and West Africa (14%) (10).

In Ethiopia, magnitude of under nutrition (BMI < 18.5 kg/m2) in Gondar University Hospital among adult PLWHA on ART in 2007 was (27.8%) (26), in St. Peter Hospital in Addis Ababa in 2008 was (25%) (27), in Bahir Dar Felege Hiwot Referral Hospital among HIV/AIDS clients who was 25.5% (28) and in Dilla University referral Hospital among PLWHA revealed the overall prevalence of malnutrition (BMI < 18.5 kg/m2) was 12.3% (29).

2.2 FACTORS ASSOCIATED WITH MALNUTRITION AMONG ADULT PLWHA ON HAART

2.2.1 SOCIO DEMOGRAPHIC, LIFE STYLE AND ECONOMIC FACTORS

A study conducted in Dilla University referral Hospital among adult people on HAART revealed that the prevalence of malnutrition was increased when the age of the study subjects was increased and women were more likely develop malnutrition than men. Likewise, in the same study proportion of malnutrition was higher (23.7%) among unemployed group compared to those employed (8.1%). moreover, a greater number of malnourished subjects were found in the group of widowed (19.1%) marital status; moderately poor economic status was protective for malnutrition (29). The prevalence of overall under nutrition (BMI < 18.5 kg/m2) among women on HAART at Humera Hospital, Ethiopia was 42.3% (30).

Moreover, a study conducted among PLWHA attending Care and Treatment Clinics in Ilala district, Dar es Salaam revealed the type of persons the client was living with and the habit of drinking alcohol was predictors of under nutrition (31).Regular physical exercise and avoiding drinking alcohol can improve nutritional status of PLWHA (32).Lifestyle habits such as smoking, alcohol, and drug abuse, and their detrimental effects on food intake, absorption, and use (3).

2.2.2 HEALTH CARE RELATED FACTORS

A study conducted in Felege Hiwot Referral Hospital revealed eating difficulties 2 weeks prior to the survey, duration ART for less than 12 months and gastro intestinal symptoms two weeks prior to the survey were independent predictors of malnutrition (28).

Moreover, a study conducted in Dilla University referral Hospital among adult people on HAART showed that WHO clinical stage four, poor adherence to HAART in the past six month, number of previous opportunistic infections and gastrointestinal symptoms (GIS) has significant effect on the likelihood of malnutrition development (29). A study done in Uganda showed HIV PLWHA taking ART at WHO clinical stage four characterized by sever wasting (chronic fever, chronic diarrhea and weight loss greater than 10% from base line(33).Moreover, similar finding exist in Kenya (34).

2.2.3 HOUSEHOLD FOOD INSECURITY

A study conducted at Jimma University specialized hospital, Southwest Ethiopia revealed that 63.0% of PLWHA on HAART were food insecure (35). A study conducted in Humera Hospital, Ethiopia, revealed clients who were food insecure are1.85 times more likely to be malnourished than those who were food secure (30). PLWHA on ART those who were food insecure were more likely to be undernourished it is from a study done in Kenya (34).

2.2.4 DIETARY FACTORS

A study conducted in Humera Hospital showed that nutritional support was independent predictor of under-nutrition However, a study done in Haiti done demonstrated that food assistance among PLWHA on ART significantly improved their BMI (30).

People who were taking inadequate diversified food were more likely to be malnourished than those who were taking adequate diversified food (30). A study conducted in Mozambique showed increased diversified associated with increased BMI (36).

A study conducted in Dire Dewa showed increased in meal frequency was associated with increased BMI (37).PLWHA have more energy requirement than uninfected persons. They should take at least 2 snacks during the day and 3 major meals (38).

Nutrition counselling can improve health outcomes and is an integral part of HIV care at any stage of the disease, from helping newly infected people to stay healthy to assisting people taking ARVs to manage their therapy(6).

The above review of different research studies on malnutrition among adult people on HAART has given an important insight into the factors influencing malnutrition. But none of the studies done earlier has made an attempt to assess the prevalence of malnutrition and factors associated with it among adult people on HAART at ART clinics of Hosanna town.
The present study aims to fulfil the gap that exists in the literature on the magnitude of malnutrition among adult people on HAART at ART clinics of Hosanna town.

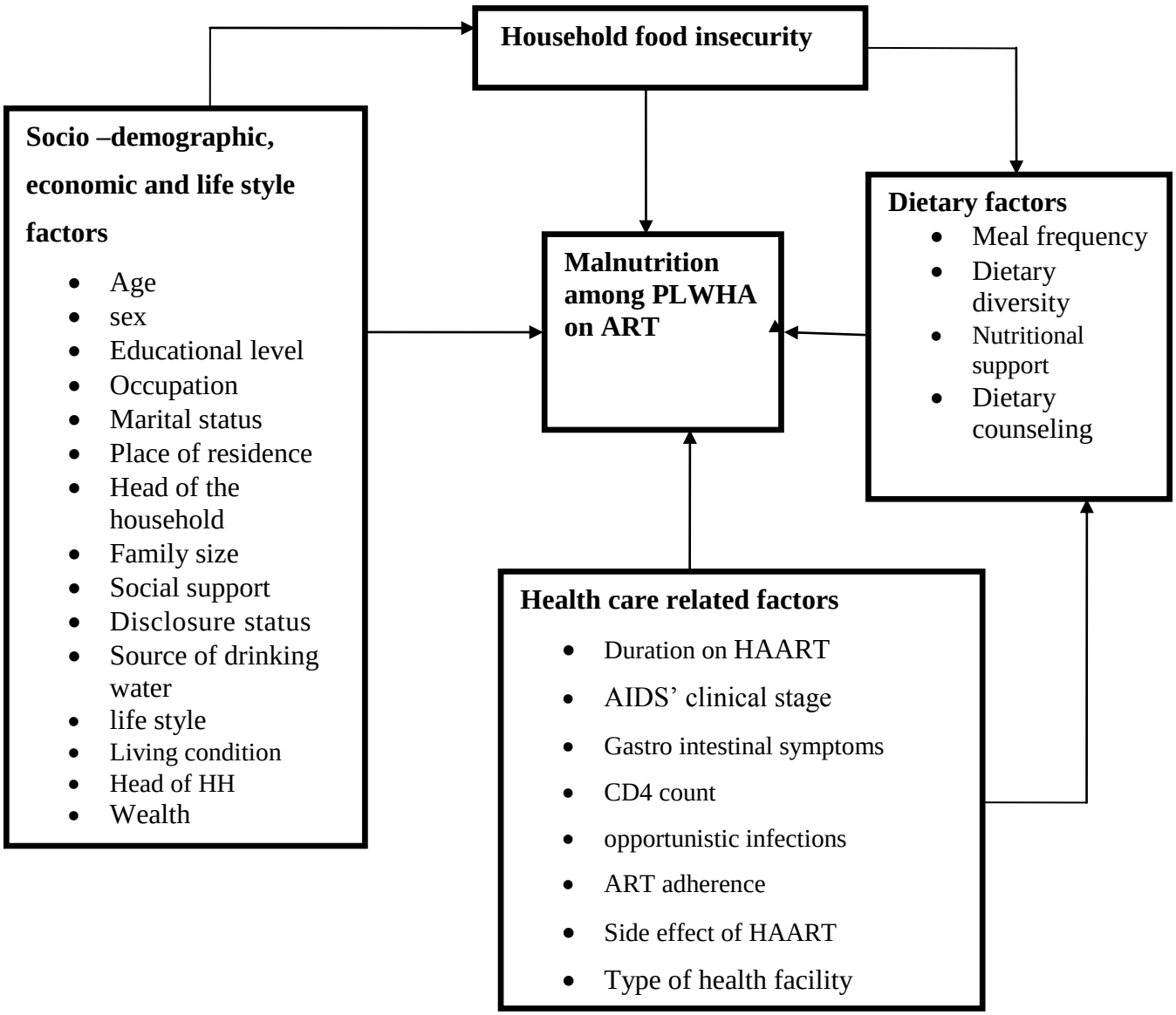

Figure 1 Conceptual framework of factors associated with malnutrition among **a**dult people on ART (adapted after reviewing different literatures)

2.3 SIGNIFICANCE OF THE STUDY

Malnutrition is the major challenge in HIV care and support interventions even in HAART era since it compromise the efficacy of antiretroviral drug treatment.

Addressing gaps in nutrition among people living with HIV/AIDS is essential because nutrition plays a vital role in the care and management of HIV/AIDS as it is intrinsically linked to immune function.

Previous studies conducted in Ethiopia only focused on clinical factors and didn't include some important factors such as dietary factors and food insecurity which may determine nutritional status among people living with HIV/AIDS on HAART. This study explored issues that are not well addressed in Ethiopia; which are the association between food insecurity, dietary factors and malnutrition among adult people on HAART at Hossana ART clinics.

The results of this study will help health authorities and other concerned bodies to design nutritional interventions to improve the health status of people infected with HIV and this contribute to combat HIV/AIDS (MDG6).

Further, the study can provide base line information for other studies and the information obtained can strengthen HIV/AIDS continuum of care.

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3. OBJECTIVE OF THE STUDY

GENERAL OBJECTIVE

- To determine magnitude of malnutrition and identify factors associated with it among adult people on HAART at ART clinics of Hosanna town.

SPECIFIC OBJECTIVES

- To determine magnitude of malnutrition among adult people on HAART at ART clinics of Hosanna town during the study period
- To identify factors associated with malnutrition among adult people on HAART at ART clinics of Hosanna town during the study period

4. METHODS AND MATERIALS

4.1 THE STUDY SETTING AND PERIOD

The study was conducted from March 20 to April 30/ 2014 in Hosanna town, which is 230 km far from Addis Ababa in the south west direction and 168 km far from Hawassa, the regional city of SNNPR in North West. According to 2007 census report and as projected in 2011 the total population is 92733 with total number of male 45,875 and female 46,858. The total number of households is 18,925 according to HEWs numbering report. There are only two ART clinics in the town at Nigist Elenie memorial Hospital and Hosanna health centre. A total of 3773 clients were present on pre ART and ART care units at the two ART clinics.

4.2 STUDY DESIGN

- Facility based cross sectional study was conducted among adult people on HAART at ART clinics of Hosanna town.

4.3 POPULATION

4.3.1 SOURCE POPULATION

- ✓ The source population was all adult people who are enrolled in highly active anti-retro viral therapy at ART clinics of Hosanna town.

4.3.2 STUDY POPULATION

- ✓ The study population was selected adult people on antiretroviral therapy at ART clinics of Hosanna town during the study period that fulfills the inclusion criteria.

4.3.1 INCLUSION AND EXCLUSION CRITERIA

INCLUSION CRITERIA

- ✓ Willingness to participate and age of 18 years and more

EXCLUSION CRITERIA

The following subjects were excluded from the study.

- ✓ Seriously ill and un-able to get through the interview.
- ✓ Age less than 18.
- ✓ Pregnant women were excluded from the study since weight gain during pregnancy introduces bias.

4.4 SAMPLE SIZE DETERMINATION & SAMPLING PROCEDURE

4.4.1 SAMPLE SIZE DETERMINATION

The required sample size was determined using single population proportion formula,

$$\mathbf{n} = \frac{\left(\mathbf{Z}_{\left(\frac{\alpha}{2}\right)}\right)^{2} \mathbf{P}\,(\mathbf{1}-\mathbf{P})}{\mathbf{d}^{2}}$$

considering the following assumptions: **p=27.8%** (proportion of malnourished People on HAART) (26), **Zα/2** is the value of the standard normal distribution corresponding to a significant level of alpha **(α)** of **0.05**, which is **1.96** and desired degree of precision (d) of **5%**, the computed sample size was 309 and by adding **10%** non response rate, the total sample size computed was **340.**

4.4.2 SAMPLING PROCEDURE

Before data collection a list of eligible ART clients were identified from ART data base. According to the total number of ART clients in each clinic, proportionate number of sample clients was assigned for each ART clinics. Study participants were selected by simple random sampling technique using random number computer generation method.

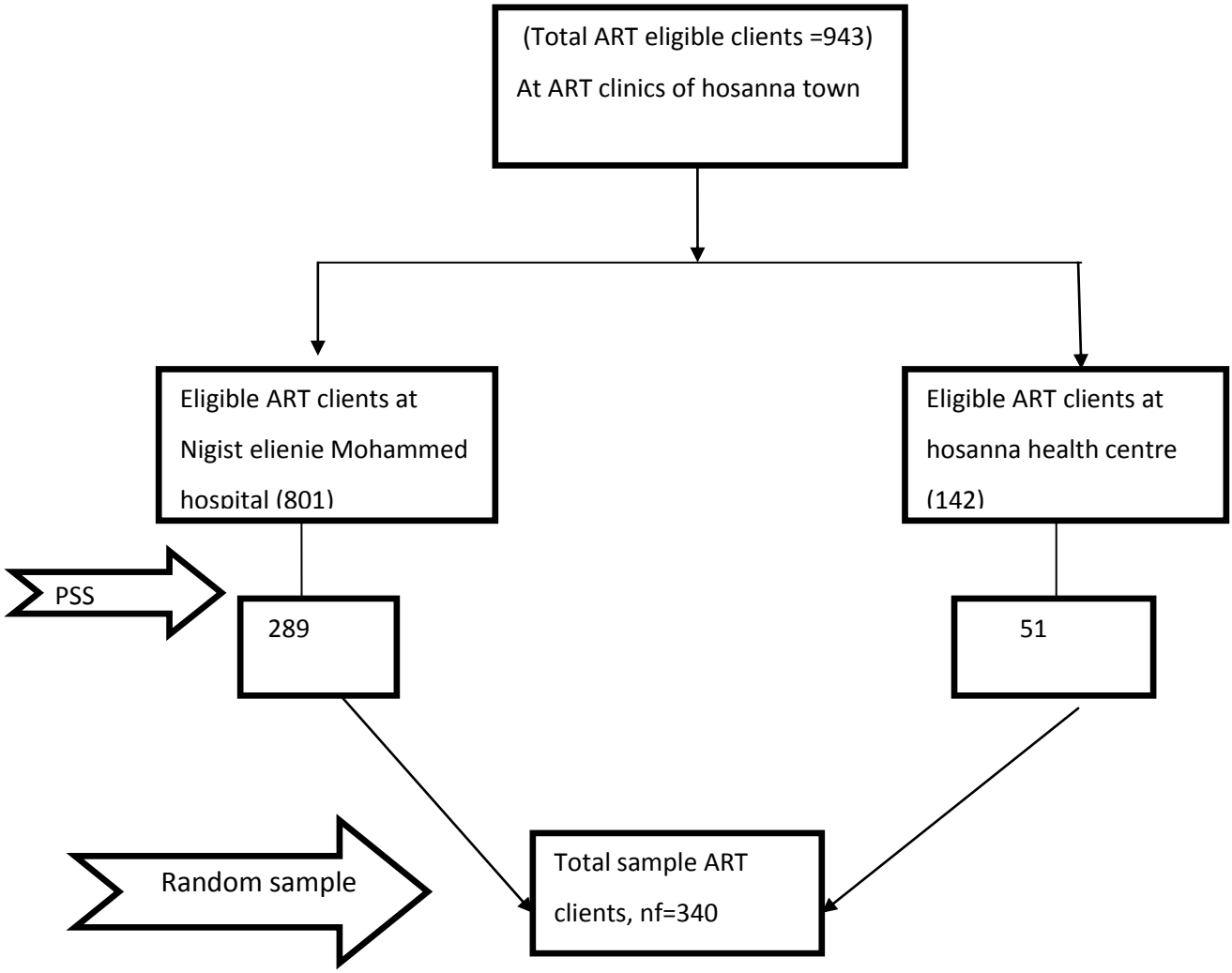

Figure 2 Schematic presentation of the sampling procedure

4.6 STUDY VARIABLES

4.6.1 Dependent variable

- Malnutrition (BMI < 18.5kg/m2).

4.6.2 Independent variables

- **SOCIO DEMOGRAPHIC ,LIFE STYLE AND ECONOMIC FACTORS**

- Age
- Sex
- Occupation
- Educational level
- Place of residence
- Social support
- Disclosure status
- Marital status
- Family size
- Head the household
- Source of drinking water
- life style
- living condition
- Wealth

HOUSEHOLD FOOD INSECURITY

DIETARY FACTORS

- Dietary diversity
- Meal frequency
- Nutritional support
- Dietary counseling

HEALTH CARE RELATED FACTORS

- AIDS' clinical staging
- CD4 count
- Duration of HAART

- Gastro intestinal symptoms
- opportunistic infections
- Side effect of HAART
- ART adherence
- Type of health facility

4.5 DATA COLLECTION INSTRUMENT AND PROCEDURES

Data were collected using face to face interview, record review and anthropometric measurements. Four ART adherence counsellors as data collectors and one health officer as supervisor were recruited.

Socio-demographic and lifestyle factors: age, sex, residence, employment status, educational level, occupation, source of drinking water, marital status, head of the house hold, social support ,disclosure status ,life style and family size was collected using pre-tested structured questionnaire.

Economic status: Data were collected on ownership of selected assets, such as television, radio, livestock, etc. to measure wealth index.

Health care related factors: gastrointestinal symptoms' in the last two weeks and adherence in the last month were collected using pre-tested structured questionnaire while, side effect of ART, duration of ART, opportunistic infections (OIs) and CD4 cell count in the past 6 months and AIDS' clinical stage was collected from record using check list.

Individual Dietary Diversity Score (IDDS): a record of the 24 hour recall of all food groups eaten by the respondents was taken and classified into the 12 food groups using the FAO/Nutrition and Consumer Protection Division recommended questionnaire (39).

For meal frequency daily eating occasions over the 24-hour period was asked and recorded (37).

Nutritional counselling and nutritional support was collected using pre-tested structured questionnaire.

Food Insecurity was assessed by using a short version of the Household Food Insecurity Access Scale (HFIAS) developed by the Food and Nutrition Technical Assistance (FANTA) project. Occurrence questions relate to three different domains of food insecurity will be used. I. Anxiety and uncertainty about the household food supply. II. Insufficient quality

(includes variety and preferences of the type of food). iii. Insufficient food intake and its physical consequences. Each of the questions is asked with a recall period of four weeks (30 days). The respondent is first asked an occurrence question that is, whether the condition in the question happened at all in the past four weeks (yes or no). If the respondent answers "yes" to an occurrence question, a frequency-of-occurrence question will be asked to determine whether the condition happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) in the past four week (41).

Anthropometric measurement consists of client's weight and height. Participants' weight was measured by seka weight scale calibrated to 0.5 kg after removing heavy clothes. Participants' height was measured using seka measuring rod calibrated to 0.5 cm. Participants were take off their shoes, stand erect, and look straight in horizontal plain to measure their Height(40).

4.8 DATA PROCESSING AND STATICAL ANALYSIS

Data was edited, coded and entered in to Epi data 3.1 and exported to SPSS window version 16.0 for analysis. Further, data cleaning (editing, recoding, checking for missing values, and outliers) was made after exported to SPSS.

The data analysis ranges from the basic description to the identification of potential predictors of malnutrition. Bi-variate analysis and multivariable logistic models was used to show the relation between malnutrition and various associated factors.

The basic descriptive summaries of patients' characteristics and outcome of interest was computed. Accordingly, simple frequencies, measure of central tendencies and measure of dispersions were computed.

Finally, all explanatory variables that results ($P < 0.25$) with the outcome variable were entered in to multivariable logistic regression model using backward likely hood ratio method to identify independent predictor of malnutrition. P-value < 0.05 was considered as statistically significant and odds ratio at 95% confidence interval is used to examine the precision and strength of association.

Body mass index (BMI): was calculated as weight in kilograms divided by the square of height in meters (kg/m2).

Dietary diversity: was computed and dichotomized into two categories; which is low dietary diversity score and high dietary diversity score. The calculated chronbach's alpha was 0.73.

Food security status: was computed and dichotomized into two categories; which is food insecure and food secure. The calculated chronbach's alpha was 0.88.

Wealth analysis: initially, reliability test was performed using the economic variables involved in measuring the wealth of the households. The calculated Chronbach's alpha was 0.79. The variables which were employed to compute the alpha value were entered in to the principal component analysis.

At the end of the principal component analysis, the wealth index was obtained as a continuous scale of relative wealth. Finally, tercile of the wealth index were created to see the association with malnutrition.

4.9 DATA QUALITY CONTROL

The questionnaire was adapted from previous literatures & modified in to the study context. It was prepared first in English and translated into Amharic, and then retranslated back to English by an expert who is fluent in both languages to maintain its consistency.

Training was given for data collectors and supervisor on objective of the research, how to collect the data through interviewing approach, anthropometric measurement and data recording. During the training, the trainer was demonstrated how to take anthropometric measurements and the trainee was demonstrated it in front of the trainer using small sample of clients.

Pre testing of the questionnaire was made on 17 ART care clients in the nearby wereda health centre a week prior to the actual survey. Consequently, based on the feedback obtained from the pre-test, questions which need clarification revised.

Daily the data was strictly revised for completeness, accuracy and clarity by the supervisors and principal investigator. In addition, the data were thoroughly cleaned and carefully entered in to computer using Epi data version 3.1 using double entry verification.

Weight of participants was taken using standard beam balance and the scale was checked at zero before and after each measurement. And also, height measurement of participants was taken using the standard measuring scale.

4.10 ETHICAL CONSIDERATION

Prior to data collection, ethical approval were obtained from ethical review committee of Jimma University, College of Public Health and medical sciences and submitted to Hadiya zone Health Bureau, Nigist Elienie Mohammed Hospital ,hosanna health centre administrators and other concerned bodies to obtain their co-operation. Verbal consent was taken from each participant after the purpose of the study explained. They were told to withdraw at any time from responding to questions if they are not interested to respond. Participants were informed that all the data obtained from them will be kept confidential using codes instead of any personal identifiers.

4.11 PLAN OF DISSEMINATION & UTILIZATION OF RESULT

After the data analyzed, based on the findings obtained, conclusions and recommendations was made. Then the result of the study was submitted to the college of public health and medical science (JU), Hadiya zone health office and Wachamo University. The result will be presented during thesis defence, as a partial fulfilment of MPH in general public health. Finally, attempts will be made to present the results on scientific conference and to publish the results of the study on peer reviewed journal.

4.7 OPERATIONAL DEFINITIONS

Dietary diversity is the number of reported different foods and food groups consumed over a 24-hour period (39).

Malnutrition: refers to under- nutrition body with mass index (BMI) < 18.5kg/m2) (40).

Mild Malnutrition: refers to BMI between 17.0-18.49kg/m2.

Moderate malnutrition: refers to BMI between 16.0-16.99 kg/m2.

Severe Malnutrition: refers to BMI < 16 kg/m2.

Normal nutrition: refers to BMI between18.5-24.99 kg/m2.

Overweight/obese: refers to BMI >=25 kg/m2.

Foods secure: if experiences none of the food insecurity (access) conditions, or just experiences worry, but rarely (41).

Food insecure: .if the family experiences any of the conditions (uncertainty, insufficient quality and quantity of food) within the recall period. If the answer to any of the questions is "rarely," "sometimes," or "often" The only exception was among households in which the respondent's answer to question 1 was "rarely" but the response to all the other questions was "never") (41).

Low dietary diversity is a score lower than four diversified food.

High dietary diversity is a score greater or equal to four diversified food.

Meal frequency is the number of reported daily eating occasions over the 24-hour period (36).

Low meal frequency: refers to meal score less than four.

High meal frequency: refers to meal score greater than equal to four.

Wealth Index is a composite measure of the cumulative living standard of a household.

Social support: refers to getting money/food aid /home care.

Good adherence ART clients are considered good adherent when they take medication prescribed (ART drugs) for greater than 95% of the time.

5. RESULTS

5.1 SOCIO-DEMOGRAPHIC, ECONOMIC AND LIFESTYLE CHARACTERISTICS

A total of 330 adult PLWHA taking ART were participated in the study giving a response rate of 97.1%.The rest 2.9% were excluded because of incomplete information.

Out of 330 participants, female accounts 214(64.8%). The mean age of respondents was 34.78(SD: 9.42) and 135(40.9%) of them were in the age range of (30-39).Majority of respondents 215(65.2%) living in urban. Two hundred (60.6%) of them headed by male, and only 93(28.2%) of them live with a family size of greater than or equal to five. Out of 330 participants, one hundred sixty six (50.3%) were married, and fifty one (15.5%) windowed. Regarding educational status, 149(45.2%) completed grade 1-8, and 102(30.9%) completed grade 9-12.Concerning their occupation, about one fourth 87(26.4%) of respondents were unemployed, and 69(20.9%) were self employed. Majority of respondents, 193(58.5%) were from ethnic group Hadiya, and 196(59.4%) were followers of protestant religion. Only 48(14.5%) of them got social support (Table 1).

Concerning their living condition, 161(48.8%) of individuals living with their spouse and 38(11.5%) were living alone. One hundred ninety eight (60%) of respondents did disclose their HIV status. Majority 269(87.6%) of respondents were got drinking water from pipe water (public and private tap) (Table 2).

Regarding wealth status, 124 (37.6%) of individuals were poor (Table 2).

Regarding life style conditions only: 7(2.1%) of individuals were smoking cigarette; 15(4.5%) of individuals were doing physical exercise; 12(3.6%) of individuals were chewing chat; and 10(3%) of individuals were drinking alcohol (Table 2).

Table 1 Socio demographic, economic and life style characteristics of respondents taking antiretroviral therapy at ART clinics of Hossana town, Hadiya zone, South Ethiopia, from March 20 to April 30/2014.

Characteristics	**Category**	**Number (%)**
Sex of the participant	Male	116 (35.2)
	Female	214(64.8)
Age category	18-29	103(31.2)
	30-39	135(40.9)
	40-49	63(19.1)
	> =50	29 (8.8)
Place of residence	urban	215(65.2)
	Rural	115(34.8)
Marital status	married	166(50.3)
	Single	77(23.3)
	Divorced	36(10.9)
	Windowed	51(15.5)
Educational level	can't read and write	34(10.3)
	Can read and write	14(4.2)
	Grade 1-8	149(45.2)
	Grade 9-12	102(30.9)
	College and above	31(9.4)
Religion	protestant	196 (59.4)
	Orthodox	87(26.4)
	Muslim	38(11.5)
	Others*	9 (2.73)
Ethnic group	Hadiya	193(58.5)
	Kenbata	32 (9.7)
	Amhara	50(15.2)
	gurage	29(8.8)
	Others**	26(7.9)
Occupation	farmer	61(18.5)
	Government employed	61(18.5)
	Self employed	69(20)
	Unemployed	87(26.4)
	Others+	52(15.8)
Head of the house hold	Male	200(60.6)
	Female	130(39.4)
Family size	<=5	237(71.8)
	>5	93(28.2)

*Adventist (1), catholic(8) + daily labor(25),house wife (27)
**Silte (21), Oromo (10), Tigre (5) and wolayta (16)

Table 2 Socio demographic, economic and life style characteristics of respondents taking antiretroviral therapy at ART clinics of Hossana town, Hadiya zone, south Ethiopia, from March 20 to April 30/2014

Characteristics	**Category**	**Number (%)**
Social support	yes	48(14.5)
	No	282(85.5)
Disclosure status	yes	198(60)
	No	132(40)
Living condition	alone	38(11.5)
	With parents	120(36.4)
	With relative	11 (3.3)
	With spouse	161(38.8)
Source of drinking water	private tap	223(67.6)
	Private well	24(7.3)
	Public tap	66(20
	Others+	17(5.2)
Wealth status	poor	124(37.6)
	Middle	103(31.2)
	Rich	103(31.2)
Smoking cigarette	yes	7 (2.1)
	No	323(97.9)
Doing physical exercise	yes	15(4.5)
	No	315(95.5)
Chewing chat	Yes	12(3.6)
	No	318(96.4)
Drinking alcohol	Yes	10(3)
	No	320(97)

+ Spring (10) & river (7)

5.2 HEALTH CARE RELATED FACTORS

Out of 330 respondents, 279(84.5%) of them were receiving care and treatment at the Hospital. Larger proportion of the respondents 248(75.2%) were following ART care for more than twelve months (Table 3).

Regarding to gastro intestinal symptoms, 139(42.12%) of them faced a gastro intestinal symptoms during the past two weeks before the survey. Concerning to opportunistic infections, 133(40.3%) were diagnosed with opportunistic infections during the past six month before the survey. Among these 31(23.30%) were diagnosed with tuberculosis, 78(58.60%) were diagnosed with oral candidiasis and 60(45%) were diagnosed with diarrhea during the past six month before the survey. Fifty five (16.7%) respondents faced side effect of ART during the past two weeks before the survey. Regarding to clinical staging, 17(5.15%) were at stage four and one hundred six (32.12%) were at stage three during the survey (Table 3).

Larger proportion (85.5%) of respondents had good adherence to ART during the past one month before the survey. However, 14(4.2%) individuals had poor adherence to ART.
Out of 330 respondents, 44(13.3%) had CD4count < 200 cells/µl, 103(31.2%) had CD4 count 200-350 cells/µl, and 183(55.5%) had CD4 count>350 cells/µl during the past six month before the survey (Table 3).

Table 3 Health care related characteristics of respondents taking antiretroviral therapy at ART clinics of Hossana town, Hadiya zone, South Ethiopia, from March 20 to 30/April 2014.

Characteristics	Category	Number (%)
Type of health facility	Hospital	279(84.5)
	Health centre	51(15.5)
Gastro intestinal symptoms	yes	139 (42.12)
	No	191(57.88)
Opportunistic infections	yes	133(40.3)
	No	197 (59.7)
Tuberculosis	yes	31(9.39)
	No	299(90.61)
Oral candidiasis	yes	78(23.64)
	No	252(76.36)
Chronic diarrhea	yes	60(18.18)
	No	270(81.82)
Side effect of ART	yes	55(16.7)
	No	275(83.3)
Adherence to ART	good	282(85.5)
	Fair	34(10.3)
	Poor	14(4.2)
Clinical staging	I	70(21.21)
	II	137(41.52)
	III	106(32.12)
	IV	17(5.15)

5.3 DIETARY CHARACTERISTICS OF RESPONDENTS

Majority of respondents, 271(82.1%) didn't get nutritional support and 209(63.3%) of them were counselled about dietary feeding (Table 4).

Out of 330 participants, larger proportion of the respondents (67.9%) had inadequate diversified food and (84.2%) had low meal frequency score with in the 24 hour dietary recall period (Table 4).

Table 4 Dietary characteristics respondents taking antiretroviral therapy at ART clinics of Hossana town, Hadiya zone, South Ethiopia, from March 20 to April 30/2014.

Characteristics	Category	Number (%)
Nutritional support	yes	59 (17.9)
	No	271(82.1)
Dietary counseling	yes	209(63.3)
	No	121(36.7)
Meal frequency score	low	278(84.2)
	High	52(15.8)
Dietary diversity score	inadequate	224(67.9)
	Adequate	106(32.1)

Out of 330 participants, larger proportions of the respondents (68.5%) were food insecure

(Fig 3)

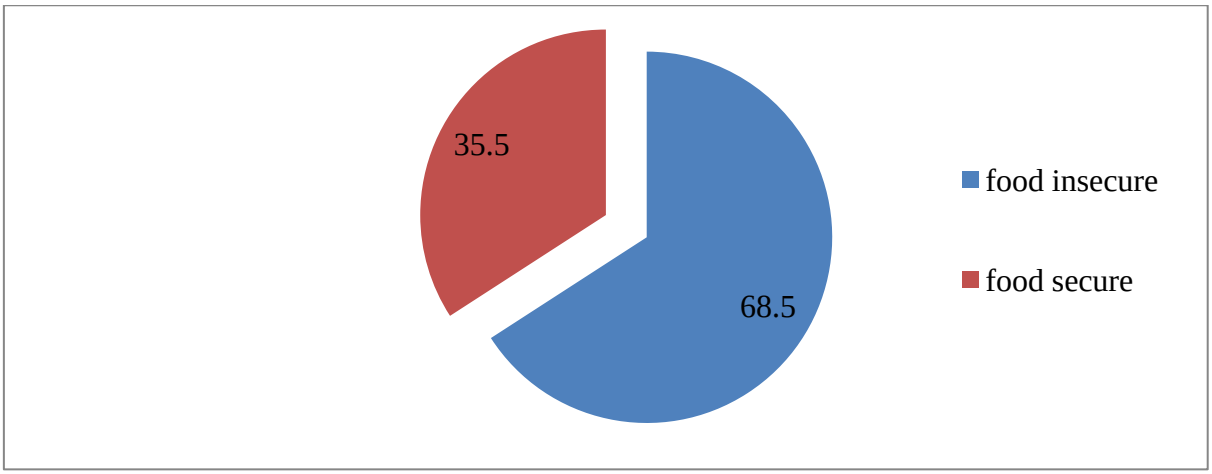

Figure 3 Food security status of respondents taking antiretroviral therapy at ART clinics of Hossana town, Hadiya zone, South Ethiopia, from March 20 to April /30

5.4 PREVALENCE OF MALNUTRITION AMONG PEOPLE ON HAART

Overall, the prevalence of malnutrition with (BMI < 18.5kg/m2) in this study was (31.2 %).Female were most affected (18.79%).Out of 103 malnourished individuals, 6(5.83%) were severely malnourished, 18(17.48%) were moderately malnourished, and 79(76.69%) were mildly malnourished (fig 4).The mean BMI of the respondents was 20.24 with SD of ±2.57.

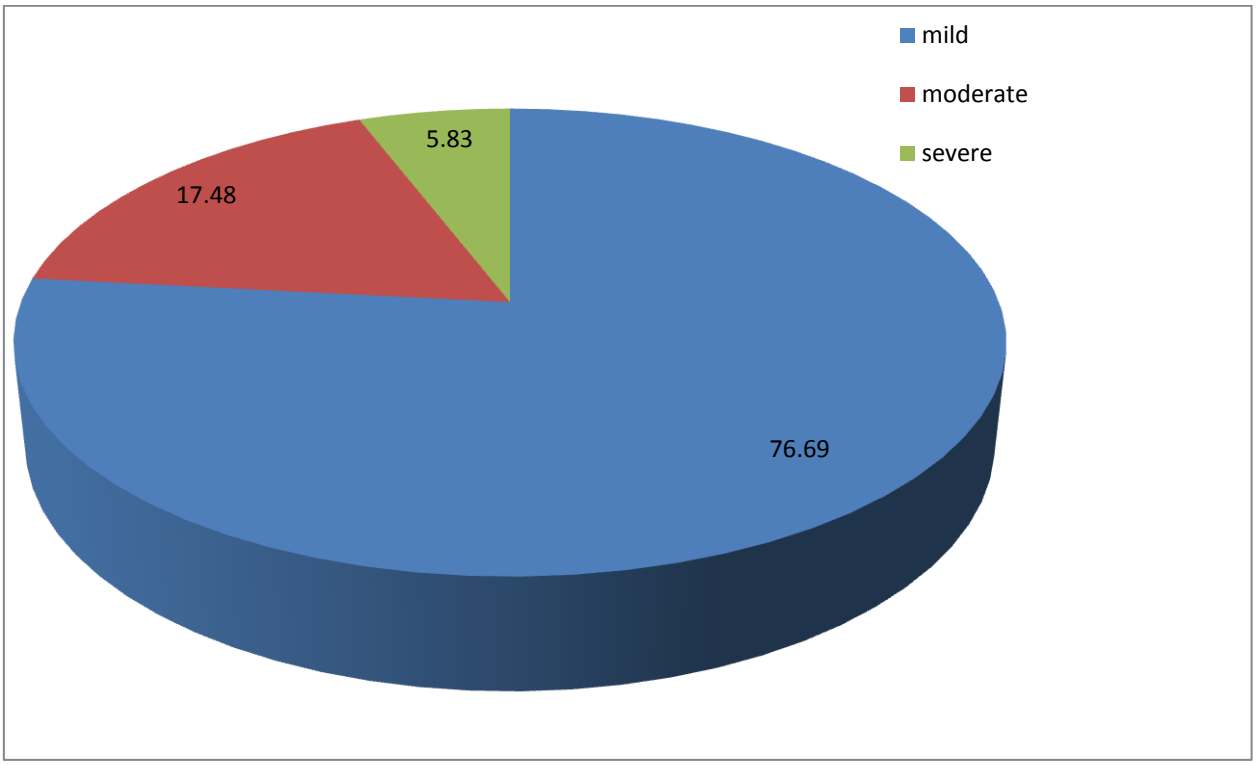

Figure 4 Degree of malnutrition among PLWHA on HAART at ART clinics of Hossana town, Hadiya zone, South Ethiopia, from March 20 to April 30/2014.

5.5 FACTORS ASSOCIATED WITH MALNUTRITION AMONG INDIVIDUALS RECEIVING HAART

In bivariate analysis, place of residence, occupation, gastrointestinal symptoms, OIS (tuberculosis, oral candidiasis, diarrhea, etc), clinical staging, duration of therapy, adherence,CD4 level, nutritional support, meal frequency score, dietary diversity score, and food insecurity were associated with malnutrition (p-value<0.05); but other variables such as sex, educational level, age, marital status, head of household, family size, source of drinking water, living condition, social support, disclosure status, family size, wealth, lifestyle factors ,type of health facility, and dietary counselling were not associated with malnutrition(Table 5 and 6).

During bivariate analysis, 23 factors had p-value<0.25 with malnutrition. Regression diagnostic procedures were carried out under linear regression by collinearity diagnostics and some variables were excluded before entering to multivariable model because of multi-co linearity effect. The effects were source of drinking water with place of residence, OIS with candidiasis, diarrhea and gastrointestinal symptoms. Source of drinking water, candidiasis, diarrhea and gastrointestinal symptoms were dropped by considering their theoretical importance versus the retained one. Variables did not meet the assumption of X^2-tests were excluded for multi variable analysis. The variables were alcohol drinking and physical exercises.

Table 5 Bivariate analysis predicting malnutrition among PLWHA taking anti retroviral therapy at ART clinics of Hossana town, Hadiya zone, South Ethiopia, from March 20 to April 30/2014.

Factors	**Categories**	**MALNUTRITION**		**Crude OR(95%CI)**
		Yes	**No**	
		N (%)	**N (%)**	
Sex	Male	41(39.81)	75(33.04)	1
	Female	62(60.19)	152(66.96)	0.75(0.46, 1.208)+
Age category	18-29	34(33)	69(30.41)	1
	30-39	37(35.92)	98(43.17)	0.77(0.44,1.34)
	40-49	22(21.36)	41(18.06)	1.09(0.56,2.12)
	> =50	10(9.71)	19(8.37)	1.07(0.45,2.55)
Residence	urban	56(54.37)	159(70.04)	1
	rural	47(45.63)	68(29.96)	1.96(1.21,3.17)*
Occupation	Farmer	27(26.21)	34(14.98)	2.16(0.97,4.77)
	Government employed	12(11.65)	49(21.59)	0.66(0.28,1.6)
	Self employed	12(11.65)	57(25.10)	0.57(0.24,1.37)
	unemployed	38(36.89)	49(21.59)	2.11(0.99,1.37)+
	Others	14(13.60)	38(16.74)	1
Source of drinking water	private tap	61(59.22)	162(71.36)	1
	private well	9(8.74)	15(6.61)	1.59(0.66,3.83)+
	public tap	25(24.27)	41(18.07)	1.62(0.91,2.88)
	Others	8(7.77)	9(3.96)	2.36(0.87,6.39)
Wealth status	poor	36(34.96)	88(38.77)	1.1(0.61,1.96)
	middle	39(37.86)	64(28.19)	1.63(0.91,2.94)+
	rich	28(27.18)	75(33.04)	1
Living condition	alone	18(17.48)	20(8.81)	2.12(1.03,4.36)*
	With parents	34(33.01)	86(37.89)	0.93(0.55,1.57)
	With relatives	3(2.91)	8(3.52)	0.88(0.23,3.47)
	With spouse	48(46.60)	113(49.78)	1
Social support	yes	19(18.45)	29(12.78)	1
	no	84(81.55)	198(87.22)	0.65(0.34,1.22)+

+p value <0.25 ***p value <0.05**

Table 6 Bivariate analysis predicting malnutrition among PLWHA taking anti retroviral therapy at ART clinics of Hossana town, Hadiya zone, South Ethiopia, from March 20 to April 30/2014.

Factors	**Categories**	**MALNUTRITION**		**Crude OR(95%CI)**
		YES	**NO**	
		N (%)	**N (%)**	
GIsymptoms	no	43(41.75)	148(65.19)	1
	yes	60(58.25)	79(34.81)	2.61(1.62,4.21)*
OIS	no	38(36.89)	159(70.04)	1
	yes	65(63.11)	68(29.96)	4(2.45,.53)*
Tuberculosis	no	82(79.61)	217(95.60)	1
	yes	21(20.39)	10(4.40)	5.56(2.51,12.30)*
Candidiasis	no	55(53.40)	197(86.78)	1
	yes	48(46.62)	30(13.22)	5.73(3.32,9.89)*
Diarrhea	no	71(68.93)	199(87.67)	1
	yes	32(31.07)	28(12.33)	3.20(1.80,5.69)*
Clinical staging	I	8(7.77)	62(27.31)	1
	II	36(34.95)	101(44.49)	2.76(1.21,6.33)*
	III	51(49.51)	55(24.23)	5.18(3.14, 16.46)*
	IV	8(7.76)	9(3.96)	6.89(2.1, 22.96)*
ART duration(month)	<=12	39(37.86)	43(18.94)	1
	>12	64(62.14)	184(81.06)	0.38(.23, .64)*
CD4 level	<200/ul	22(21.36)	22(9.69)	3.69(1.85, 7.35)*
	200-350/ul	42(40.78)	61(26.87)	2.54(1.50, 4.31)*
	>350/ul	39(37.86)	144(63.44)	1
Nutritional support	yes	29 (28.16)	30 (13.22)	1
	No	74 (71. 84)	197(86.78)	0.39(.22, .69)*
Meal frequency score	low	97 (94.17)	181(79.74)	1
	high	181(79.74)	46 (20.26)	0.24(.10, .60)*
Dietary diversity score	Inadequate	85 (82.53)	139(61.23)	1
	Adequate	18 (7.47)	88 (38.77)	0.33(.19, .59)*
Food security	Food secure	18 (17.47)	86 (37.88)	1
	Food insecure	85(82.53)	141(62.12)	2.88(1.62, 5.12)*

Out of 23 variables, 17 variables were entered to multivariable regression model by backward likely hood ratio method. Multivariable logistic regression analysis confirmed low meal frequency, inadequate dietary diversity, clinical staging three and four, opportunistic infections, nutritional support and food insecurity as potential predictor for malnutrition while controlling other covariates (Table 7).There was no interaction effect between the potential predictor variables.

Table 7 Multivariable logistic regression models predicting malnutrition (BMI < 18.5kg/m2) among PLWHA taking anti retroviral therapy at ART clinics of Hossana town, Hadiya zone, South Ethiopia, from March 20 to April 30/2014.

		MALNUTRITION (BMI < 18.5kg/m2)			
Factors	**category**	Yes **N (%)**	No **N (%)**	**COR (95%CI)**	**AOR(95%CI)**
Nutritional support	yes	29 (28.16)	30 (13.22)	1	1
	No	74 (71. 84)	197(86.78)	0.39(0.22, 0.69)*	0.45(0.23, 0.89)*
OIS	No	38(36.89)	159 (70.04)	1	1
	yes	65 (63.11)	68 (29.96)	4.00(2.45, 6.53)*	2.62(1.49, 4.59)*
Clinical stage	Stage-I	8 (7.77)	62 (27.31)	1	1
	Stage-II	36 (34.95)	101 (44.49)	2.76(1.21,6.33)*	2.1(.0.86, 5.1)
	Stage-III	51(49.51)	55 (24.23)	5.18(3.14, 16.46)*	3.91(1.57, 9.73)*
	Stage-IV	8 (7.76)	9(3.96)	6.89(2.1, 22.96)*	5.23(1.42, 19.35)*
Meal frequency	low	97 (94.17)	181(79.74)	1	1
	High	6 (5.83)	46 (20.26)	0.24(0.10, .60)*	0.29(0.11,0 .76)*
Dietary diversity	Inadequate	85 (82.53)	139(61.23)	1	1
	Adequate	18 (7.47)	88 (38.77)	0.33(0.19,0 .59)*	0.44(0.23,0 .84)*
Food security	Food secure	18 (17.47)	86 (37.88)	1	1
	Food insecure	85(82.53)	141(62.12)	2.88(1.62, 5.12)*	2.51(1.31, 4.81)*

* P value <0.05

WHO clinical stages had significant effect on the likelihood of malnutrition development. Individuals at clinical stage four were more than five times likely malnourished than those at stage one (AOR= 5.23, 95% CI: 1.42- 19.35). Individuals at clinical stage three were 3.91 times more likely malnourished than those at stage one (AOR=3.91, 95% CI: 1.57, 9.73).

Individuals who were diagnosed with OIS during the past six weeks were more than two times likely to be malnourished than not infected with OIS (AOR= 2.62, 95% CI: 1.49- 4.59).

There was also a statistically significant positive association between malnutrition and food insecurity. Respondents who were food insecure more than two times likely malnourished than food secure (AOR= 2.51, 95% CI: 1.31- 4.81)

There was a statistically significant positive association between malnutrition and dietary diversity. Clients who were taking adequate diversified food 56% less likely to be malnourished than who have adequate diversified food (AOR= 0.44, 95% CI: 0.23- 0.84).

There was a statistically significant positive association between malnutrition and meal frequency. Respondents with high meal frequency score 71% less likely to be malnourished than who have high meal frequency (AOR= 0.29, 95% CI: 0.11- 0.76).

Individuals who were not receiving nutritional support and care 55% less likely to be malnourished than those who were receiving nutritional support and care (AOR= 0.45, 95% CI: 0.23- 0.89)

6. DISCUSSION

The aim of this study was to determine magnitude of malnutrition (BMI < 18.5 kg/m2) and identify factors associated with it among adult people on HAART at ART clinics of Hosanna town.

Results of the study showed that people on antiretroviral therapy suffer from malnutrition (BMI < 18.5 kg/m2) at the study area. The overall prevalence of malnutrition in this study was 31.2%.

Earlier studies revealed that the magnitude of under nutrition (BMI < 18.5 kg/m2) in Gondar University Hospital in 2007 was 27.8% (26) and in St. Peter Hospital, Addis Ababa in 2008 was 25% (27).The result of the present study is higher than the results of these studies. This high rate of under nutrition in this study could be due to high prevalence of household food insecurity (68.5%) leading to lack of access to adequate, safe and nutritious food resulting to under nutrition. There were also a large number of subjects (67.9 %) taking inadequate dietary diversified food which reflects low micronutrient intake; it may contribute to the pathogenesis of HIV through increasing oxidative stress and compromised immunity and indirectly resulting in under nutrition. However, there is higher prevalence of malnutrition (BMI < 18.5 kg/m2) at a study done in chaina and Brazil than this study. The difference could be due to these studies were done on Hospitalized AIDS patients, which may present the occurrence of increased opportunistic infections (24, 25).

Female were most affected by malnutrition (18.79%). This might be due to the fact that HIV is common in women than the men. This result was consistent with an earlier similar study conducted in Dilla university hospital and Humera hospital, Ethiopia(29,30).A meta-analysis study conducted in 11 sub-Saharan countries reported that the pooling prevalence estimates of HIV-related under nutrition among HIV infected women was 10.3% (13).It is lower than the prevalence proportion of women's malnutrition in this study. The difference could be due to the difference in socio-economic factors.

The results of this study indentified independent of other factors household food insecurity, inadequate dietary diversified diet, opportunistic infections, low meal frequency score and clinical stage four were significantly associated with malnutrition (BMI < 18.5kg/m^2) at $p<0.05$ among adult people on ART.

WHO clinical stages had significant effect on the likelihood of malnutrition development. Individuals at clinical stage four were more than five times likely malnourished than those at stage one (AOR= 5.23, 95% CI: 1.42- 19.35). Respondents at clinical stage three were 3.91 times more likely malnourished than those at stage one (AOR=3.91, 95% CI: 1.57, 9.73).

This result is consistent with an earlier similar study conducted in dilla university hospital (29). Similarly, study done in Uganda shows PLWHA taking ART at WHO clinical stage four characterized by sever wasting (chronic fever, chronic diarrhea and weight loss greater than 10% from base line (33).

Regarding to OIS, individuals who were diagnosed with OIS during the past six weeks were more than two times likely malnourished than not diagnosed with OIS(AOR= 2.62, 95% CI: 1.49- 4.59).This result is in line with earlier similar study conducted in Dilla university hospital (29). Likewise, this finding is well supplemented by similar studies conducted in Kenya (34).

A study conducted in jimma university hospital, Ethiopia revealed 63.0% of PLWHA on HAART were food insecure (35).There was a statistically significant positive association between malnutrition and food insecurity in this study. Respondents who were food insecure were more than two times likely malnourished as compared to food secure individuals (AOR= 2.51, 95% CI: 1.31- 4.81). This result was consistent with study conducted at Humera Hospital (30). Moreover, the result of this study consistent with an earlier similar study conducted in Uganda in 2012 among PLWHA on ART that those who were food insecure were more likely to be undernourished (33).

There was a statistically significant association between malnutrition and dietary diversity. Clients who had adequate diversified food were 56% less likely to be malnourished than who had inadequate diversified food (AOR= 0.44, 95% CI: 0.23- 0.84). This result was consistent with an earlier similar study conducted in Humera referral hospital (30). Moreover, a study conducted in Mozambique supports the result of this study (36).

The finding of this study showed low meal frequency had significant positive association with malnutrition. Respondents with high meal frequency score 71% likely to be malnourished than who had low meal frequency (AOR= 0.29, 95% CI: 0.11- 0.76). A study

conducted in Dire Dewa supports this finding; in which increased meal frequency was associated with increased BMI (37). Moreover, the finding from this study is supported by a nutrition counselling card for PLWHA (38).limited similar studies exist to discuss more on this issue.

Other important finding of this study, which has implication for practical programming, is the negative relationship of nutritional support and under nutrition. In this study participants who were not taking nutritional care and support were 55 % less likely to be undernourished than those who were taking nutritional care and support (AOR = 0.45, 95%CI: 0.23, 0.89).

However, a study done in Haiti demonstrated that food assistance among PLWHA on ART significantly improved their BMI (42). This disagreement between the findings could be individuals experiencing food insecurity were probably shared nutritional support among household members or sold to get money.

LIMITATION OF THE STUDY

- Recall bias may limit subjects to remember components of their nutritional intake.
- Respondent may not tell the real information about their food security status due to the need for aid.
- Data on dietary intake may be affected by seasonal variation.

7. CONCLUSION & RECOMMENDATIONS

7.1 CONCLUSION

- In conclusion, the prevalence of overall malnutrition (BMI < 18.5 kg/m2) was high among adult people on ART despite of HAART in the study area.
- Existing care and treatment clinics that provide nutritional support to PLWHA on ART do not appear to address the issues of malnutrition.
- Predictors of malnutrition were food insecurity, inadequate diversified diet, low meal frequency, clinical stage four and three, opportunistic infections and nutritional support (plumpy nut).

7.2 RECOMMENDATIONS

- Only ART is not enough to improve the health status of PLWHA on HAART. Further, intervention initiatives should focus on improving household food security, diversity of diet, meal frequency, clinical staging and prevention and control of opportunistic infections in adult HIV infected individuals receiving highly active antiretroviral therapy to address the problem of malnutrition.

Zonal health department, Nigist Elenie memorial Hospital and Hosanna health centre

- Consistent and proper nutritional assessment should be a vital part of HIV management.
- OIS should be prevented and treated as early as possible.
- Nutritional counseling, education and information should be integrated well in HIV/AIDS care and support programme.
- Malnutrition should be prevented through nutritional interventions by screening the risk of malnutrition among individuals with BMI $\geq$ 18.5 kg/m^2.

Other relevant bodies

- Food security good nutrition should be key components of HIV treatment.
- Attention needs to be given to micronutrient adequacy through supplementation and promoting eating vegetables and fruits
- Intervention initiatives should focus on improving food insecurity.

- Improved multi-sectoral interventions are needed to address multifaceted causes of malnutrition.
- Further study on the association between malnutrition and meal frequency is needed.
- Randomized controlled experimental study design is needed to know the effect of nutritional support (plumpy nut) on nutritional status.

Health service providers

- Nutritional education provided by health care providers should encourage patients to increase dietary diversity on a variety of recommended locally available food groups and increase meal frequency through considering drug interaction with certain food groups.

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ANNEX I: ENGLISH QUESTIONNAIRE

JIMMA UNIVERSITY COLLEGE OF PUBLIC HEALTH AND MEDICAL SCIENCES

Title: malnutrition and associated factors among adult people on HAART at ART clinics of Hosanna town, southern Ethiopia

DEPARTMENT OF EPIDEMOLOGY

Consent Form

My name is_____ I am collecting data in a survey conducted by post graduate student of Epidemiology department of Jimma University, so as to determine magnitude of malnutrition and associated factors among people on HAART. I am going to ask you some questions that are very important for the programmers to plan effective malnutrition prevention program. Your name will not be written on this form and will never be used with any information you may tell me. You don't have to answer any questions that you don't want to answer and you may end this interview at any time you want. However, your honest answer to these questions is very important for the purpose of the study. It will take 30 minutes to complete the questionnaire. If you have any problem or question on the survey you can call to +251-0912 029517.We would very much appreciate your participation in this survey by genuinely responding to the interviews. Would you be willing to participate?

Yes_____

If no thank and stop here.

Questionnaire identification number_____

Interviewe^{r}'s name and signature _____

Supervisors name and signature _____

GENERAL INSTRUCTIONS (asking questions and recording answers)

All questions in this paper are based on interviewing people on HAART, record review and anthropometric measurement. It is very important that you ask each question exactly as it is written on the questionnaires. In addition to the questions, some of the questions have pre-coded responses. It is important that you do not read these alternatives/choices aloud to the participants. When you ask a question, you should listen to response/answer, and then circle the code next to the category that best matches the answer/response. Avoid writing the name.

PART ONE: SOCIO-DEMOGRAPHIC AND ECONOMIC INFORMATION

NO	Questions	option	.
101	Sex?	1.Male 2.Female	..|___|
102	Age?	_____yrs	...|___|
103	Where is your current residence?	1.Urban 2.Rural	...|___|
104	What is your religion?	1.Protestant 3.Muslim 2.Orthodox 4.Catholic 96.Others(specify)_____	...|___|
105	Current marital status?	1.Married 3.Separated 2.Unmarried 4.Others(specify)_____	...|___|
106	What is the highest educational level you have achieved?	1.can't read & write 2.can read write 3.Grade1-8 4.Grade 9-12 5.Collage and above	...|___|
107	What is your ethnic group?	1.Hadiya 2.kenbata 3.Amhara 4.Gurage	. ..|___|

		96.other(specify)_____	
108	What is your occupation?	1.Farmer 2.Employed (government) 3.Business(Self employed) 4.Unemployed 96.Other (Specify)_____	...|___|
109	Head of the Household?	1.Male 2.Female	...|___|
110	What is your main source of drinking water?	1.Private tap 2.Private well 3. public tap 96.other (specify)_____	...|___|
111	How many people live in the Household?	_____in number	...|___|
112	Do you smoke cigarette?	1.Yes 2.No	...|___|
113	Do you have physical exercise?	1.Yes 2.No	...|___|
114	Do you chew kchat?	1.Yes 2.No	...|___|
115	Do you drink alcohol?	1.Yes 2.No	...|___|
116	With whom you are living?	1.living alone 2.with parents 3.with relatives 96.other(specify)___	...|___|
117	Did you get social support?	1. Yes 2.No	...|___|
118. Disclosure status?		1. Yes 2.No	..|___|
119	Does the household currently have any of the following	1.Yes	0. No

How many

	animals?(circle the answer) Oxen?	1	0	
	Cow?	1	0	
	Goat / sheep?	1	0	
	Chicken?	1	0	
120	Does the household currently have any of the following items? (circle the answer)	1.Yes	0. No	
	Functioning radio?	1	0	
	Functioning television?	1	0	
	Functioning tape recorder/CD player?	1	0	
	Kerosene stove?	1	0	
	Telephone?	1	0	
	Electric stove?	1	0	
	Sofa?	1	0	
	Bed?	1	0	
	Bicycle?	1	0	
	Motor cycle?	1	0	
	Spring mattress?	1	0	
	Foam mattress?	1	0	
	Grass mattress?	1	0	
	Chair?	1	0	
	Table?	1	0	
	Refrigerator?	1	0	

PART TWO: HEALTH CARE RELATED FACTORS

NO	Questions	option	coding
201	Institution	1.hospital 2.health center	...|___|
202	Do you have gastro intestinal symptoms 2 weeks prior to survey ?	1.Yes 2.No →Go to Q203	...|___|
202a	If yes (Q202), what types of gastro intestinal symptoms? more than one answer is possible	1.eating difficulty 2.Loss of appetite 3.Vomiting 96.other (specify)_____	...|___|
203	Opportunistic infections in the past 6 month **(From record)**	1.Yes 2. No →Go to Q204	...|___|
203a	Types of opportunistic infections (more than one answer is possible)	1.TB 2.Candidiasis 3.Diarrrea 96.other (specify)_____	...|___|
204	AIDS' clinical stage **(From record)**	[1] Stage-I [2] Stage-II [3] Stage-III [4] Stage-IV	...|___|
205	CD^4 cell count in the past 6 month **(From record)**	_____in number	...|___|
206	Duration of HAART **(From record)**	_____year	...|___|
208	Side effect of HAART **(From record)**	1.Yes 2.No→**Go to Q209**	...|___|

208 a	If yes (Q208), what side effect(s)? more than one answer is possible**(From record)**	1.nausea 2.headache 3.vomiting 4.diarrhea 96.other (specify)_____	...|___|
209	Adherence**(From record)**	1.good 2.Fair 3.poor	...|___|

PART THREE: DIETARY DIVERSITY AND MEAL FREQUENCY SCORE TOOL

301. during the previous 24-hours period (yesterday day and night), how many times did you consume? ----------

Write down all foods and drinks eaten. When composite dishes are mentioned, ask for the list of ingredients. When the respondent has finished, probe for meals and snacks not mentioned.

Before breakfast	breakfast	snack	Lunch	snack	Dinner	snack

303	Do you have nutritional support (plumpy nut)?	1.Yes 2.No	.|___|

304	Have you ever had dietary counseling about the importance of good nutrition?	1.Yes 2.No	.|___|	...|_

Place one in the box if the food groups in question were eaten, place zero in the box if the food group were not eaten the previous day and night.

NO	Food groups	option	coding
301	Cereals (corn, rice, wheat, sorghum, barley, tef or foods made from these (e.g. bread, enjera, pasta, porridge ,etc)	[1] Yes [0]No	...|___|
302	White tubers and roots (false banana, potato Irish, etc)	[1]Yes [0]No	..|___|
303	Vegetables (kale, cassava leaves, carrot, red sweet pepper, tomato, onion ,cabbage ,etc)	[1]Yes [0]No	...|___|
304	Fruits(mango, papaya , orange, avocado, banana, lemon, pineapple, etc)	[1]Yes [0]No	...|___|
305	Meat(beef, goat, sheep ,chicken, etc)	[1]Yes [0]No	...|___|
306	Fish and other sea foods	[1]Yes [0]No	...|___|
307	Eggs	[1]Yes [0]No	…|___|
308	Legumes, nuts and seed(beans, peas, lentils, nuts, seeds or foods made from these (peanut butter ,etc)	[1]Yes [0]No	...|___|
309	Milk and milk products (milk, cheese, ,yogurt or other milk products)	[1]Yes [0]No	...|___|
310	Oils and fats (oil, fats or butter added to foods	[1]Yes [0]No	..|___|
311	Sweets(sugar, honey, cakes, cookies, candies, chocolates, etc)	[1]Yes [0]No	..|___|

312	Spices, condiments and beverages(spices ,coffee, tea, hot sauce, beverage ,etc)	[1]Yes [0]No	..|___|

PART FOUR: HOUSEHOLD FOOD INSECURITY MEASURING TOOLS

NO	Questions	option	Skip to/Remark
401	In the past four weeks, did you worry that your household would not have enough food?	0.No(skip to Q402) 1.Yes	....|___|
401 a.	How often did this happen?	1.Rarely (once or twice in the past four weeks) 2.Sometimes (three to ten times in the past four weeks) 3.Often (more than ten times in the past four weeks	....|___|
402	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	0.No(skip to Q403) 1.Yes	....|___|
402.a	How often did this happen?	1.Rarely (once or twice in the past four weeks) 2 .Sometimes (three to ten times in the past four weeks) 3. Often (more than ten times in the past four weeks	....|___|
403	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources	0.No(skip to Q404) 1.Yes	....|___|

403.a	How often did this happen?	1.Rarely (once or twice in the past four weeks) 2 .Sometimes (three to ten times in the past four weeks) 3.Often (more than ten times in the past four weeks	....|___|
404	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	0.No(skip to Q405) 1.Yes	....|___|
404.a	How often did this happen?	1.Rarely (once or twice in the past four weeks) 2.Sometimes (three to ten times in the past four weeks) 3.Often (more than ten times in the past four weeks	....|___|
405	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0.No(skip to Q406) 1.Yes	....|___|
405.a	How often did this happen?	1.Rarely (once or twice in the past four weeks) 2 .Sometimes (three to ten times in the past four weeks) 3.Often (more than ten times in the past four weeks	....|___|
406	In the past four weeks, did you or any other household member have to eat fewer meals in a day	0.No(skip to Q407) 1.Yes	....|___|

	because there was not enough food?		
406.a	How often did this happen?	1.Rarely (once or twice in the past four weeks) 2.Sometimes (three to ten times in the past four weeks) 3.Often (more than ten times in the past four weeks	....|___|
407	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	0.No(skip to Q408) 1.Yes	....|___|
407.a	How often did this happen?	1.Rarely (once or twice in the past four weeks) 2 .Sometimes (three to ten times in the past four weeks) 3.Often (more than ten times in the past four weeks	....|___|
408	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0.No(skip to Q409) 1.Yes	....|___|
408.a	How often did this happen?	1.Rarely (once or twice in the past four weeks) 2.Sometimes (three to ten times in the past four weeks) 3.Often (more than ten times in the past four weeks	....|___|
409	In the past four weeks, did you or any household member go a whole day and night without eating anything because there	0.No 1.Yes	....|___|

	was not enough food?		
409.a	How often did this happen?	1.Rarely (once or twice in the past four weeks) 2.Sometimes (three to ten times in the past four weeks) 3.Often (more than ten times in the past four weeks	....|___|

PART FIVE: ANTHROPOMETRIC MEASURMENT

S. no	**MEASURMENT**	**Value**	**remark**
501	Clients weight in kilogram		
502	Clients height in cm		

ANNEX II: AMHARIC QUESTIONAIRE

ጅማ ዩኒቨርሲቲ

የህብረተሰብ ጤና እና ሕክምና ሳይንስ ኮሌጅ

የኢፒዲሞሎጂ ትምህርት ክፍል

የጥናቱ ርእስ: የስነ ምግብ ሁኔታ እና የችግሩ መንስኤዎች በአዋቂ ኤአርቲ ተጠቃሚዎች በሆሳዕና ከተማ ኤአርቲ ክሊኒኮች ፣2006 ኣ.ም

የስምምነት ፎርም

የተከበራችሁ የጥናቱ ተሳታፊዎች

እኔ ---------- በጅማ ዩኒቨርሲቲ ኢፒዲሞሎጂ ትምህርት ክፍል የሁለተኛ ዲግሪ ተማሪ በሚስራው ጥናት ላይ መረጃ እሰበስባለሁ። ከላይ በርዕሱ ለመጥቀስ እንደተመከረው ይህ ጥናት ትኩረት ያደረገው በአዋቂ ጸረ ኤች ኣይ ቪ መድሃኒት ተጠቃሚዎች የስነ ምግብ ሁኔታ ላይ ነው ፡። ለዚህም ጥናት የእናንተ የችግሩ ተጋሪዎች ቀና ተሳትፎ በእጅጉ ጠቀሜታ አለው። እናንተ በዚህ መጠይቅ የምትሰጡት መረጃ ለምርምር እና ለጥናት ከመሆንም አልፎ በችግሩ ዙሪያ ለሚሰሩ መንግስታዊ እና መንግሰታዊ ላልሆኑ ድርጅት አንደ አንድ ግብዓት ከማገልገሉ በላይ በአርሰዎ ላይ ምንም አይነት ተፅዕኖ የለውም ሚስጥርን ከመጠበቅም አንፃር በቃለ መጠየቁ ላይ ስምአይፃፍም። ስለሆነም እርሰዋም በዚህ ጥናት ውስጥ ለተጠየቁት መጠይቆች መልስ እንዲሰጡን በትህትና እጠይቃለሁ። በመጠይቁ ላይ ላሉ ጥያቄዎችን ያለመመለስ ሙሉ መብት አለዎት። መጠየቁንም በምትፍልጉበት ሰዓት መተው ይችላሉ። ጥያቄ ወይም ችግር ካለ በስልክ ቁጥር 0912-02-95-17 መጠየቅ ይችላሉ፡፡

ኣመሰግናለሁ።

በጥናቱ ላይ ለመሳተፍ ተሳምምተዋል? አዎ ------ አልተስማማሁም ------

ካልተስማሙ እናመሰግናለን (ወደሚቀጥለው ሰው ይለፉ)

የመጠይቁ መለያ ቁጥር_____

የጠያቂ ስምና ፊርማ_____

የተቆጣሪ ስምና ፊርማ_____

ክፍል አንድ፡ ማህበራዊና ኢኮኖሚያዊ ሁኔታዎች፡

ተ.ቁ	ጥያቄ	ምርጫ	ኮድ
101	ጾታ ?	1.ወንድ 2.ሴት	..|____|
102	ዕድሜ ?	----------አመት	..|____|
103	የመኖሪያ አድራሻ ?	1.ከተማ 2. ገጠር	..|____|
104	ሀይማኖት ?	1. ፕሮቴስታንት 2.አርቶዶክስ 3.ሙስሊም 4.ካቶሊክ 96. ሌላ (ይገለፅ)----------	..|____|
105	የጋብቻ ሁኔታ ?	1.ያገባ/ች(አብረው የሚኖሩ) 2.ያላገባ/ች 3.የተለያዩ 4. በሞት የተለየ (ይገለፅ)----------	..|____|
106	የትምህርት ደረጃ ?	1.መጻፍ እና ማንበብ የማይችል/ትችል 2.መጻፍ እና ማንበብ የሚይችል/ትችል 3.ከ1-8ኛ ክፍል የተማረ 4.ከ9-12ኛ ክፍል የጨረሰ 5.ዲፕሎማና ከዛ በላይ ያለው	..|____|
107	ብሔር ?	1. ሃድያ 2. ከንባታ 3. አማራ 4.ጉራጌ 96. ሌላ(ይጠቀስ)------	..|____|
108	በምን ስራ ነው የ ሚኖሩት?	1.ገበሬ 2. የመንግስት ሰራተኛ 3. ነጋዴ 4.ስራ አጥ 96. ሌላ _____ (ይጠቀስ)	..|____|
109	የቤት አስተዳዳሪ ማን ነው?	1.ወንድ 2.ሴት	..|____|
110	የመጠጥ ውሃ ከየት ነው የምታገኘው/ኚው?	1. ከቧንቧ (ከግል) 2. ከጉርጓድ 3. ከቦኖ(ከ ህዝብ) 96.ሌላ---------- ይጥቀሱ	..|____|
111	የቤተሰብ ብዛት ስንት ነው?	_____በቁጥር ይገለፅ	..|____|
			..|____|

112	ሲጋራ ያጨሳሉ?	1.አዎ 2.የለም	
113	የሰውነት ብቃት እቅስቃሴ ያደርጋሉ?	1.አዎ 2.የለም	..|____|
114	ጫት ይቅማሉ ?	1.አዎ 2.የለም	..|____|
115	አልኮል ይጠጣሉ ?(ቢራ ፤ ጠላ ፤ጠጅ የመሳሰሉት)	1.አዎ 2.የለም	..|____|
116	ከማን ጋር ነው የምትኖረው/ሪው ?	1.ለብቻዬ 2.ከቤተሰብ ጋር 3.ከዘመድ ጋር 4. ከትዳር አጋር ጋር	..|____|
117	ማህነራዊ ድጋፍ ያገኛሉ?	1. አዎ 2. የለም →ወደ ጥይቄ 118 ይሒዱ	..|____|
118	በ ኤች አይ ቪ መያዘዎን ቤተሰብ ያውቀዋል ?	1.አዎ 2.የለም	..|____|

119	የቤት እንስሳቶች አሏችሁ?(አከብብ)	1.አዎ	0. የለኝም	ምን ያህል(በቁ ጥር ይገለፅ)
	ላም	1	0	____ _____
	ፍየል እና በግ	1	0	_____
	በሬ	1	0	____
	ዶሮ	1	0	
120	የሚከተሉት ንብረቶች አላችሁ?(አከብብ)	1. አዎ	0. የለኝም	
	ቴሌቭዝን(የሚስራ)	1	0	
	ሬድዮ(ሚስራ)	1	0	
	ቴፕ/ዲቪዲ	1	0	
	ቡታጋዝ	1	0	
	ኤሌክትሪክ እስቶቭ	1	0	
	ሶፋ	1	0	
	ጠረቤዛ	1	0	
	ወንበር	1	0	
	ዐልጋ	1	0	
	ባይስክል	1	0	
	ሞተር ሳይክል	1	0	
	የስፕሪንግ ፍራስ	1	0	
	የዕስፖነጅ ፍራስ	1	0	
	የ ሳር ፍራሥ	1	0	
	ፍሪጅ	1	0	

ክፍል ሁለት፡ ከጤና ጋር የተያያዙ መረጃዎች የተመለከቱ ሁኔታዎች፡

ተ.ቁ	ጥያቄ	ምርጫ	ኮድ
201	የህክምና ቦታ	1.ሆስፒታል 2.ጤና ጣቢያ	..|____|
202	ባለፉት ሁለት ሳምንት ዉስጥ ከምግብ መመገብ ጋር የተያያዘ ችግር ነበረዎት ?	[1] አዎ [2] የለም →ወደ ጥይቄ 203 ይሒዱ	..|____|
202ሀ	ምን አይነት ችግር ነበር? ከአንድ በላይ መልስ ይቻላል	[1] ምግብ መብላት አለመቻል(የአፍ መቁሰል) [2] የምግብ ፍላጎት መቀነስ [3] ማስመለስ [96] ሌላ (ይገለፅ)	..|____|
203	ባለፉት ስድስት ወራት ተጋዳኝ በሽታዎች አሉ (ከመዝገብ ላየ ይመልከቱ)	[1] አዎ [2] የለም →ወደ ጥይቄ 204 ይሒዱ	..|____|
203ለ	የተገኙ ተጋዳኝ በሽታዎች	1.ስጋ ደዌ 2.ፈንገስ 3.ተቅማጥ 96] ሌላ (ይገለፅ)	..|____|
204	በ አለም የ ጤና ድርጅት መስፈርት የኤች አይ ቪ ኤድስ ደረጃ (ከመዝገብ ላየ ይመልከቱ)	[1] ደረጃ-I [2] ደረጃ -II [3] ደረጃ-III [4] ደረጃ-IV	..|____|
205	የ CD^4 cell መጠን (ከመዝገብ ላይ ይመልከቱ)	_____በቁጥር ይገለፅ	..|____|
206	ጸረ ኤች አይ ቪ መድሃኒት	_____ በአመት ይገለፅ	.

	የተጀመረበት ጊዜ (ከመዝገብ ላይ ይመልከቱ)		.|____|
208	የጸረ ኤች አይ ቪ መድሃኒት የጎንዮሽ ችግረ አለ?(ከመዝገብ ላይ ይመልከቱ)	[1] አዎ [2] የለም →ወደ ጥይቄ 209 ይሒዱ	..|____|
208ሀ	ምን አይነት ችግር ?ከአንድ በላይ መልስ ይቻላል	[1] ማቅለሽለሽ [2] እራስ ምታት [3] ማስመለስ [4]ማስቀመጥ [96] ሌላ (ይገለፅ)	..|____|
210	የመድሃኒትን በትክክል የመውሰድ ሁኔታ?ከመዝገብ ላይ ይመልከቱ)	[1] ጥሩ [2] በቂ [3] ዝቅተኛ	..|____|

ክፍል ሶስት፡ በ 24 ሰዐት ዉስጥ የተለያዩ ምግቦች የመመገብ ሁኔታ እና የምግብ ድግግሞሽ መለኪያ የተመለከቱ ጥያቄዎች

301. በ 24 ሰዐት ዉስጥ ምን ያህል ጊዜ ምግብ ተመግበዋል?----------

302. በ 24 ሰዐት ዉስጥ የተመገቡትን የምግብ አይነቶች ሁሉ ይንገሩኝ (ሌላ ካለ ለማስታወስ ይሞክሩ)

ምገቡ ከተለያየ አይነት የተዘጋጀ ከሆነ ከምን እንደተሰራ ይጠይቁ

ጊዜ	የ ምግብ አይነቶች /ምግብ/ፈሳሽ/ፍራፍሬ/አትክልት
ቁርስ	
በቁርስ እና በምሳ መሀል	
ምሳ	
በምሳ እና እራት መሀል	
እራት	
ከእራት በኃላ	

303	የ ምግብ ድጋፍ (አልሚ ምግብ) በህክምና ኖታ ያገኛሉ ?	[1] አዎ [2] የለም	..|____|
304	ስለ ጥሩ ምግብ አመጋገብ ጥቅም ት/ት አግኝተው ያውቃሉ?	[1] አዎ [2] የለም	

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ክፍል አራት፡- በቤተሰብ ውስጥ የምግብ ዋስትናን የተመለከቱ ጥያቄዎች

ተ.ቁ	ጥያቄ	ምርጫ	ኮድ
401	ባለፈው አራት ሳምንት ውስጥ በቂ ምግብ ቤትውስጥአይኖርም ብለሽ/ህ ተጨንቀሽ/ህ ነበር?	1.አዎ 0.አልሰጋሁም→ወደ ጥይቄ 402ይሒዱ	
401. ሀ	አዎ ከሆነ ለ401 በወር ውስጥ ምን ያህል ጊዜ?	1. በጣም ትንሽ ጊዜ (አንዴ ወይ 2. አንዳንዴ(2-10 ጊዜ) 3. ሁል ጊዜ(ከ አስር ጊዜ በላይ)	
402.	ባለፈው አራት ሳምንት ውስጥ በምግብ ወይም በገንዘብ እጥረት ምክንያት በቤተሰብ ውስጥ የመረጣቹትን ምግብ መመገብ ያልቻላቹበት ጊዜ ነበር	1. አዎ 0.የለም→ወደ ጥይቄ 403 ይሒዱ	
402.ሀ	አዎ ከሆነ ለ402 ለምን ያህል ጊዜ	1. በጣም ትንሽ ጊዜ (አንዴ ወይ ሁለቴ) 2. አንዳንዴ(2-10 ጊዜ) 3. ሁል ጊዜ(ከ አስር ጊዝ በላይ)	
403	ባለፈው አራት ሳምንት ውስጥ የመግዛት አቅም ስላልነበራችሁ ከቤተሰብ አባል ትንሽ ምግብ የበላ ሰው ነበር?	1.አዎ 0. የለም→ወደ ጥይቄ 404 ይሒዱ	
403.ሀ	አዎ ከሆነ ለ 403 ለምን የህል ጊዜ?	1. በጣም ትንሽ ጊዜ (አንዴ ወይ ሁለቴ) 2. አንዳንዴ(2-10 ጊዜ) 3. ሁል ጊዜ(ከ አስር ጊዜ በላይ)	
404	ባለፈው አራት ሳምንታት ውስጥ ምግብ ስላነሰ ወይም ገንዘብ ስለሌለ የማትፈልጉትን ምግብ ተመግባቹህ ነበር?	1.አዎ 0.አልነበረም→ወደ ጥይቄ 405 ይሒዱ	

404.ሀ	አዎ ከሆነ ለ404 ለምን ያህል ጊዜ?	1. በጣም ትንሽ ጊዜ (አንዴ ወይ ሁለቴ) 2. አንዳንዴ(2-10 ጊዜ) 3. ሁል ጊዜ(ከ አስር ጊዜበላይ)	
405	ባለፈው ወር ቤት ውስጥ በቂ ምግብ ስለሌለ ከሌላው ጊዜ ያነሰ ምግብ የተመገበ ሰው አለ?	1. አዎ 0.የለም→ወደ ጥይቄ 406 ይሒዱ	
405.ሀ	አዎ ከሆነ ለ 405 ምን ያህል ጊዜ?	1. በጣም ትንሽ ጊዜ (አንዴ ወይ ሁለቴ) 2. አንዳንዴ(2-10 ጊዜ) 3. ሁል ጊዜ(ከ አስር ጊዜ በላይ)	
406	ባለፈው ወር ውስጥ በቂ ምግብ ስለሌለ በቀን ውስጥ በጣም ትንሽ ምግብ የተመገባቹህበት ቀን ነበረ?	1.አዎ 0.የለም→ወደ ጥይቄ 407 ይሒዱ	
406.ሀ	አዎ ከሆነ ለ 406 ለምን ያህል ጊዜ?	1. በጣም ትንሽ ጊዜ (አንዴ ወይ ሁለቴ) 2. አንዳንዴ(2-10 ጊዜ) 3. ሁል ጊዜ(ከ አስር ጊዜ በላይ)	
407	ባለፈው ወር ውስጥ ምንም አይነት ምግብ ቤት ውስጥ ሳይኖር ቀርቶ ያውቃል (ገንዘብ ስለሌለ)?	1.አዎ 0 .አያውቅም→ወደ ጥይቄ 408 ይሒዱ	
407.ሀ	አዎ ከሆነ 407 ለምን ያህል ጊዜ?	1. በጣም ትንሽ ጊዜ (አንዴ ወይ ሁለቴ) 2. አንዳንዴ(2-10 ጊዜ) 3. ሁል ጊዜ(ከ አስር ጊዜ በላይ)	
408	ባለፈው ወር ውስጥ ምግብ ስለሌለ ከቤተሰብ አባል ምግን ሣይበላ ያደረ አለ?	1. አዎ 0.የለም →ወደ ጥይቄ 409 ይሒዱ	
408.ሀ	አዎ ከሆነ ለ408 ለምን ያህል ጊዜ?	1. በጣም ትንሽ ጊዜ (አንዴ ወይ ሁለቴ) 2. አንዳንዴ(2-10 ጊዜ) 3. ሁል ጊዜ(ከ አስር ጊዜ በላይ)	
409	ባለፈው ወር በቤተሰብ ውስጥ በምግብ እጥረት ምክንያት ከቤተሰብ አባል ቀንና ማታ ምንም ምግብ ሳይበላ ያሳለፈ ሰው ነበር ?	1.አዎ 0.የለም	
409.ሀ	አዎ ከሆነ ለ409 ለምን ያህል ጊዜ?	1. በጣም ትንሽ ጊዜ (አንዴ ወይ ሁለቴ) 2. አንዳንዴ(2-10 ጊዜ) 3. ሁል ጊዜ(ከ አስር ጊዜ በላይ)	

ክፍል አምስት፡ የሰውነት አቃም መለኪያ

502	የተሳታፊ ክብደት(በ ኪ.ግ)				
503	የተሳታፊ ቁመት(ሜ. ሜ)				

በጠናቱ ላይ በመሳተፈዎ እጅግ በጣም አመሰግናለሁ።

ANNEX III: PRINCIPAL COMPONENT ANALYSIS FOR WEALTH INDEX (method PCA)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squar	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	3.909	27.922	27.922	3.909	27.922
2	1.823	13.024	40.946	1.823	13.024
3	1.277	9.120	50.066	1.277	9.120
4	1.061	7.580	57.645	1.061	7.580
5	.974	6.955	64.600		
6	.792	5.656	70.256		
7	.702	5.012	75.268		
8	.652	4.660	79.928		
9	.596	4.261	84.188		
10	.566	4.046	88.234		
11	.514	3.671	91.906		
12	.443	3.167	95.073		
13	.372	2.658	97.731		
14	.318	2.269	100.000		

Extraction Method: Principal Component Analysis.