PREDICTORS OF DIARRHEAL DISEASE AMONG ADULT PEOPLE LIVING WITH HIV ATTENDING ART IN WEST HARARGHE ZONE GENERAL HOSPITALS, EASTERN ETHIOPIA. Case control study

BY:

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Research thesis submitted to Jimma University, Institute of Health, Faculty of Public Health, Department of Epidemiology, in Partial Fulfillment for the Requirement of Master of Public Health in Field Epidemiology.

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Jimma, Ethiopia

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Abstract

Background: - Diarrhea disease is a common cause of morbidity and mortality among people living with HIV/AIDS (PLHIV). The magnitude of diarrhea disease among PLHIV ranges from 30% to 60% in developed and 90% in developing countries. It speeds up the progression from HIV to AIDS and can easily impaired absorption of important nutrients, which can lead to negative impact on quality of life. There is also limited information on possible risk factors for diarrheal diseases among HIV infected patients in west Hararghe zone. The aim of this study was to identify the predictors of Diarrhea disease among adult PLHIV attending ART in west Hararghe Zone General Hospitals, East Ethiopia

Method and Materials: - A facility-based case control study was conducted from April to May 2019. Consecutive sampling methods was used to select 94 cases and 190 controls .Data were collected using pretested structured questionnaire through face-to-face interviewer checklist was used to collect clinical data from medical record. Data were entered to Epidata 4.4 and exported to SPSS 23 version .Descriptive statistics and bivariate logistic regression was used to identify candidate variables for multivariable logistic regression model. Hosmer and Lemeshow goodness-of-fit test was used to test model adequacy. Multivariable logistic regression was computed and adjusted odd ratio (AORs) with their corresponding to 95% CIs was used to assess strength of association.

Result: - In the study, 90 (96.4%) cases and 186 (98.8%) controls were participated. PLHIV who had history of diarrhea were more than two times (AOR= 2.5; 95% CI: 1.3, 4.8) more likely to have diarrhea compare to their counterparts. Adult PLHIV who had pets in their houses were more than three times (AOR=3.4, 95% CI: 1.8, 6.4) more likely to had diarrhea compared to those who had not. PLHIV who had washed their hands sometimes after visiting toilet were three times (AOR=3.0; 95% CI: 1.5, 6.1) more likely to be affected by diarrhea compared to their counterparts. PLHIV who consumed less than 20 liters water per day per capita were more than two times (AOR=2.6; 95% CI:1.2, 5.4) more likely to acquired diarrhea.

Conclusions -The independent predictors of diarrheal disease among PLHIV were, presence of pets household, washing hand sometimes after visiting toilet, consuming less than 20 liters of water per day and previous history of diarrhea .Regional Health bureau should strengthening of WASH activities among PLHIV .Health care providers for HIV/AIDS care should work on hygiene.

Keywords: - Adult PLHIV**,** ART**,** Diarrheal Disease, Ethiopia, West Hararghe

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List of abbreviation and acronyms

AIDS	Acquired immunodeficiency Syndrome
AOR	Adjusted odd ratio
ART	Antiretroviral therapy
BMI	Body mass index
CI	Confidence intervals
COR	Crude Odds Ratio
ETB	Ethiopia Birr
FMOH	Federal Ministry of Health
HH RWI	Household related wealth index
HIP	Hygiene improvement project
HIV	Human Immunodeficiency Virus
HO	Health officer
IRB	Institutional Review Board
LMICs	Low Middle Income Countries
OIs	Opportunistic infection
OWNP	One WASH National Program
PCA	principal component analysis
PEPFAR	President's Emergency Plan for AIDS Relief
PLHIVAIDS	People Living With HIV /AIDS
UNAIDS	Joint United Nation Programme of HIV/AIDS
UNICEF	United Nation International Children's Emergency Funds
USAID	United State Agency for International Development
VIP	Ventilated Improved Pit latrine
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

CHAPTER ONE: INTRODUCTION

1.1. Background

Diarrheal disease is defined as the passage of unusually loose or watery stool at least three times in 24 hours period or more frequently than normal for an individual's (1).The etiologies of AIDS associated diarrhea is multifactorial, which is caused by common and atypical pathogens including bacteria, parasites, fungal and viruses are frequently isolated from patients AIDS related diarrhea. The most common protozoal opportunistic intestinal parasitic infections causes of diarrheal disease among HIV infected patients Cryptosporidium pravum, Isospora and microsporidia are a very significant cause of diarrhea in developing countries, responsible for acute and chronic diarrhea in HIV patients (2).

Diarrheal disease can be classified as acute watery and bloody diarrhea(duration with or without blood lasting less than 14 days) , persistent (duration at least 14 days) and chronic diarrhea which lasts more than four weeks most common advanced stage of the PLIHIV/AIDS (3). Diarrheal disease is one of the common clinical manifestation of PLHIV/AIDS in the third world countries. Infection with enteric pathogens are the leading cause of diarrhea in PLHIV infected individuals (4,5). Opportunistic parasitic infections are common in Human Immunodeficiency Virus specially in developing countries (6).

There are several ways of the feco-oral route of water born disease transmissions, these include contamination of drinking water catchment areas and transmission can result from contamination in the distribution system and hygienic handling of the stored household water. The quality of drinking water is the most important environmental determinants of health and it has been a pillar of primary prevention and control of diarrhea disease (7).In general infectious diarrhea is the leading predominant illness in people infected with HIV(8).

There was strategy designed and implementing, which was supported by United State Agency for International Development (USAID)/ Hygiene improvement project (HIP) in integrating of WASH activities in HIV program to reduce morbidity and mortality due to diarrhea disease among more than 2 million PLHIV in Sub Africa countries including Ethiopia.(9).

1.2. Statement of the problems

According to World Health Organization (WHO) and UNICEF there were about 2 billion cases of diarrheal disease per year globally , most of them from developing countries(10). The magnitude of Diarrhea is a common gastrointestinal symptom in HIV positive patients occurring 30-60% of patients in developed countries.

African region is the most affected region 25.7 million People living with HIV and two third of new infection from African region (11). The magnitude of diarrheal disease among PLHIV more than 90% of patients in developing countries. A global systematic review and meta-analysis involved 106 countries on prevalence of opportunistic intestinal protozoa (Cryptosporidium, Microsporidia and Isospora) infections in HIV -infected people revealed that the prevalence of diarrhea disease among PLHIV infected patients in sub saran Africa account 21% (2). The cross sectional study conducted on diarrhea due to Intestinal parasitic infection among HIV patients in Southern Ethiopia revealed prevalence was 35.8 % (12) and similar study in Northwest Ethiopia the prevalence of diarrheal due to protozoan infection status among individual living with HIV was 30.6% (13).

It is an independent indicators of mortality and morbidity in PLWH, majority of HIV /AIDS (80%) patients die from HIV related infection including opportunistic intestinal parasitic infections rather than HIV infection itself (14,15). According to the World Health Organization (WHO), 644,000 people died because of diarrhea associated diseased in sub-Saharan Africa (2000 and 2012), accounting for 67% of all the worldwide deaths (16), and about 90% of Diarrhoea deaths occurred in south Asia and sub-Saharan Africa (17).

Opportunistic infections are the most causes of high morbidity and mortality among HIV/AIDS patients. Most of patients with Human immunodeficiency Virus (IV) shows diarrhea that contributes negatively to quality of life and compliance to antiretroviral therapy (18). Diarrhea is among opportunistic infection of gastro enteritis that reduced quality of life of people living with HIV due to infection, which can speed up the progression from HIV to AIDS. Diarrheal illness in PLWH can affects the absorption of antiretroviral drug that contribute to suboptimal viral control and in some cases early antiretroviral resistance. Available study revealed that diarrheal disease also reduced the absorption of important nutrients which resulted in malnutrition ,affecting ART adherence and deteriorating the impact of HIV/AIDS on both children and adult (19).

Chronic diarrhea can have a serious impact on the quality of life of people with HIV, contributing to doubts and fears about treatment, in addition patients can feeling of depression and compromising individual ability (20). Various studies reported that development of diarrheal disease among HIV patients in many developing countries due to poor environmental sanitation, poor personal hygiene, unavailability of safe drinking water and living with domestic animals and educational status were known associated risk factors (15). People living with HIV who had diarrhea disease needed hygiene more than those immune systems competent and require good nutrition (21).

There was strategy designed and working on WASH activities integrated with HIV/AIDS treatment and care programm by international NGOs under USAID and President's Emergency Plan for AIDS Relief (PEPFAR) to reduce morbidly and mortality due to diarrhea disease among PLHIV ,in Sub-African countries including Ethiopia (21,22). Water, Sanitation and Hygiene sector in Ethiopia is Guided by the One WASH National program (OWNP), National Hygiene and Environmental Health strategy and Integrated Urban and Sanitation and Hygiene Strategy and School WASH strategy (2013-2020)(23).

These strategy prioritize elements of open defecation by 2023 and achieving Universal access to safe water services by 2030 and 82% improve sanitation by 2020 (23). Besides these,2016, Ethiopia Demographic and Health Survey report showed that only 6% of households use improved toilet facilities (16% in urban and 4% in rural area)(24).

Despite the efforts made by the government and other organizations, diarrhea disease in PLHIV is still a public health problem. Before planning to prevention and control of diarrhea disease, it is necessary to identify risk factors of diarrheal disease among Adult PLHIV in that area. There is also limited information on possible risk factors for diarrheal diseases among HIV infected patients in west Hararghe zone.

Therefore, the aim of this study was to identify the potential risk factors of diarrheal disease among adult PLHIV attending ART clinic in West Hararghe Zone General Hospitals, East Ethiopia. Both hospital managements and partner those working on the HIV / AIDS prevention and control programme to control diarrhea among HIV patients will use the finding of this study.

CHAPTER TWO: LITERATURE REVIEW

2.1. Predictors of diarrhea among HIV patients

Category of risk factors of diarrheal disease include socio-demographic and economic, Environmental and clinical related factors of the finding from different literatures described in the following three categories.

2.2. Socio demographic and economic related factors

A case control Study conducted in South Africa Clinical and sociodemographic determinants of diarrheal disease among HIV/AIDS revealed that being female was significantly associated with diarrhea disease (25). Similar study conducted in South west Ethiopia, Jimma Town, on determinants of diarrheal disease among adult PLHIV revealed that males were 2 times higher risk of developing diarrhea disease when compare with Females (26). In contrast to both studies, study conducted in Arba Minch town, southern Ethiopia on Prevalence of Opportunistic Intestinal Parasites and Associated factors among HIV Patients revealed that being either male or Female was not significantly association with diarrhea disease (27).

A case control Study conducted in India, diarrhea disease among HIV infected patients lower educational status was positive association with diarrhea disease (8). A case control Study conducted in south Africa, Clinical and social determinants of diarrhea among PLHIV showed that being in old age was significantly associated with diarrhea disease when compared with younger age (25). Case control study conducted in India on diarrheal disease among HIV-infected adults, evaluation of risk factors reveal that large family size or crowded living condition of the family was positive association with diarrhea disease compared with small Family size (8). A systematic review and Meta- analysis on risk factors for Cryptosporidium infection in low- and middle-income countries revealed that overcrowded living condition was significantly associated with diarrhea disease (28) A cross sectional study conducted in Burkina Faso Opportunistic and other intestinal parasites infection among HIV positive patients being illiterate was independently associated with infection of diarrhea disease (29).

Similar study conducted in Gondar, North Ethiopia, on Assessment of water, sanitation, and hygiene practice and associated factors among people living with HIV/AIDS showed that educational status was significantly associated with hygienic practice. Individual who can read and write were less likely to have poor hygienic practice than those illiterates were. As individual educational status increased, the probability of having unimproved sanitation status decreased. Clients of elementary education are more than 59% less likely to be unimproved sanitation status as compared to illiterate clients (30).

2.3. Environmental Sanitation, Water supply and Hygiene related factors

In contrast, study conducted in India on Diarrhea disease among HIV -infected adults, evaluation of risk factors and etiology showed that there was not significant associated between water source and Diarrhea Disease (31). A case control study conducted in South Africa Clinical and social determinants of diarrheal disease among HIV/AIDS revealed that those who had limited access to water point was at risk of developing diarrheal disease as compared to those who had access to water point (25).

Similar Study conducted in Jimma town, Southwest Ethiopia, determinants of diarrhea disease among PLHIV showed that use of public water point was significantly associated with diarrheal disease. Using public water point was five times increased odds of diarrhea compared with those who had used private water point (26). A cross sectional study conducted in Dessie Hospital, North east Ethiopia, on prevalence of intestinal parasites and associated factor reveal that inaccessibility of water source was positive association with diarrhea disease (32).

Another cross sectional study conducted in China, Behavioral factors associated with diarrhea among adults, over 18 years of age revealed that washing hands before meals and after defecation was significantly associated with diarrhea disease. Hand washing practice as protective factors for prevention of diarrhea disease (33). Hand washing promotion leads to reduction in Diarrhoea episodes in both child day-care centers in high-income countries and among communities living in LMICs(Low middle income counties) by about 30% (36).

A case control study conducted in Zimbabwe on risk factors for contracting watery diarrhea showed that hand washing was an importance practices in preventing diarrhea illness (34).

A cross sectional study conducted in Arba Minch town, Southern Ethiopia Water and hygiene practice and associated factors among HIV infected people revealed that Clients who don't have washing device were four time more likely to have poor hygienic practice compared to those who had a hand washing device in their house's (30,35).

A case control study conducted in Kenya enteric pathogens and factors associated with bloody diarrhea among adult revealed that washing hand after defecation was significantly associated as protective factors with diarrhea disease (37). A cross sectional Study conducted in Adigrat Hospital , North Ethiopia on risk factors for intestinal parasitosis among HIV/AIDS patients revealed that lack of hand washing with soap was significantly associated risk of intestinal parasitosis (38). A case control study conducted in North Ethiopia, on Acute bloody diarrhea individuals of their water consumption less than 20 liters per day were 3 time more likely to be affected by diarrhea as compared with those who had consumed greater than 20 liters per day (39).

A cross sectional study conducted in Gondar on the Environmental factors of Diarrhea prevalence among under five children the risk of diarrhea disease in children who hand high sanitary risk of contamination of household storage had five times higher probabilities of developing diarrheal disease compared to hygienic low risk of contamination of household storage (40). A case control study conducted in India, revealed that individuals who had traveled to obtain drinking water from the distance significantly association with diarrhea disease compared with those who had obtained from near distance (8).

A systematic review and meta-analysis risk factors for cryptosporidium infection in low- and middle-income countries sowed that open defecation was identified as risk factors, which was

significantly associated with cryptosporidium infection (28). A case control Study conducted in India, diarrheal disease among HIV-infected adults evaluation of risk factors revealed that Households those who had no latrine in their compound were positive association with Diarrhea disease (8). In similar country, study revealed that household those who were using public latrine were significantly associated with diarrhea disease (31). Comparative cross sectional study conducted in Dessie Hospital Prevalence of intestinal parasites and associated risk factors among HIV/AIDS found that Absence of Toile or latrine seven times more likely to be risk of diarrhea disease compared with those who had latrines (32).

A cross sectional study conducted in Northeast Ethiopia prevalence of intestinal parasite and associated factors among HIV patients showed that clients who don't have latrine availability were 10 times more likely to be unimproved sanitation status as compared to those who had latrine availability (32). A case control study conducted in Jimma town, south west Ethiopia determinates of diarrheal disease among adult PLHIV patients revealed that ,individuals who had used latrine without cover was 2 times increased the probabilities of acquired diarrhea compared to controls (26).

Presence of pets in the house was significantly associated with acquiring diarrhea disease. Case control Study conducted in India also support living with pets and animals in the same home was significantly associated diarrhea disease (31). A comparative Cross sectional study conducted in Kenya revealed that close contact with animals such as cows, dog and pigs were significantly associated with development of diarrheal disease (41). A systematic review and meta-analysis of risk factors for cryptosporidium infection in low- and middle-income countries found that close contact with animal in the home was associated with increased risk of diarrhea disease (28).

A cross-sectional study conducted in Butajira town, Southern Ethiopia, intestinal parasitic infections and its association with undernutrition among HIV/AIDS patients found that the presence of one or more animals in the house was significantly associated with intestinal parasites. Participants who had one or more animals in their home were six times more likely to be infected with one or more intestinal parasites as compared to those who had no animals in their home (42). Similar study conducted in Southern Ethiopia, revealed that patients who had contact with animal in their compound were more likely to acquire opportunistic intestinal parasitic infections than patients who had no contact (27). A Case control study conducted in South west Ethiopia, showed

that presence of pets in their house was associated with diarrhea which reported having exposure to pets was accounted for significant diarrhea burden and also Solid waste disposal inside garbage container was associated with increased risk of diarrhea (26).

2.4. Clinical factors

A cross sectional study conducted in Southern Ethiopia ,water, sanitation and hygienic practice and associated factor among HIV people revealed that Clients who had diarrhea for the past 24 hours were 10 times more likely to be unimproved water status as compared to those who did not have diarrhea for the past 24 hours (35). A case control study conducted in India, diarrheal disease among PLHIV revealed that individual who had previous history of diarrhea was significantly associated with diarrheal disease (8). Similar study conducted in Jimma Town, South west Ethiopia among PLWH AIDS showed that PLHIV who had history of diarrhea disease significantly associated with diarrhea (26).

Study conducted in India on diarrhea, CD4 count and enteric infection of in hospital-based cohort of HIV infected patients showed that diarrhea was strongly associated with low CD4 counts (43). Similar study conducted in Gondar and Dessie Hospitals, North Ethiopia showed that World Health Organization (WHO) clinical stage III and IV HIV-infected patients were 9.4 and 23 times more likely to develop opportunistic (OIs) intestinal parasitosis compared to clinical stage-I respectively (32,44).

A case control study conducted in South Africa clinical and social determinants among HIV infected patients showed that Non-utilization of ART was strongly positive associated with diarrhea. Those who did not utilized ART six times increase odd of diarrhea compared with those who had been taking ART (25). Similar study conducted in Ethiopia, factors associated with fist line ART treatment failure among adult HIV positive patients found that patients who had persistence diarrhea were positive association with ART failure (45). Study conducted in India , diarrheal disease among HIV-infected adults evaluation of risk factors revealed that diarrhea disease among HIV infection showed that taking Co-trimoxazole prophylaxis was protective factors with diarrheal disease (8).

2.5. Significance of the study

Identifying predictors of diarrhea in PLHIV as additional evidences regarding predictors of diarrheal disease in PLHIV. It Help particularly Chiro & Galemso Hospital during implementation

of intervention regarding diarrheal diseases prevention and control among PLHIV. It also help as an input for West Hararghe Health Office and concerned partners working on the HIV prevention and control program in the study area, and similar settings efficiently control diarrheal disease among HIV/AIDS patients and Serve as an evidence input for further studies.

2.6. Conceptual framework

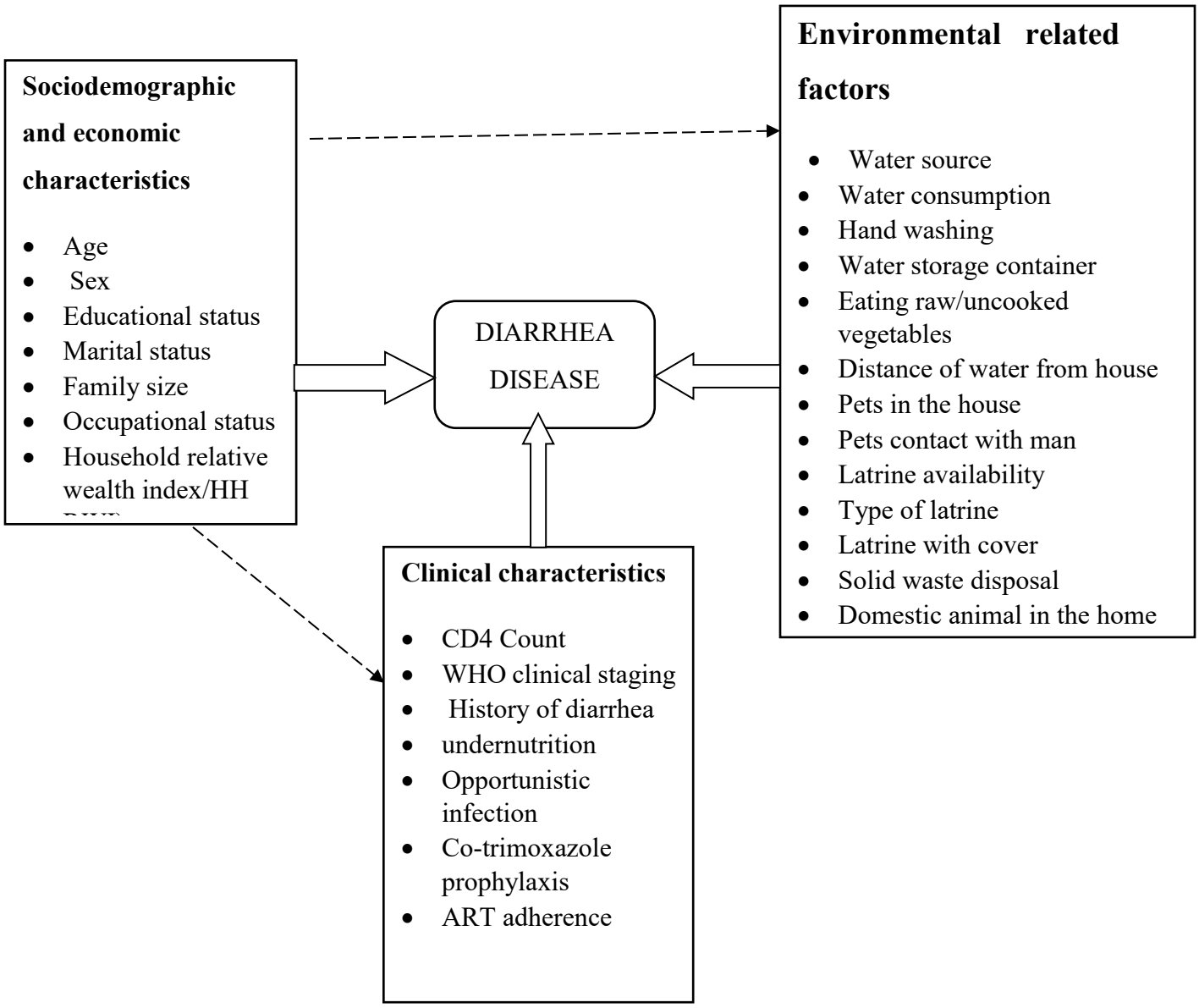

Figure 1 Conceptual framework shows the relationship of diarrhea disease and expected determinants adopted from different literature, 2019

CHAPTER THREE: OBJECTIVE

- To assess determinants of diarrheal disease among adult PLHIV attending ART in West Hararghe zone General Hospitals, Eastern Ethiopia, from April 4 to May 28, 2019.

CHAPTER FOUR: METHODS AND MATERIALS

4.1 Study setting and period

The study was conducted in West Hararghe zone general Hospitals. West Hararghe Zone is one of the zones in Oromia Regional State which is located 326km to east of Addis Ababa and it comprises of 15 districts and 2 administrative Towns. According to 2007 population estimation (24) , the current total population of zone has to be estimated 2,582,209 where are males (51%) and female (49%), respectively. There are four hospitals (two general hospitals and two primary hospitals), 84 health centers and 449 health posts in the Zone. Chiro and Galamso General Hospitals are located 326km and 402km from Addis Ababa respectively. Two hospitals are among public Hospitals in West Hararghe zone currently providing Medical, Surgical, Obstetrics and Gynecology and basic HIV care and treatment at its ART clinic. The total number PLHIV attending ART clinics in both hospitals were 1773, whereas adult PLHIV ≥ 18 years were 1666. Study was conducted from April 4 to May 28/ 2019.

4.2 Study design

Health facility-based case -control study design was implemented

4.3 Population

4.3.1 Source population

The source populations was all HIV-infected adult (adult patients of 18 years or older) who have ever been enrolled on ART in West Hararghe zone general hospitals.

4.3.2 Study population

The study populations were a sample of all adult PLHIV who fulfil eligibility criteria and were presented at ART clinic of West Hararghe zone general hospitals during data collection period

Diarrhea: - Individuals who reported as the passage of three or more loose or liquid stools within 24 hours duration

Cases: - HIV positive adult on ART (18 years or older) presented with a passage of three or more loose or liquid stools per 24 hours duration of diarrhea in the last 14 days were considered as cases in this study.

Controls: HIV positive adult (adult 18 years or older) patients without diarrhea at the time of presentation and without history of diarrhea in the preceding 14 days of study period.

4.4 Eligibility criteria

4.4.1 Inclusion criteria

Adult people living with HIV who were on antiretroviral therapy at least one month in general hospitals and those age ≥ 18 years old participates were included as either cases or controls respectively.

4.4.2 Exclusion criteria

All HIV positive adult patients who have ever been enrolled in the ART clinics in of West Hararghe zone general hospitals those who were critically ill and cannot hear, pregnant women, unable to standing and have back deformity were excluded from the cases and controls.

4.5 Sample size and sampling procedures

4.5.1 Sample size determination

The sample size was determined based on sample size calculation using Epi-Info version 7.2.2 software with assumptions of 95% two-sided confidence level, 80% statistical power, two to one control to case ratio, percent of controls exposed, adjusted odds ratio and 5% non-response rate. Three important independent variables/predictors of diarrhea among HIV- infected adult (Being male, latrine cover , pests in the home, more than five people in home and More than 5 people at home) were considered from a previous study (8,26), and then three different sample sizes were calculated and compared to choose the largest one as final sample size. Accordingly, 284 study samples (94 cases and 190 controls) were included in the study.

Table 1 Assumption used to calculate sample size from other study for predictors of Diarrhea disease among adult HIV positive in West Hararghe Hospitals, 2019

S/n	Predictors used to calculate Sample size	%of control exposed	Adjusted OR	Sample size for		
				Case	Control	**Total**
1	Being Male	23.1	2.27	90	180	270
2	Latrine cover	61.2	2.76	68	135	203
3	Pets in the house	34.3	2.26	80	160	240
4	More than 5 people at home	32.7	3.3	39	78	117

4.5.2 Sampling procedure

West Hararghe Zone has four government hospitals (Chiro and Galamso General, Asabot and Hirna primary Hospitals), Chiro and Galamso Hospitals were selected purposively based on the service provided for large proportion of PLHIV attending basic HIV care and treatment at their ART clinics. The total sample size for both cases & controls were allocated proportionally to the hospitals based on the number of adult PLHIV attending the ART clinics.

Cases were selected consecutively as they occur and controls were selected consecutively following cases selection daily.

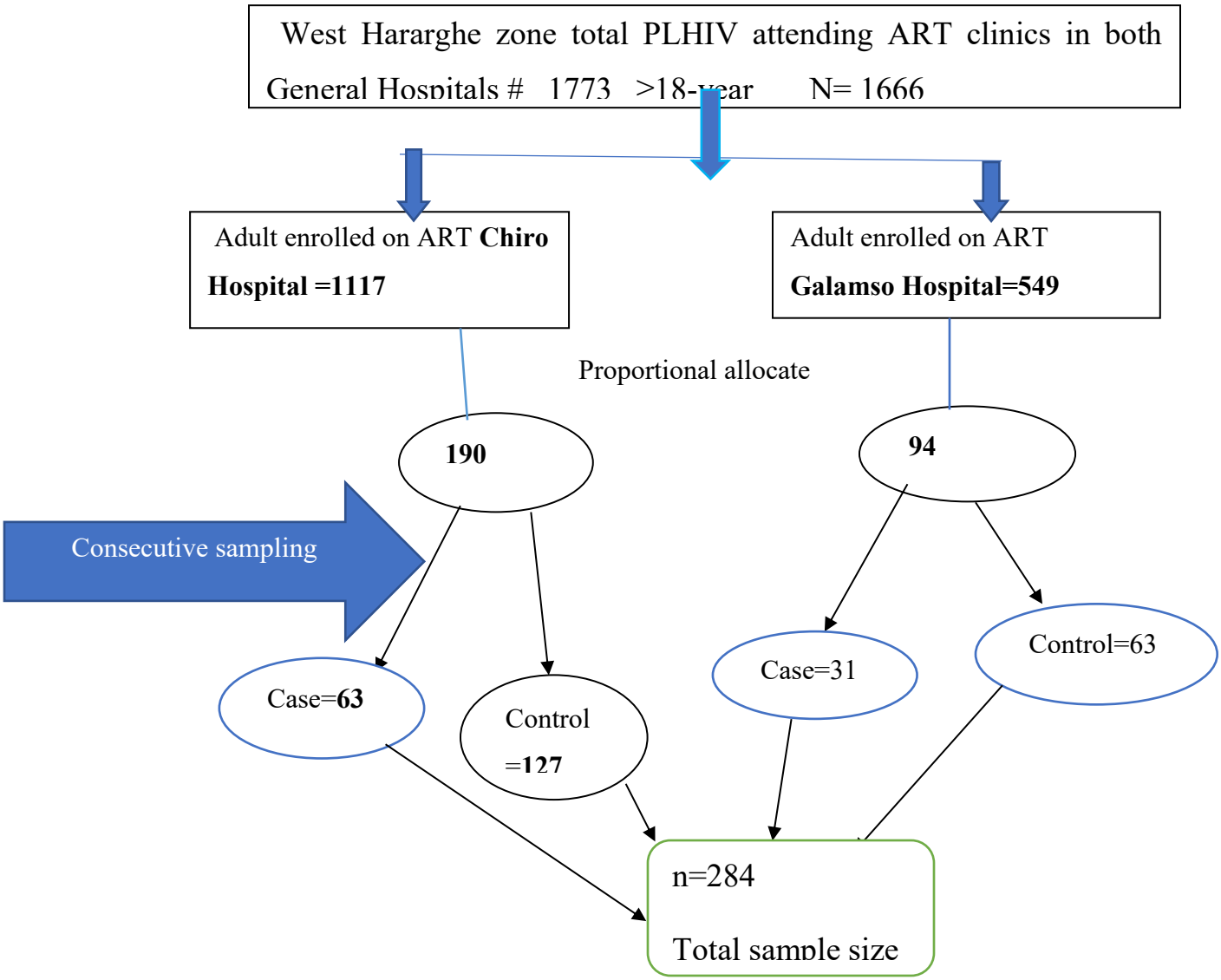

Figure 2 Scheme showing Sampling procedure of study participants West Hararghe Zone General Hospitals, 2019

4.6 Variables

Dependent variable: diarrheal diseases status

Independent variables:

Socio-demographic and economic variables-

Age

Sex

Educational status

Marital status

Family size

Occupational status

Household relative wealth index

Environmental sanitation, Water supply and hygiene factor related variables

Pets in the house

Pets Contact with man

Insect & rat in the home

Latrine availability and ownership

Type of latrine

Latrine with cover

Solid waste disposal

Latrine Hand washing facility

Water source

Water point ownership

Hand washing before food preparation and after using toilet

Water storage container

Eating raw/uncooked food

Distance of water collection from house

Handwashing materials

Storage of drinking water and water consumption

Clinical variables-

CD4 Count

WHO clinical stage

Previous history of diarrhea

ART Adherence

Undernutrition

Opportunistic infection

Cotrimexazole prophylaxis

4.7 Data collection instruments and procedures

4.7.1 Data collection instruments

Structured Questionnaire adapted from different literatures. Interviewer administered structured questionnaire and medical Record by using checklist to collect information of clinical factors. Anthropometric measurement tools such as, Beam balance and Stadiometer, Household economic level was measured using Relative wealth index, the tool adopted from EDHS,2017 (24).

4.7.2 **Data collection procedure**

After the study participants were identified as cases and controls by supervisors, they were sent to private rooms for cases and controls but the data collectors were blinded for the case status . Before starting the interview, anthropometric measurements like height and weight were measured, Weight of an individual was measured to the nearest 0.1kg using weighing balance and height of an individual was measured to the nearest 0.1cm using Stadiometer at standing position. They were interviewed based on an interviewer administered structured questionnaire by four clinical nurses who were trained and was supervised by two trained Health Officer (HO) supervisors. Checklist was used for medical record reviewed to collect information about some clinical factors such as CD4 count, WHO clinical stage of the disease, opportunistic infections and Cotrimexazole prophylaxis.

4.8 Data processing and analyses

Data were checked for completeness manually, and then coded data entered in Epi-data version 4.4.2 software and exported to SPSS-version 23 statistical analysis software .Data were cleaned and processed before analysis that include recoding, computing, categorizing and selection accordingly. The wealth index was constructed using household asset data composed of different indicators common to households through a principal component analysis (PCA) after checking its assumptions. The variables, which fulfilled assumption, entered in to the principal component analysis, finally the factors weighted and rank, the score was organizes in to quintiles as poorest, poor, middle, rich and riches. Normality test was checked for continuous variables by Kolmogorov-Smirnov test. Descriptive statistics such as mean, media and standard deviation for continuous variables and crosstab for categorical variable was computed and presented using tables and graph.

Bivariate analysis was conducted for all predictors to test the association between the independent and the outcome variables to identify candidate variables .All variables with P-value <0.2 in bivariate analysis were entered to multiple logistic regression model after testing for the model fitness or adequacy using Hosmer & Lemeshow goodness-of-fit test. The multiple logistic regression by using backward stepwise techniques and Model was fitted to identify the potential independent predictors of diarrhea among adult PLHIV where adjusted odd ratio (AORs) with their corresponding to 95% confidence interval (CIs) was used to assess the strength of the associations between the outcome variables and predictors variables at P value<0.05 cut-off point.

4.9 Data quality assurance

The questionnaire was originally designed in English, then translated to local languages, and back translated to English by other person to check for its consistency. Two days training was given to data collectors and supervisors on the objective of the research, how to collect the data through interview approach, record data and anthropometric measurement and the data collectors blinded case status. The questionnaires was pre-tested on 14 participants (5%) of the samples in Kuni Health center before the actual study begins and necessary modifications was considered. Weight of participant was taken using standard beam balance and the scale was checked to calibrate at zero before and during measurement. Two trained supervisors supervised the data collection

process. The principal investigator was supervised routinely the data collection process and ensures completeness and consistency of the collected questionnaires

4.10 Ethical consideration

The study was conducted after getting ethical clearance from institutional review board (IRB) of Jimma University, Institute of Health. Permission letter was obtained from west Hararghe Zonal Health office and respective Hospitals. In addition, informed written consent obtained from each study participants to confirm willingness for participation after explaining the objective, benefits, risk and procedure of the study.

Respondents were informed that they have the right to refuse or terminate at any point of the interview and the information provided by each respondent were kept confidential.

4.11 Dissemination Plan

Study finding will be presented to Jimma University, Institute of Health, Faculty of Public Health, and Department of Epidemiology. The finding will be shared to study hospitals and West Hararghe Zonal Health office. In addition, the findings of study will be presented on Scientific Conference and effort will be made for publication on peer review journal

4.12 Operational definition

Diarrhea:-PLHIV who reported to passage three or more loose, liquid or watery bowel movement within 24 duration hours

Handwashing facilities: - is the proportion of population with handwashing facility with Soap and water near the latrine at home. Handwashing facilities can consists of a sink with tap , but can also include other devices that contain regulate the flow of water (46).

Improved water source: - an individual was considered as using improved water source if the drinking water protected from contamination. These include piped water, protected dug well and spring,(47)

Unimproved (poor) water status: Water from a dam, pool or stagnant water source from a river, stream or rainwater tank, unprotected well, unprotected spring, water from a spring or borehole, cart with tank, tanker truck, surface water (47).

Improved latrine facilities: - These include wet sanitation technologies flush and pour flush toilets connecting to sewers, septic tanks or pit latrine) ventilated improved pit latrines, pit latrine with slab, or composting toilets (47).

Unimproved (poor) sanitation status:-Household with no latrine or toilet facility or a bucket system; open latrine, outside yard/compound, shared private facility of any type, outside yard/compound, shared public facility of any type, open defecation(47).

Household Wealth status index -household living status categorized to lowest, second, middle, fourth and highest using wealth index, which was calculated from Household assets using principal component analysis (PCA)(48).

Distance of water source: - according to WHO, the distance of water source that 20 minutes away that afford the possibility of reliably obtained at least 20 liters per day per family member (47)**.**

Water consumption per day per capita:-Average consumption of water by person per day per capita < 20 liters and $\geq 2o$ liters of water per day per person in this stud (49).

Good adherence: is defined as if person took ≥95% or (missed <3 dose) of prescribe drugs for the last month fair adherence as taking 85–94% of prescribed doses, and poor adherence as taking < 85% of prescribed doses (50).

CHAPTER Five: RESULTS

5.1 Socio –Demographic and Economic Characteristics

Total of 90 cases and 186 controls adult PLHIV on ART were participated in study with response rate of 96.4% and 97.8 % respectively. Among respondents, 68 (75.6%) cases and 130 (69.9%) controls were females. The median ages of the cases and control were 35 (IQR, 28-45.5) and 37 (IQR, 30-45) years, respectively. Majority of the cases (42.2%) and controls (38.2%) were in the age range of 25-34 and 35-44 years, respectively. Most of the cases (87.8%) and Controls (89%) were urban residents.

More than half of cases, 48 (53.3%) and 89 (48%) controls were married. Forty-two (46.7%) cases and 2 third of the controls, 78 (41.9%) were primary education. Near one third of cases (32.2%) and controls (27.4%) were unemployed. Among family size cases (84.4%) and more than half controls (78%) had less than five family members. Concerning economic status, relative Wealth Index, 11 (12.2%) cases and 44 (23.7%) controls were poorest, whereas 17.8% and 21.3% cases and controls were the richest respectively (Table-2).

*Table 2. **Socio Demographic** and **Economic** Characteristics of Diarrhea Disease among Adult HIV attending ART, West Hararghe General Hospitals, 2019*

Variables		Cases, N (%)	Controls, N (%)
Sex	Female	68 (75.6)	130 (69.9)
	Male	22 (24.4)	56 (30.1)
Age	18-24 years	4 (4.4)	12 (6.5)
	25-34 years	38 (42.2)	49 (26.3)
	35-44 years	22 (24.4)	71 (38.2)
	>=45 years	26 (28.9)	54 (29.0)
Family size	< 5 members	76 (84.4)	145 (78.0)
	>= 5 members	14 (15.6)	41 (22.0)
Place of Residence	Urban	79 (87.8)	165 (88.7)
	Rural	11 (12.2)	21 (11.3)
Marital status	Married	48 (53.3)	89 (47.8)
	Single	7 (7.8)	8 (4.3)
	Widowed	19 (21.1)	49 (26.4)
	Divorced	8 (8.9)	16 (8.6)
	Separated	8 (8.9)	24 (12.9)
Educational status	Illiterate	31 (34.4)	71 (38.2)
	Primary	42 (46.7)	78 (41.9)
	Secondary	11 (12.2)	29 (15.6)
	Above secondary	6 (6.7)	8 (4.3)
Occupational status	Unemployed	29 (32.2)	51 (27.4)
	Government Employee	16 (17.8)	34 (18.3)
	Daily workers	25 (27.8)	41 (22.0)
	Merchant	17 (18.9)	44 (23.7)
	Farmer	3 (3.3)	16 (8.6)
Relative Wealth index	Poorest	11 (12.2)	44 (23.6)
	Poor	20 (22.2)	36 (19.4)
	Middle	19 (21.1)	33 (17.7)
	Rich	24 (26.7)	34 (18.3)
	Richest	16 (17.8)	39 (21)

5.2 Environmental Related Factors

Eighty-five (94.4%) cases and 165 (88.7%) of controls had latrine facilities, from whom more than half of cases (57.6%) and controls 52.7%) had used communal or shared latrines. Sixty-three (74.1%) cases and majorities of controls, 154 (93.3%) had pit latrine with slab. Concerning

presence of Pets in their houses, 54 (60%) and 55 (29.6%) of cases and controls had pets in the house respectively.

Fifty-five (61.1%) of cases and 143 (76.9%) of controls had Insects and rats in their houses, and 49% and 72% of cases and controls were not contact with cats respectively. More than half (57.8%) of cases and 48.9% of controls disposed solid waste at open field. Majority of cases, 83 (97.6%) and 153 (92.7%) of controls did not have washing facilities from their latrines. Concerning water supply, 54.4% of cases and half of (50.5%) controls had used public water source. Almost all, 179 (93.3%) and 84 (96.2%) of cases and controls had used Jerkan for water storage respectively.

More than half, 48 (53.3%) of cases and 162 (87.1%) of controls, their drinking-water storage container had a cover. Fifty- seven (63.3%) of cases and 155 (83.3%) of the controls had been washing their hand always after visited toilet (Table 3).

Table 3.Univariables Analysis of Environmental Related Factors of Predictors of Diarrhea Disease among Adult HIV Attending ART, West Hararghe General Hospitals, 2019

Variables		Cases, N (%)	Controls, N (%)
Availability Latrine facilities	Yes	85 (94.4)	165 (88.7)
	No	5 (5.6)	21 (11.3)
Ownership of the latrine	Shared	49 (54.4%)	87 (46.8)
	No latrine	5 (5.6)	21 (11.3)
	Private	36 (40.0)	78 (41.9)
Types of latrine	No latrine facility	5 (5.6)	21 (11.3)
	Pit latrine	69 (76.6)	157 (84.3)
	VIP	15 (16.7)	4 (2.2)
	Flush to pit	1 (1.1)	4 (2.2)
Pit larine with cover	Yes	14 (20.3)	24 (10.2)
	No	55 (79.7)	133 (89.8)
Latrine with hand washing facility	Soup & water	2 (2.4)	12 (7.3)
	No handwashing	83 (97.6)	153 (92.7)
Pets in the home	Absent	36 (40)	131 (70.4)
	Presents	54 (60)	55 (29.6)
Contact between man and cat/dog	Absent	44 (48.9)	134 (72)
	Presents	46 (51.1)	52 (28)
Primary dispose of waste	Open field	52 (57.7)	91 (48.9)
	Burn	6 (6.7)	18 (9.7)
	Container	14 (15.6)	35 (18.8)
	Pit	18 (20.0)	42 (22.6)
Presence insect and rat in the home	Absent	55 (61.1)	143 (76.9)
	Presents	35 (38.9)	43 (23.1)
Source of water point	Public	49 (54.4)	94 (50.5)
	Private	41(45.6)	92 (49.5)
Storage of water containers at home	Jerkan	84 (93.3)	180 (96.8)
	Plastic bucket	6 (6.7)	6 (3.2)
Separate container other purposes from drinking water	Yes	52 (57.8)	132 (71.0)
	No	38 (42.2)	54 (29.0)
Separate can for drinking water	Yes	46 (51.1)	102 (54.8)
	No	44 (48.9)	84 (45.2)
Storage container with a cover	Yes	48 (53.3)	162 (87.1)
	No	42 (46.7)	24 (12.9)
Washing hands after visiting the toilet	Always	57 (63.3)	155 (83.3)
	Sometimes	33 (36.7)	31 (16.7)
Washing hands before preparing food	Always	61 (67.8)	157 (84.4)
	Sometimes	29 (32.2)	29 (15.6)
Eating raw/ uncooked vegetables and raw meat	Yes	55 (61.1)	85 (45.7)
	No	35 (38.9)	101 (54.3)

Distance to get water in minute	<20 minutes	66 (73.3)	153 (82.3)
	≥20 minutes	24 (26.7)	33 (17.7)
Daily Consumption of water per day per person per capita	≥20 liters	62 (68.9)	151 (81.2)
	<20 liters	28 (31.1)	35 (18.8)

5.3 Clinical Related Characteristics

From clinical related factors, 69 (76.2%) of cases and 146 (78.5%) of controls had CD4 counts greater than 350/µl. Forty-nine (54.4%) of cases and 132 (71%) of controls did not use cotrimexazole prophylaxis. cases, 41 (45.6%) and controls, 40 (21.5%) had previous history of the diarrheal disease. Twenty-six (29%) of cases and 28 (15.1%) of controls had Opportunistic infections. Almost all cases (97.8%) and Controls (99.5%) had good adherence for antiretroviral therapy.

Table 4. Univariate Analysis Clinical Related Diarrhea Disease among Adult HIV attending ART clinic West Hararghe General Hospitals, 2019

Variables		**Cases, N (%)**	**Controls, N (%)**
CD4 count	<200/µl	3 (3.3)	12 (6.4)
	200-350/µl	18 (20.0)	28 (15.1)
	>350/µl	69 (76.7)	146 (78.5)
WHO clinical stages	Stage –I	77 (85.6)	168 (90.3)
	Stage-II	8 (8.9)	12 (6.5)
	Stage- III and above	5 (5.5)	6 (3.2)
Cotrimexazole prophylaxis	Yes	41 (45.6)	54 (29.0)
	No	49 (54.4)	132 (71.0)
Previous history of diarrhea	Yes	41(45.6)	40 (21.5)
	No	49 (54.4)	146 (78.5)
Presence of OIs	Yes	26 (29.0)	28 (15.1)
	No	64 (71.0)	158 (84.9)
Body mass index	<16kg/m^2	1 (1.1)	6 (3.2)
	16-16.99kg/m^2	2 (2.2)	7 (3.8)
	17-18.49kg/m^2	12 (13.3)	20 (10.8)
	>18.50kg/m^2	75 (83.3)	153 (82.3)
ART adherence	Good	88 (97.8)	185 (99.5)
	poor	2 (2.2)	1 (0.5)

5.4 Bivariables Logistic Regression Analyses

5.4.1 Sociodemographic and economic related factors

Bivariate logistic regression was employed for each individual variables to select candidate variables for multivariable logistic regression. From variables under socio demographic and economic that include age, family size, and Relative wealth index were significant at p value < 0.20 in bivariate logistic regression.

Table 5 *Bivariate Logistic Analyses of* ***Socio*** *Demographic and Economic Characteristics of Predictors of Diarrhea Disease among Adult HIV attending ART West Hararghe General Hospitals, 2019*

Variables		**Cases, N (%)**	**Controls, N (%)**	**COR(95% CI)**	**p-value**
Sex	Male	68 (75.6)	130 (69.9)	1	
	Female	22 (24.4)	56 (30.1)	1.3 (0.7-2.3)	0.328
Age	18-24 years	4 (4.4)	12 (6.5)	0.7 (0.2-2.4)	0.556
	25-34 years	38 (42.2)	49 (26.3)	1.6 (0.9-3.0)	0.139*
	35-44 years	22 (24.4)	71 (38.2)	0.6 (0.3-1.3)	0.197*
	>=45 years	26 (28.9)	54 (29.0)	1	
Residence	Urban	79 (87.8)	165 (88.7)	0.9 (0.4-1.9)	0.821
	Rural	11 (12.2)	21 (11.3)	1	
Marital status	Married	48 (53.3)	89 (47.8)	1	
	Single	7 (7.8)	8 (4.3)	1.6 (0.6-4.8)	0.377
	Widowed	19 (21.1)	49 (26.4)	0.7 (0.4-1.4)	0.309
	Divorced	8 (8.9)	16 (8.6)	0.9 (0.4-2.3)	0.872
	Separate	8 (8.9)	24 (12.9)	0.6 (0.3-1.5)	0.280
Educational status	Illiterate	31 (34.4)	71 (38.2)	0.6 (0.2-2)	0.352
	Primary	42 (46.7)	78 (41.9)	0.7 (0.2-2.2)	0.563
	Secondary	11 (12.2)	29 (15.6)	0.5 (0.1-1.8)	0.291
	Above secondary	6 (6.7)	8 (4.3)	1	
Relative Wealth index	Poorest	11 (12.2)	44 (23.6)	0.5 (0.2-1.3)	0.180*
	Poor	20 (22.2)	36 (19.4)	1.0 (0.4-2.3)	0.982
	Middle	19 (21.1)	33 (17.7)	2.4 (1.1-3.2)	0.031*
	Rich	24 (26.7)	34 (18.3)	1.3 (0.4-2.8)	0.583
	Richest	16 (17.8)	39 (21)	1	
Occupational status	Government employee	29 (32.2)	51 (27.4)	1	
	Unemployment	16 (17.8)	34 (18.3)	1.2 (0.6-2.8)	0.427
	Daily workers	25 (27.8)	41 (22.0)	1.4 (0.6-2.8)	0.344
	Merchant	17 (18.9)	44 (23.7)	0.8 (0.4-2)	0.835
	Farmer	3 (3.3)	16 (8.6)	0.6 (0.2-2.4)	0.463
Family Size	< 5 members	76 (84.4)	145 (78.0)	1	
	>= 5 members	14 (15.6)	41 (22.0)	0.3 (0.1-0.9)	0.048*

5.4.2 Bivariables Logistic Regression Analyses of Environmental Related Factors

Variables from Environmental related factors in the bivariate logistic regression include presence insect and rat in the home, pets in the house, contact between cat/dog, hand washing before preparing food and after visited toilet. Eating raw/uncooked vegetables and meat, method of drawing water, Latrine availability, separate container for other purpose, distance to get water in minutes, consuming less than 20 liters of water per day were significant in bivariate logistic regression**.**

Table 6 Bivariate Logistic Regression Analyses of Environmental Related Factors of Predictors of Diarrhea Disease among Adult HIV attending ART, West Hararghe General Hospitals, 2019

Variables		Cases, N (%)	Control, N (%)	COR(95% CI)	P- value
Availability latrine	Yes	85 (94.4)	165 (88.7)	1	
	No	5 (5.6)	21 (11.3)	0.5 (0.2-1.3)	0.134*
Latrine facility	Shared	49 (54.4%)	87 (46.8)	1.2 (0.7-2.1)	0.460
	No latrine	5 (5.6)	21 (11.3)	0.5 (0.2-1.5)	0.218
	Private	36 (40.0)	78 (41.9)	1	
Pets in the home	Absent	36 (40.0)	131 (70.4)	1	
	Presents	54 (60.0)	55 (29.6)	3.6 (2.1-6.0)	0.000*
Contact between man and cat/dog	Absent	44 (48.9)	134 (72.0)	1	
	Presents	46 (51.1)	52 (28.0)	2.7 (1.6-4.5)	0.000*
Primary dispose of waste	Pit	18 (20.0)	42 (22.6)	1	
	Burn	6 (6.7)	18 (9.7)	0.6 (0.4-1.4)	0.385
	Container	14 (15.6)	35 (18.8%)	0.6 (0.2-1.6)	0.283
	Open field	52 (57.7)	91 (48.9%)	0.7 (0.3-1.4)	0.323
insect and rat in the home	Absent	55 (61.1%)	143 (76.9%)	1	
	Presents	35 (38.9%)	43 (23.1%)	2.1 (1.2-3.6)	0.007*
Source of water point	Public	49 (54.4)	94 (50.5%)	1.2 (0.7-1.9)	0.543
	Private	41 (45.6%)	92 (49.5%)	1	
Storage of water containers at home	Jerkan	84 (93.3%)	180 (96.8%)	1	
	Plastic bucket	6 (6.7%)	6 (3.2%)	2.1 (0.7-6.8)	0.201

separate for other purposes container from drinking water	Yes	52 (57.8%)	132 (71.0)	1	
	No	38 (42.2%)	54 (29.0)	1.8 (1.1-3.0)	0.030*
Distance to get water in minute	≥20 minutes	24 (26.7%)	33 (17.7)	1	
	< 20 minutes	66 (73.3%)	153 (82.3)	1.7 (0.9-3.1)	0.088*
Daily Consumption of water per capita	< 20 lit	28 (31.1%)	35 (18.8)	1.9 (1.1-3.5)	0.024*
	≥20 lit	62 (68.9%)	151 (81.2)	1	
Methods of drawing water	dipping	24 (26.7)	31 (16.7)	1.8(0.9-3.3)	0.05
	pouring	66 (73.3)	155 (83.3)	1	
separate can for drinking water	Yes	46 (51.1%)	102 (54.8)	1	
	No	44 (48.9%)	84 (45.2)	1.2 (0.7-1.9)	0.561
washing hands after visiting the Toilet	Always	57 (63.3%)	155 (83.3)	1	
	Sometimes	33 (36.7%)	31 (16.7)	2.8 (1.5-4.9)	0.001*
Eating raw/uncooked vegetables and meat	Yes	55 (61.1%)	85 (45.7)	1.9 (1.1-3.1)	0.017*
	No	35 (38.9%)	101 (54.3)	1	

NB- p-value at 0.2 significant for Bivariables logistic regression

5.4.3 Bivariables Logistic Regression Analyses of Clinical Related Factors

From the Clinical related factors previous history of Diarrhea, having opportunistic infection, and cotrimexazole prophylaxis were candidate in bivariate logistic regression.

Table 7 Bivariables Analysis Clinical Related Factors of Predictors of Diarrhea Disease among Adult HIV Attending ART, West Hararghe General Hospitals, 2019

Variables		Cases, N (%)	Controls, N (%)	COR(95% CI)	p- value
CD4 count	<200/µl	3 (3.3)	12 (6.5)	0.5 (0.1-1.9)	0.336
	200-350/µl	18 (20.0)	28 (15.0)	1.4 (0.7-2.6)	0.359
	>350/µl	69 (76.7)	146 (78.5)	1	
WHO clinical stages	Stage –I	77 (85.6)	168 (90.3)	1	
	Stage-II	8 (8.8)	12 (6.5)	1.5 (0.6-3.7)	0.432
	Stage_ III and above	5 (5.6)	6 (3.2)	1.8 (0.5-6.1)	0.336
Cotrimexazole prophylaxis	Yes	41 (45.6)	54 (29.0)	1	
	No	49 (54.4)	132 (71.0)	0.5 (0.3-0.8)	0.007*
Previous history of diarrhea	Yes	41 (45.6)	40 (21.5)	3.1 (1.8-5.3)	0.000*
	No	49 (54.4)	146 (78.5)	1	
Presence of OIs	Yes	26 (28.9)	28 (15.1)	2.3 (1.3-4.2)	0.007*
	No	64 (71.1)	158 (84.9)	1	

NB. 1 stands for reference * significant at p-Value <0.20

5.5 Multivariables Logistic Regression

5.5.1 Factors independently associated with diarrheal disease

Multivariable logistic regression fitted to identify independent predictors of diarrhea among PLHIV. Accordingly, presence of pets in the household, washing hands only sometimes after visiting the toilet, water consumption <20 liters per day per capita and history of diarrhea were independent determinants of diarrhea among PLHIV.

The study finding revealed that adult PLHIV who were from households which had pets were more than three times (AOR= 3.4, 95% CI: 1.8, 6.4) more likely to had diarrhea compared to those who had not. PLHIV who did not wash their hands after visiting toilet were three times (AOR=3.0; 95% CI: 1.5, 6.1) more likely to be affected by diarrhea compared to their counterparts. Those PLHIV who consumed less than 20 liters of water per day per capita were more than two times (AOR=2.6; 95% CI:1.2, 5.4) more likely to acquired diarrhea. PLHIV who had history of diarrhea were more than two times (AOR=2.5; 95% CI: 1.3, 4.8) more likely to have diarrhea compare to their counterparts. (Table 8).

Table 8 Factors independently associated with Diarrhea Disease among Adult HIV on ART, West Hararghe General Hospitals, 2019

Variables		Cases, N (%)	Controls, N (%)	COR(95% CI)	AOR (95% CI)	P- value
Family Size	<5 members	76 (84.4)	145 (78.0)	1		
	>=5 members	14 (15.6)	41 (22.0)	0.3 (0.1-0.9)*		
Age	18-24 years	4 (4.4)	12 (6.5)	0.7 (0.2-2.4)		
	25-34 years	38 (42.2)	49 (26.3)	1.6 (0.9-3.0)		
	35-44 years	22 (24.4)	71 (38.2)	0.6 (0.3-1.3)*		
	>=45 years	26 (28.9)	54 (29.0)	1		
Relative Wealth index	Poorest	11 (12.2)	44 (23.6)	0.5 (0.2-1.3)*		
	Poor	20 (22.2)	36 (19.4)	1.0 (0.4-2.3)		
	Middle	19 (21.1)	33 (17.7)	2.4 (1.1-3.2)*		
	Rich	24 (26.7)	34 (18.3)	1.3 (0.4-2.8)		
	Richest	16 (17.8)	39 (21)	1		
Presence of pets in the house	Present	54 (60.0)	55 (29.6)	3.6 (2.1-6.0)*	3.4 (1.8-6.4)	0.000
	Absent	36 (40.0)	131 (70.4)	1	1	
Daily Water consumption per capita	<2o lit/day	28 (31.1)	35 (18.8)	1.9 (1.1-3.5)*	2.5 (1.2-5.4)	0.011**
	≥20 lit/day	62 (68.9)	151 (81.2)	1	1	
Previous history of diarrhea	Yes	41 (45.6)	40 (21.5)	3.0 (1.8-5.3)	2.5 (1.3-4.8)	0.005**
	No	49 (54.4)	146 (78.5)	1	1	
Hand washing after visiting toilet	Always	57 (63.3)	155 (83.3)	1	1	
	Some time	33 (36.7)	31 (16.7)	2.8 (1.5-5.0)*	2.9 (1.4-6.1)	0.003**
Availability latrine	yes	85 (94.4)	165 (88.7)	1		
	No	5 (5.6)	21 (11.3)	0.5 (0.2-1.3)		
insect and rat in the home	Presents	55 (61.1)	143 (76.9)	2.1 (1.2-3.6)*		
	Absent	35 (38.9)	43 (23.1)	1		
Cotrimexazole prophylaxis	Yes	41 (45.6)	54 (29.0)	1		
	No	49 (54.4)	132 (71.0)	0.5(0.3-0.8)*		
Opportunistic infection	Yes	26 (28.9)	28 (15.1)	1		

	No	64 (71.1)	158 (84.9)	0.4 (0.2-0.9)*		
Contact between man and cat/dog	Absent	44 (48.9)	134 (72.0))	1		
	present	46 (51.1)	52 (28.0)	2.7(1.6-4.3)		
separate container for other purposes from drinking water	Yes	52 (57.8)	132 (71.0)	1		
	No	38 (42.2)	54 (29.0)	1.8 (1.1-3.0)		
Methods of drawing water	dipping	24 (26.7)	31 (16.7)	1.8(0.9-3.3)		
	pouring	66 (73.3)	155 (83.3)	1		
Distance to get water in minute	≥20 minutes	24 (26.7)	33 (17.7)	1.7 (0.9-3.1)		
	<20 minutes	66 (73.3)	153 (82.3)	1		
Eating raw/uncooked vegetables and meat	Yes	55 (61.1)	85 (45.7)	1.9 (1.1-3.1)		
	No	35 (38.9)	101 (54.3)	1		

NB. Multivariables ** significant at p-value < 0.05, 1---Reference

CHAPTER SIX: DISCUSSION

Identifying predictors of diarrheal disease among adult people living with HIV are important for prevention and control of opportunistic infection, which will improve their survival status. This study focused on identifying of predictors of diarrheal disease among adult people living with HIV.in west Hararghe General Hospitals. Results from this study showed that presence of pets in the house, poor hand washing after toilet, water consumption less than 20 liters per day and previous history of diarrhea were independently associated with diarrheal disease among adult PLHIV.

The study finding revealed that presence of pets in the house was significantly associated with diarrheal disease among PLHIV. Adult PLHIV who were from household, which had pets, were more than three times more likely to had diarrhea compared to those who had not. The finding is supported by study conducted among adult People Living with HIV /AIDS in Jimma Town ,South-Western Ethiopia, which found that presence of pets in houses was associated with diarrhea (26). Similar study conducted in Kenya which found that the odd of diarrhea disease among PLHIV who had close contact with pets were three time more likely to acquired diarrhea compared to the counterparts (41).

These could be due to the reason that pets are reservoirs for microorganisms, which are easily transmitted from pets to the persons. The pets in the house have easy contact with either food items or utensils in their house, as a result individual might acquire microorganisms (26). The implication of this study is strengthen urban Health extension programm on importance of providing housing for pets outside their house.

This finding showed that washing hands sometimes after visiting the toilet was independently associated with diarrheal disease. Adult PLHIV who did not wash their hands after visiting toilet were three times more likely to be affected by diarrhea compared to their counterpart. The finding was in-line with the study conducted in Kenya, which found that people washing their hands after last defecation were 76% less likely to acquiring diarrhea as compared to those who did not wash their hand (37). Likewise, study conducted among PLHIV in China reported that washing hands after defecation was significant association with diarrhea (33). Hand washing promotion leads to reduction in diarrhea episodes in both child day-care centers in high-income countries and among communities living in LMICs (Low and middle income counties) by about 30% (36).

These is the fact that hand washing with soap is cost effective strategy to reduce burden diarrhea disease in the communities. Pathogens multiply in human guts and exit in excreta, people who cannot practicing hand washing after visiting toilet can acquired microorganism, because of hands as media for feco oral transmission. The implication of this study is strengthen the implementation of integration WASH activities in the HIV/AIDS care and treatment.

Consuming water less than 20 liters per day per capita was positively associated with diarrhea disease. The study finding showed that PLHIV who consumed less than 20 liters water per day per capita were more than two times more likely to acquired diarrhea disease compared to those who had been consumed greater than 20 liters. The finding is supported by study conducted in North Ethiopia which found that adults who consumed less than 20 liter of daily water consumption per capita were three times more likely to developing diarrhea compared to adults who used ≥20 liters per day per capita (39). Similarly, case control study in South Africa, shows that limited access to water point has positive association with diarrheal disease among PLHIV compared to those who had access to water service (25).

These could be explain by the fact that People Living with HIV required additional amount of water and additional access to sanitation facility (51). If water consumption less than 20 liters per day per capita ,they cannot practice bathing every day, washing soiled dress and linen, and keeping home environment clean and taking medicines safely (30). Because of vulnerability, PLHIV might be easily acquire opportunistic infection from water related pathogens. Inadequate water supply result in Poor hygiene of living which might increase chance of developing acute diarrhea (39). The implication of this finding, in addition to quality of water supply, adequate quantities of water is very crucial for quality of life and has major role in prevention of diarrhea disease among PLHIV.

From clinical related factors previous history of diarrhea were independently associated with diarrheal disease. The finding revealed that previous history of diarrheal disease was significantly associated with diarrhea. PLHIV who had history of diarrhea were more than two times (OR, 2.5; 95% CI: 1.3, 4.8) more likely to have diarrhea compared to their counterparts.

This finding is consistence with case control study conducted in South West Ethiopia which found that PLHIV who had previous history of diarrhea were four times more likely to develop diarrhea

among PLHIV (26).Similar study conducted in India ,which found that who had previous history of diarrhea were increased risks of diarrhea disease (8).

These might be due to inappropriate diagnosis and identification of pathogens, and treatment of patients which might result in suffering from diarrheal disease (26). Microorganisms might easily affect PLHIV due to high susceptibility and immune degradation.

Limitation of the study: Recall and social desirability biases affected respondent's response, specifically history of diarrhea, sanitation and hygiene. Social desirability bias was minimized by selecting data collectors those who unfamiliar to ART clinic and training of data collectors, clarifying the objective of study. The second, this study was not identifying weather diarrhea was due to infection and noninfectious diarrhea.

CHAPTER 7: CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

The study was tried to determine different factors to identify predictors of diarrheal disease among adult PL HIV/AIDS. The independent predictors include previous history of diarrhea, presence of pets or animals in their house, washing hands sometimes after visiting toilet and Daily water consumption less than 20 liters per day per capita were statistically significant and independently predictors of diarrheal disease.

7.2 Recommendations

To **Regional Health Bureau, Zonal Health Department and Partners**

- ❖ Strengthen implementation of integrating of WASH activities with HIV/AIDS care and treatment

To Hospitals

- ❖ Due attention for PLHIV with previous history of diarrhea during WASH intervention
- ❖ Awareness creation activities for PLHIV regarding,
    - critical time hand washing
    - WASH practice
    - proper handling of pets

To Chiro and Galamso Town Health office

- ▪ Behavioral change communication on Hygienic practice
- ▪ PLHIV targeted implementation of WASH activities at Household by urban HEWs.

For Researcher: further studies, which determine cause and effect relationship and identification of infectious diarrhoea by using lab. Confirmation

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Annexes

JIMMA UNIVERSITY.

INSTITUTE OF HEALTH

FACULTY PUBLIC HEALTH DEPARTMENT OF EPIDEMIOLOGY

QUESTIONNAIRE ON PREDICTORS OF DIARRHEA DISEASE AMONG ADULT PLHIV ATTENDING ART CLINIC IN WEST HARARGHE ZONE GENERAL HOSPITALS,2019

Annexes I: Participant Information Sheet and Informed Voluntary Consent Form

Good morning/good afternoon. My name is _____. We came from Jimma University, Institute of Health, Faculty of Public Health and Department of Epidemiology. We are working for an investigator doing this research for the partial fulfillment of master degree in Field Epidemiology. We would like to ask you few questions. This will help us to identify some of the risk factors of Diarrheal disease among PLHIV based on your answer. We will also take some measurements including weight and height from you. If you are interested, we can tell you your weight and height measurements. You have full right to refuse, withdraw or completely reject part or all of your participation in the study. But we encourage your full participation, as the answers you give on this form and your participation in taking your measurements are very important to this study.

We would like to assure you that all of your responses to our questions was kept confidential throughout the study process. Any of information you provide was used only by the research team and, by no means, revealed to a third party. We will ask you questions and take measurements in a place where other people or conditions couldn't interfere. We would like to assure you that your participation on this research will not affect any of your treatment and other benefit that you get from any organization. The questions and measurements will take 30-45 minutes. If you have any questions about this study, you can ask me. Do you agree to participate in this study?

Yes _____ 2. No_____ Thank you for help!

If yes, Study participant's sign. _____ Questionnaire code _____ Date _____Supervisor is Name _____- Sign. _____

Data collector's Name _____ Sign. _____

Annex II: Questionnaire (English Version).

Questionnaires for predictors of Diarrhea Disease among adult PLHIV attending ART clinic in West Hararghe Zone General Hospitals, 2019

Region: _____ Zone _____Hospital_____,2019

. Result Codes: Completed =1, partially completed =2, Refused =3, others =4

Direction for eligibility

- PLHIV who reported passage of three or more loose, liquid or watery stools within 24 hours period was considered to have diarrhea in this study.
- HIV positive adult patient (18 years or older) presented with diarrhea within 14 days

Q101. Do you have a passage three or more loose, liquid or watery stools within 24 hours in last 14 days? 1. Yes 2. No

II .

No.	Questions	Coding Categories	Skip
Q102	Sex/gender	1. Male 2. Female	
Q103	How old were you at your last birthday?	Age in complete years_____	
Q104	Place of residence	1. Rural 2. Urban	
Q105	What is your ethnicity?	1.Oromo 2. Amhara Other (specify) _____	
Q107	Current Marital Status of respondent	1. Married 2. Single 3.Widowed 4. Divorced 5.Separated	
Q108	Family size in the House	_____	
Q109	What is your Educational status primary, secondary, technical/vocational or higher?	1.illiterat 2.Primary 3 .Secondary 4. above secondary	
III	Socio economic characteristics /Household relative Wealth index measuring varialbles		
Q111	What is your current occupation?	1.Government employee 2.Unemployed 3.Daily worker 4. Merchant 5. Farmer	

Q201	***What is Source of drinking water of your family?***	1.Piped in to dwelling 2. Piped to yard/plot 3. Public Taps/standpipe 4. Protected well (5) Protected spring (6)Unprotected well and spring	
Q202	Do you have latrine facility?	1. yes 2. No	
Q203	***What Types of toilet facility your Household have?***	**(1**)pit latrine with slab (2) pit latrine without slab (3) Ventilated improved pit latrine (4)Flush to pit latrine (5) Flush to piped sewer system (6) flush to septic tank (7)NO facility/bush/open field	
Q204	What Type of cooking fuel using in your home***?***	1.Electricity 2. Biogas 3. charcoal 4.Kerosene 5.wood 6. straw/shrubs/grass 7. agriculture crop 8.Animal dug	
Q205	The main floor of house	1***)*** Earth/sand (2) Dung (3)wood planks 4)Palm/Bamboo 5. ceramic 6. Cement 7.Carpet	
Q206	The main roof of the house	1.metal/corrugated iron 2.wood planks3.Palm/bamboo 4.Thatch/Mud 5.carboard 6. Wood 7. Cement	

Q207	What is main wall of your House?	1. Cane /palm/trunk 2. Bamboo with mud 3. stone with Mud 4. Plywood 5. Reused wood 6.stone with lime/Cement 7.Bricks 8.Cement Blocks	
Q208	Does your house have an Electricity?	1. Yes 2. NO	
Q209	Does your house have a radio?	1.Yes 2. No	
Q210	Does your house have a Television?	1. Yes 2. No	
Q211	Does your house have a Refrigerator	1. Yes 2. No	
Q212	Does your house have electric Mitad/ stove?	1. Yes 2. No	
Q213	Does your house have a bed with cotton/sponge mattress?	1. Yes 2. No	
Q214	Telephone(non-Mobile)	1. Yes 2. No	
Q215	Kerosene Lamp	1.yes 2. No	
Q217	Does your house have a Watch?	1. Yes 2. No	
Q218	Does your house have a Mobile telephone?	1. Yes 2. No	
Q219	Does your house have a Bicycle?	1. Yes 2. No	
Q220	Does your household have a Motorcycle?	1. Yes 2. No	
Q221	Does your house have a Baggage?	1. Yes 2. No	
Q222	Does any member in the house have bank account?	1. Yes 2. No	
Q223	Does your House ownership	1. Private 2. Rented	
Q224	How many members of the house sleep per room?	_____	
Q225	Does you have Own land for agriculture?	1. Yes 2. No	
Q226	Does your house have Caw/bulls	1 yes. 2. No	
Q227	Does your house have Goat/Sheep	1. yes 2. No	
Q228	Does your house have Chickens or other Poultry?	1. Yes 2.NO	
Q229	Does your house have Bee hives?	1.yes 2. No	
Ser NO	**Section IV. Environmental Sanitation**		Sk
Q301	How many of rooms in your house?	_____	

Q302	Ownership of latrine	1.private 2.Shared 3.public	
Q303	Does the latrine currently function?	1. Yes 2. No	
Q304	How often do you clean the latrine?	1. Everyday 2. More than 3 times a week. 3 .do not clean	
Q305	If the latrine is pit latrine, does it have cover?	1. Yes 2. No	
Q306	Does your latrine have hand-washing facility?	1. Soup and water 2. Ash and Water 3. No hand washing	
Q307	If the family has no latrine, where do you dispose human waste?	1 Open field 2. Other specify_____	
Q308	How do your household Primarily dispose of household waste?	1. Pit 2. Burn. 3.garbege container 4.open field	
Q309	Is there pet's presence in the House?	1. Present 2. Absent	Skp
Q310	Is there any contact between man and cat /dog?	1. Present 2. Absent	
Q311	Does Insect and rat in the house?	1. Present 2. Absent	
Q401	Where is your water point?	1. Public 2. Private	
Q402	Distance of Water from house (in minute)	_____ minute	
Q403	What water storage material do you use in your home?	1. Jerkan 2. Plastic Bucket 3. Iron Bucket 4 .Roto	
Q404	Using the material mentioned above, how much water your household consume in one day?	_____	
Q405	Do you wash your hands before preparing food?	1. Always 2. Sometimes 3. never	
Q406	Do you wash your hands after visiting the Toilet?	1. Always 2. Sometimes . 3.Never	
Q407	Did you always wash your hands after cleaning and disposing stools of child?	1. Yes 2. No	
Q408	Does the drinking-water storage container have a cover?	1. Yes 2. No	
Q409	Is there a separate can for taking drinking water from the storage container?	1. Yes 2. NO	
Q410	Do you store water for other purposes in separate container from drinking water?	1. Yes 2. No	

Q411	Method of drawing of water from the storage container	1. Dipping 2. pouring	
Q412	DO you eaten raw or uncooked vegetables and meat foods in your home?	1. Yes 2. NO	
Q501	CD4 count	_____	
Q502	WHO staging	1. Stage I 2. II 3. III and above	
Q503	Cotrimexazole prophylaxis	1. Yes 2. No (from record)	
Q504	Previous history of diarrhea	1. Yes 2. NO	
Q505	Opportunistic infection	1. Yes 2.No (from record)	
Q506	Weight	_____KG	
Q507	Height	_____meters	
Q508	ART adherence	_____	

Thank you very much !

Annex IV. Gaaffiilee (Afaan Oromo version)

Gaaffilee Sababoota gara kaassaa Namoota "HIV/ AIDS" walin jiran umriin 18 olii tahaan qorachuf ilaalchis Hospitalaa dhufaniif qophaa'e.

Naannoo: Oromiyaa Godina: Harargee Lixaa :Hospitaala_____

001.haala gaaffiin itti guutame:

guutumaan guututti guutamee jira=1 Walakkaan guutume=2 hin guutamne=3

Qaceelfama Ulaagaa fillnno Hirmaata

- Gara kaasa jechun :- sagaara yreoo duraanii irraa baayyee laafatau ykn dhangala'aa guyyatti yeroo sadi fi isaa ol sa'aa 24

- Namota HIV /AIDS walin jiran wagga 18 fi isaa oli) guyyaa 14 keessa garaa kaasan dhukubsatani dhufan, guyyatti sa'aa 24 keessatti yeroo sadii fi isaa oli garaan kan yaasu yootahe.

Q101. Torban laman dabree keessati sagaara yreoo duraanii irraa baayyee lallafatau ykn dhangala'aa siqabee beeka? 1.Eyyee 2. lakkii

Duraan dursee gaaffii muraasa si gaafachuu barbaada.

Kutaa I: Haala Hawaasaa fi Odeeffanoo Maatii			Kodii	Skipii
Lakk	Gaaffii	Deebii		
G102	Saala/Korniyaa	Dhira 2. Dubartii		
G103	Umriin keessan meeqaa/waggaa guutuu	_____		
G104	Bakka jireenyaa	1. Magaala 2. Baadiyyaa		
G105	Sabni kee maali?	1.Oromoo 2.Amhaara 3. Gurage		
G106	Amantiin kee maali?	1.Muslima 2.Ortodoksii 3. Kaatolikii 4. Protestaantii		
G107	Haala fuudhaa fi heerumaa kan ammaa	1. Fudhee/Heerumee 2.Hinfune 3. Jalaa du'ee jira. 4 .Wal hiikaniiru 5. Adda bahan		
G108	Baay'ina waliigala maatii mana keessa jiraatan	_____		
Q109	Sadarkkan barnnota keessani mali?	1. hinbarane 2.Sadarkaa 1ffaa 3 .Sadarkaa 2 ffaa 4. Sadarkaa 2ffaa oli		
G111	Hojiin keessan maali?	1.Qonnaan bulaa 2 .Hojjattaa mootummaa 3.Hoji-dhabaa 4. Hojjettaa guyyaa 5 .Daldala		
KutaII:	Odeefannoo Dindge Hawaasumma			
G201	Maatiin keessan Maddii bishaan dhugati eeyssa argatu?	1. Boombaa gandaa 2. Mooraa mana keessaa 3.Boono motuummaa 4.Bishaan boolaa dangeefamee		
G202	*Mana fincaanii niqabdanii*	1 .Eyyee 2. Lakkii		
G203	*Mana fincaanii keessan gosa kami?*	1. Boola Mana fincaani Qadaddo qabu/"pit" 2. Boola mana fincaanii Qadaddo hinqabnee 3.Mana fincaanii foyya'aa folee hin qabne/VIP 4.kan Bishaanin dhiqamu gara Mana fincaanii dabarsu 5.kan bishaanin dhiqamu gara boola biraa dabrsu		
G204	Nyaata bilcheefachuuf madda annisaa kam fayyadamtuu?(deebi tokkoo oli)	1 Elektrikii /ibsaa 2. Bayoogaazii 3. kasalaa 4. Gazaa adii 5 .Mukaa 6. Huura//baala/citaa 7.waan maasaa irraa argamu/Qaraa		

		8. Dikee looni		
G205	Mana jireenyaa keessaan lafti isaa maalii dha?	1.Biyyee/ashawaa 2. Dikee 3.Mukka xawlaa 4.Goobeensa 5.Seeramika 6.Simminttoo 7. Mushammaa		
G206	Gonbisaa/xaaraa mana jireenya keessanii maali irraa hojjatame?	1.Qorqorroo 2. Mukaa xawlaa haphii 3. Goobeensa 4.Citaa/dhoqee 5. Kaartona 6. Mukkaa 7. Simminttoo		
G207	Dhaabnii Mana keessanii maali irraa hojjatamee?	1.Goobeenasa 2. Goobeensa fi Dhoqee 3. Dhaggaa dhoqee waliin 4. Mukaa qaqallaa 5. Mukaa Foxooqee 6 .Kaartoona 7.Dhagaa fi Simmittoon 8.Shakilaa 9. Blokeetii		
G208	Mannii keessan ifa Elektrikaa niqaba?	1. Eeyyee 2. Lakkii		
G209	Radiyoona Manna keessaa niqabdanii?	1.Eeyyee 2. Lakkii		
G210	Televiziyoona niqabdanii?	1.Eeyyee 2. Lakkii		
G211	Elee elektirkaa niqabdanii?	1.Eeyyee 2. Lakkii		
G212	Firijaa niqabdanii?	1.Eeyyee 2. Lakkii		
G213	Minjaala /xarabeezaa niqabdanii?	1 Eeyyee 2. Lakkii		
G214	Mannii keessan siree firashaa jibrii/sponjii niqaba?	1. Eeyyee 2. Lakkii		
G215	Mannii keessan bilbila mana niqaba?	1. Eeyyee 2. Lakkii		
G216	Faanusaa Mana keessani niqabadani?	1.Eeyyee 2. Lakkii		
G217	Kompitaraa niqabadani?	1.Eeyyee 2. Lakkii		
G218	Mana keessaa Sa'aati dhaaba mana irraa niqabdani?	1.Eeyyee 2. Lakkii		
G219	Manna keessan bilbilii Mobaaylaa namni qabu jira?	1.Eeyyee 2. Lakkii		
G220	Saayikila niqabadani?	1.Eeyyee 2. Lakkii		
G221	Motrsaaykilii niqabadani?	1.Eeyyee 2. Lakkii		
G222	Fardda gaariiga niqabdanii?	1 .Eeyyee 2. Lakkii		
G223	Bajaaji niqabadani?	1.Eeyyee 2. Lakkii		
G224	Konkolaata niqabadani?	1.Eeyyee 2. Lakkii		
G225	Maatii mana keessa namnii dabtaraa Baankkii banatee jiraa?	1.Eeyyee 2. Lakkii		
G226	Mannii keessa galtan kan enyuutii?	1 .kan Dhunfaa 2.kan kiraa		
G227	Mana keessan Nama meeqaatuu Daree tokkoo keessaa bula?	_____		
G228	Lafa qonnaa niqabdanii?	1.Eeyyee 2. Lakkii		
G229	Loon/sangaa niqabdanii ?	1.Eeyyee 2. Lakkii		
G230	Hoola/ ree'ee niqabdanii?	1.Eeyyee 2. Lakkii		
G231	mana keessan Lukkun ni jirtii?	1.Eeyyee 2. Lakkii		

G232	mana keessani gaaguraa kannissa ni qabdanii?	1.Eeyyee 2. Lakkii		
Lakk	Kutaa III. Qulqullina naannoo ilaalchise		Kodii	skipi
G301	Manii keessan daree meeqa qaba?	_____		
G302	Mana fincaani abbumman kan enyuuti	1. Dhunfaa 2. kan nama waliin 3. Kan hawaasa		
G303	Mana fincaanii yeroo amma tajajjila nikeenaa?	1 .Eeyyee 2. Lakkii		
G304	Yeroo akkami qulqullesituu?	1.Guyya guyyaan 2.Torbanin yeroo sadii 3 .Hin qulqulahu		
G305	Mana fincaani Boola /pit / yoonif tahe, Cuqaala/qadaddoo niqaba?	1. Eeyyee 2. Lakkii		
G306	Manii fincaanii harka dhiqannaa kam qaba?	1. Saamuna fi bishaan 2. Bishaani fi daaraa 3. Bishaan qofa		
G307	Mana fincaanii yoonif hinjiranne maatin eeysatii fayyadamtuu?	1. Diree gubbaa 2. Iddoo biraatti		
G308	Balfa googa eeysaatii gadi naqxu?	1. Boollatti 2. Gubuu 3.meeshaa balfaa irratti 4 .Diree gubbaa		
G309	Bineesoota maxaqan mana keessa nijira?	1 . Nijira 2. Hinjiru		
G310	Waltutuqin bineesoota/saree fi adurree/ mana waliin nijiraa?	1. Nijira 2. Hinjiru		
G311	Ilbisoonii xixiqaan mana keessa jira?	1. Nijira 2. Hinjiru		
G312	Namaa fi Beeyladaan mana tokko keessa waliin jiraattuu?	1 Eeyyee 2. Lakkii		
Lakk.	**Kutaa IV: Dhiheesii Bishaani fi qulqullina ilaalchise**		Kodii	skipii
G401	Bishaan dhugatti eyssa warabattan?	1. kan hawaasaa 2. Kan dhunfaa		
G402	Fageenya bishaan dhugaati mana keessan irraa jiru(daqiqaadhan) hangam?	daqiqaa_____ Sa'aa _____		
G403	Mana keessatti bishaan maalitti kahatan?	1.jarkana 2..Baaldii laastikaa 3.Baaldii sibilaa 4.kan bira_____		
G404	Guyyaatti ittifayyadamni bishaan dhugatii keessani hangam?	_____		
G405	Nyaata Qopheesu dura harka ni dhiqattaa?	1.yeroo hunda 2. yeroo tokkoo tokkoo 3. hindhiqadhu		
G406	Mana fincaanii irraa yoo deebitu harka ni dhiqattaa?	1.yeroo hunda 2. yeroo tokkoo tokkoo 3. hin dhiqadhu		
G407	Erga ijoole qulqullesite fi booyli hartee harka ni dhiqataa?	1.yeroo hunda 2. yeroo tokkoo tokkoo		

		3. hin dhiqadhu		
G408	Meeshaan bishaan ittikufamuu qadaaddo/ cuqaali niqaba?	1. Eeyyee 2. Lakkii		
G409	Meeshaan addaatti bishaan kufamee keesaa ittin warabatan nijiraa?	1. Eeyyee 2 Lakkii		
G410	Meeshaa Bishaan dhugati irraa addaatti kan qamaa, dhiqataa fi kan biroo ittin kaahan ni jiraa?	1. Eeyyee 2 . Lakkii		
G411	Meeshaa bishaan itti kufamu keessa bishaan akkamitii fudhatu/warrabata?	1. Dubuysuu 2. qicachuu		
G412	Mana keessanittii Nyaata dheedhii ykn hin bilchaattin kan akka kuduralee fi foonii ni nyaattaa?	1. Eeyyee 2 Lakkii		
Kutaa V: Ragaa Fayyummaa ilaalchise			Kodii	Skipii
G501	Lakkoysa “CD4 cell” /Galmee irraa/	Ragaa ammaa_____		
G502	Ulagaa Sadarkaa dhukuba “HIV/AIDS” dhaabata fayyaa adunyaatin keenname/WHO clinical stage /	1. Sadarkaa - I 2.Sadarkaa - II 3. Sadarkaa- III fi isaa ol		
G503	Haala qoricha fudhata turan “ART adherence”	_____		
G504	Dhukuboota biroo ” opportunistic infection” ni qaba?	_____		
G505	Qoricha” Cotrimoxazole prophylaxis” fudhachuu jiraachuu	1. Eeyyee 2. Lakkii		
G506	Seena Dhibee gara kaasaa qabchuu/galmee irraa/	1. Niqaba 2. Hinqabu		
G507	Ulfatina qamaa Kilograman	Kilogramaa_____		
G508	Dheerina qama metraan	_____		