Jimma University

College of Natural Science

Department Of Biology

Assessing adherence of adult people living with Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome to antiretroviral therapy at Kaffa,Ethiopia

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A Thesis submitted to Department of Biology, College of Natural Sciences, Jimma University, in Partial Fulfillment of the Requirement for the Degree Master of Science in General Biology

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Table of Contents

Contents **Page**

List of Tables

List of Figure

Author’s Declaration

I, the undersigned declared that this thesis is my original work and has not been presented for degree Master thesis in any other university, and that all sources of material used for this research have been acknowledged. I followed all ethical consideration in the preparation of data collection, analysis and completion of this thesis. All scholarly matter that is included in the thesis has been given recognition through citation. I have cited and referenced all sources used in this thesis. Every serious effort has been made to avoid any plagiarism in the preparation of this thesis.

1. Author

Name_____Signature_____Date_____

Acknowledgement

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Acronyms

AIDS:	Acquire immuno deficiency syndrome
ART:	Antiretroviral therapy
ARV:	AIDS Related Virus
$CD4^{+}$:	Cluster of Differentiation
HIV:	Human immune-deficency virus
CSA:	Central statistical agency
AOR:	Adjusted odd ratio
EDHS:	Ethiopian Demographic and Health Survey
ERB:	Ethical Review Board
FHPCO:	Federal HIV/AIDS prevention and control office
HAART:	Highlyactive antiretroviral therapy
MOH:	Minster of health
PLWHA:	People Living with HIV/AIDS
SNNPR:	South nation nationality peoples region
SPSS:	Statistical packaging for social sciences
WHO:	World health organization

Abstract

The scale-up of antiretroviral treatment is among the greatest successes of the global Acquired Immunodeficiency Syndromes response to date and it is on a Fast-path- approach. To contribute to the global and local target of human immune virus-acquire immune deficiency syndrome response as well as to obtain full benefits of antiretroviral therapy medication, strong adherence to Anti-Retroviral Therapy is important. Therefore, this study was designed to assess the adherence of Adult people living with human immune virus–acquired immune deficiency syndrome to antiretroviral therapy at GebretsadikShawoGeneralHospital, Bonga, Kaffa, south west Ethiopia. An Institutional basedcross sectional study was conducted. Data werecollectedusingpre-structured questionnaires and structured and unstructured interviews, ferquency,percent and chi-squertest, Both bivariate and multivariate logistic regression models were performed to examine the influences of different variables on adherence and to control potential confounders.Out of 531 patients participated in the study, 368(69.3%) were females and 163(30.7%) were males. Among targeted population 69.9% of them had good dose adherence and the remaining 30.1% of them were poor adherent to their antiretroviral therapy drugs. Among the participants socio-demographic features, Muslim religion followers had poor medication adherence (adjusted odd ratio =13.490, Confidence interval =1.157-157.235, P=0.038). Patients that have poor perception toward effectiveness of the HAART had poor medication adherence (adjusted odd ratio=0.103, Confidence interval =0.027-0.397, P=0.001). Those without co-infection or co-morbidity with other infection, (adjusted odd ratio =11.324, Confidence interval =1.950-65.756, P=0.007), and taking co-current medication had poor medication adherence (adjusted odd ratio=6.056, Confidence interval =1.338-27.415, P=0.019)independentlywerepredictedfor poor medication adherence. In general, the level of adherence to antiretroviral therapy was relatively higher when compared to other studies done in Ethiopia, but it is below the recommended level. Interventional strategies should be designed to enhance patients' awareness regarding ways to improve adherence level, on adverse effects on adherence, and predictor factors of poor medication adherence.

Key words: Adult, ART, Good and poor adherence, Hospital, HIV/AIDS

1. Back ground

The human immunodeficiency virus (HIV) is a retrovirus that infects cells of the immune system, destroying or impairing their functionality and acquiredimmuno deficiency syndrome is most advanced stage of HIV infection and diseases that caused by HIV virus (Koyra,2018). HIV infection over's the leading cause of morbidity and mortality throughout the world. Globally, in 2016 there were 36.7 million people living with HIV, 1.8 million new HIV infections, and 1 million AIDS related deaths (UNAIDS,2017).

Sub-Saharan Africa contributed 76% of the total HIV-infected people, 76% of the total new HIV infections, and 75% of the total HIV/AIDS deaths in 2015(Wang *et al*.,2016). In Ethiopia 2016, there were 720,000 people living with HIV and 27,104 newly diagnosed cases. But only 67% of expected PLWH know their status and 59% of them were enrolled in highly active antiretroviral therapy (HAART) program, while significant proportion people living with HIV were died(EPHI,2017). Seven out of the nine regional states and two city administrations have HIV prevalence above 1 percent. Looking at HIV prevalence by region, it is highest in Gambella (4.8 %), followed by Addis Ababa (3.4%), Dire Dawa (2.5%), and Harari (2.4%), Afar(1.4%),Amhara(1.2%), Tigray(1.2%), BenshangulGumiz(1.0%), SNNP(0.7%), Oromia(0.4%) and Somaila(0.1%)(FMOH,2018).

Adherence is taking the correct dose of medications, on schedule, and following dietary instructions. Unlike other chronic conditions, very high levels of adherence (> 95%) are required for ART to be effective for long term and to prevent the emergence of resistant viral strains not only this but also Poor medication adherence is linked to the development of drug resistance, higher mortality rates, and lower rates of increase in $CD4^+$ cell count, lower rates of undetectable viral load, lower therapeutic success and increased hospital days (Hogan and Salomon, 2005).

The introduction of antiretroviral therapy (ART) brings significant changes to the live of peoples. People living with HIV have started to live longer and AIDS related death has also been declining because of the availability of the (ART) programmers (Koyra, 2018). Since 1995, around 2.5 million deaths have been faced in low and middle-income countries because of

increased access to (ART) and also antiretroviral therapy increases $CD4^+$ lymphocyte counts reduce risk of opportunistic infections and improve survival of HIV infected people. The accessibility of ART in resource limited areas greatly reduced the morbidity and mortality of HIV infected people. Especially the introduction of HAART, significantly improved the life expectancy and quality of life of HIV infected people (Koyra, 2018).

The importance of ART is that it shortens illness duration, improves quality of life and survival of PLWHA through reduction of viral load and increasing the level of $CD4^+$ cells. However, lack of adherence to ART is a major challenge to AIDS care (Carballo*et al*., 2014). In order to ensure worldwide access great effort has been made in decentralization of complete HIV care and treatment services including antiretroviral therapy to hospitals and health centers throughout the country. However, with rapid expansion of ART service the issue of adherence of patients has increasingly become a serious challenge.

1.1.Statements of the problem

The scale of adherence in 2009 and 2012 was between 66-91%and 9-34% in Asia good and poor adherence level respectively (De-Munter*et al*., 2009) and 86.3-42.6%and 13.7-57.49% in Africa good and poor adherence level respectively (Mandara*et al*., 2012). In Ethiopia, the prevalence of good and poor adherence respectively in 2012 and 2014 was between 92 - 68.6and 8 - 31.4% (Tadesse and Fisiha, 2014).

Previous studies in Ethiopia reported that demographic, behavioral, clinical and institutional factors were reported to contribute for poor adherence. For example, spreading positive pulmonary tuberculosis, male, CD4 count<200 cells/μL, having a mental illness, having HIV-negative partner, fear of stigma and side effects were the risk factors associated with adherence. However, the previous studies assessed that either the prevalence or factors (Asefa*et al*., 2013).

Research indicated that there wasinadequateresearch on adherence level of ART, andadherence not considering of the large number of adherent patients in western part of Ethiopia(Mohammad *et al*.,2017). The studies conducted in the south west part of the nation were case control studies and assessed only factors contributing for default, reflecting that the magnitude of the problem

was not extensive and other major contributory factors of adherence levels were not assessed (Deribe*et al*., 2008). Unlike the rest part of Ethiopia, the Southwest region is composed of different population groups. Furthermore, Kaffa is also near Gambella region (Southwest Ethiopia), a region known to have the highest prevalence rate (4.8%) of HIV in Ethiopia that other parts of the country (<2%) (FMOH, 2018), it is necessary to understand whether the high prevalence is also associated withadherencestatus to ART in the region and other predictor variables for the medication adherence of people living with HIV/AIDS to ART. Therefore assessing the level of medication adherence of HIV/AIDS patients is critical and timely. Based on the above gape the researcher was developed the following research questions.

1.2. Research questions

1. What look like theinfluences of demographic and socioeconomic factors on adherence of adult people living with HIV-AIDS to ARTatGebiretsadikshawo general hospital?
2. What look like the level of adherence status of adult PLWHA to ART at Gebiretsadikshawo general hospital?
3. What are the predictor's factors that affect adherence levelof adult people living with HIV-AIDS to ARTatGebiretsadikshawo general hospital?
4. What seem like the CD4+ cell counts and viral load of PLWHA onARTatGebiretsadikshawo general hospital?

1.3. Objectives of the study

1.3.1. General objective

- General objective of this research is to assess the status of adherence to Antiretroviral Therapy among Adult PLWHA at GebretsadikShawo General Hospital, Bonga, Kaffa, southwest Ethiopia.

1.3.2. Specific objectives

- To determine the influence of demographic and socioeconomic factors on the adherence to antiretroviral therapy among Adult PLWHA,
- To identify the level of adherence to Antiretroviral Therapy among Adult PLWHA on antiretroviral therapy,

- To determine predictor factors of medication adherence to antiretroviral therapy among adult peoples living with HIV/AIDS,
- To assess the level of CD4 cell count and viral load of Adult PLWHA on antiretroviral therapy.

1.4. Significance of the study

A few are known about the factors affecting ART adherence, the scale of ART adherence and HIV distributions in Kaffa, especially Bonga town. The issue of ART adherence among HIV/AIDS The major reasons for missing doses were forget, being too busy, distance from hospital, hopeless , long distance from home, drug side effects fear and HIV/AIDS negative partners fear and also Experiencing stigma, perception towards effectiveness of HAART, second line drug regime, Con-current medication taken by patient and Type of disease happen on the patient were identified predictor of risk factors for medication adherence,Finally effect of demographic and socioeconomic factors, level of $CD4^{+}$ cell count and viral load suppressions were identified in this study therefore the study was important to Ethiopia and in study area. Therefore, the study was determined to assess scale of adherence and factors that affect adherence among patients who follows up ART service at Gebiretsadik Shawo general Hospital. Since there is no previous research conducted on this topic on the study area, the finding of this study will serve as evidence for policy makers to take appropriate measure to improve patients ‘awareness and perception on adherence to the ART in the study area.

2. Literature review

2.1. HIV virus and its Biology.

The human immunodeficiency virus (HIV) is a retrovirus that infects cells of the immune system, destroying or impairing their functionality. As the infection progresses, the immune system of the infected person becomes weaker, and the patient becomes more susceptible to contract opportunistic diseases. The most advanced stage of HIV infection is acquired immunodeficiency syndrome (AIDS). HIV/AIDS is a public health problem and major development crisis that affects all sectors. It has drastically affected health, economic and social progress reducing life expectancy, deepening poverty, and contributing to and exacerbating food shortages (Koyra, 2018).

Identified in 1984, HIV is a human retrovirus. A retrovirus contains RNA as its geneticmaterial as well as the enzyme reverse transcriptase required translating RNA into DNAwithin the human host cell. Once HIV RNA is transcribed into human DNA through the processof replication, it becomes a functional virus capable of producing profound immune deficiency, as with other retroviruses, HIV has a rapid rate of genetic mutation. HIV-1 is the form ofthe virus that causes disease in most of the world, including the United States, Europe, Asia, Latin America, and most of Africa. HIV-2, discovered in 1986, causes a relatively small proportionof cases clustered in West Africa. Unless specified, the term HIV used in this guidelinewill refer to HIV-1.HIV selectively infects certain cells within the human body, with the primary sites beingblood mononuclear cells, particularly T-helper (CD4) lymphocytes and lymphoid tissues.

HIVis neuropathic, invading the CNS early during the initial period of infection.At the same time, the host immune systemmounts a response. The capacity of HIV to infect host cells and replicate, destroying CD4cells in the process, is counteracted by the capacity of the host immune system to produce andmaintain immune surveillance over the replicating virus. Current knowledge suggests thatthere is a viral “set point” that varies among individuals and constitutes a balance between viralreproduction and the immune response. This viral set point has prognostic significance (UNAIDS, 2010).

2.2. Transmission of HIV

HIV is transmitted through body fluids. It has been isolated from a variety of body fluids, includingblood, semen, vaginal secretions, breast milk, urine, saliva, and tears. The risk of transmissionthrough contact with a given fluid is related both to the amount of virus present in thefluid and to the type of exposure to it. HIV is found in such small concentrations in tears, saliva, and urine that transmission through casual contact with these fluids is theoretically possiblebut highly unlikely. On the other hand, behaviors that leads to certain types of exposureto blood, semen, vaginal secretions, and breast milk—all fluids with higher HIV concentrations may lead to HIV transmission. HIV is spread primarily by unprotected sexual intercourse,irrespective of gender or sexual orientation, and sharing of unsterilized injectionequipment for either medical or illicit purposes. It can be transmitted from an infected motherto an infant in uteri during pregnancy, prenatally, or through breast-feeding (Fain, 2009).

2.2.1. Entry stage HIV

The entry phase,viral genetic material is converted to DNA**,** the new DNA enters the host cell DNA**,** the new DNA 'instructs' the cell to make more HIV (Fain, 2009).

2.2.2. Pathogenesis of HIV/AIDS

Three to 6 weeks after initial infection with HIV, there is a burst of viral replication, with widedistribution of the virus throughout the body, particularly in lymphoid tissue and within theCNS. During this acute phase, approximately 50%–90% of people will experience a nonspecific"flu-like" syndrome of varying severity with fever, sore throat, rash, lymphadenopathy, andsplenomegaly, as the host's immune system begins to recognize the pathogen and mounts a responseto control the infection, plasma viral titers may drop 100-fold within 1 or 2 months ofinitial infection. When the host produces circulating antibodies against HIV, the host is said to"seroconvert," demonstrating a positive HIV antibody test(Kinloch *et al*., 2009).

2.2.3. Treatment for HIV infection

Most of the world's HIV-infected population has little if any access to antimicrobial the rapier for consequences of immune deficiency, let alone combination antiretroviral treatment. In theUnited States, revised standards of care for the treatment of HIV infection have improved treatmenteffectiveness, increased survival for patients, and potentially pointed development of

viralresistance. Treatment is accomplished through numerous combinations of antiretroviralagentsfrom four classes: nucleoside analogue reverse transcriptase inhibitors, non-nucleosidereversetranscriptase inhibitors, protease inhibitors, and the newest class, nucleotide analoguesreplication but do not eradicate HIV from all parts of the body, particularly lymphoid tissueand the brain(Descamps*et al.*,2000).

2.3. Prevalence HIV/AIDS

According to FMOH (2018), prevalence of HIVby two city administration and seven region state seem like , it is highest in Gambella (4.8 %), followed by Addis Ababa (3.4%), Dire Dawa (2.5%), and Harari (2.4%), Afar(1.4%),Amhara(1.2%), Tigray(1.2%), BenshangulGumiz(1.0%), SNNP(0.7%), Oromia(0.4%) and Somaila(0.1%).In Ethiopia 2018, there were 690,000 people living with HIV, 23,000 newly diagnosed cases and 11,000 people died from an AIDS related illness. But only 79% of expected PLWH know their status and 65% of them were enrolled in highly active antiretroviral therapy (HAART) program (USAIDS, 2018).Today, the estimated number of individuals living with HIV/AIDS worldwide is approximately 33.4 million, including 2.1 million children. The new infection rate is approximately 2.7 million per year, including 430,000 children. Globally, the highest level of HIV/AIDS cases is in sub-Sahara Africa, where approximately 22.4 million peoples are infected Ethiopia is among the countries most affected by HIV epidemic with an estimated 790,000 HIV positive people. According to the Ethiopian demographic survey, adult HIV prevalence in 2011 was estimated to be 1.5%. In addition, children under 15-years are also heavily affected and account for over 20% living with HIV in 2011 with prevalence in the urban and rural population 7.7% and 0.9% respectively (MoH, 2018).

The most recent 2011Ethiopia EDHS reported an HIV prevalence of 1.5% overall with 1.9%among females and 1.0 percent among males (EDHS, 2011). The HIV Related Estimates and Projections for Ethiopia – 2011 report (FMOH, 2011), which uses the spectrum model, adopted this estimate, and projected HIV prevalence of 1.8% for females, 0.9% for males, and 1.3% overall for 2012. Statistically, HIV prevalence is significantly higher among women compared to men the age distribution of HIV prevalence differs significantly for males and females. Prevalence increases more sharply at younger ages for women and peaks between age 30 and 34, while age-specific prevalence rises more gradually for males and peaks later between

age 35 and 39. HIV prevalence is 3 to 4 times higher among women than men in the under-35 age groups (20-34 years). In the 35 and older age groups, HIV prevalence is nearly identical between the two sexes. In Ethiopia, 76 % of those with secondary or higher levels of education live in cities or towns where background HIV prevalence is highest. While a strong positive association of education and HIV might be expected to age, sex, wealth and urban residence, education reveals a distinctly non-linear relationship those with any education are at significantly higher risk of HIV than those with no education (EDHS, 2011).

2.4. Level of adherence to ART

The scale of adherence in 2009 and 2012 was between 66-91%and 9-34% in Asia good and poor adherence level respectively (De-Munter*et al*., 2009) and 86.3-42.6%and 13.7-57.49% in Africa good and poor adherence level respectively (Mandara*et al*., 2012). In Ethiopia, the prevalence of good and poor adherence respectively in 2012 and 2014 was between 92 -68.6and 8-31.4% (Tadesse and Fisiha, 2014).Adherence to ART is a primary determinant of viral suppression and transmission risk, disease progression and death. Long-term adherence to treatment is critical for the success of ART and presents new challenges. Suboptimal adherence is a major challenge in all regions, at all stages of HIV disease, and is associated with a diversity of patient- and program-related challenges. Study has suggested that when adherence rates are between 50% and 85%, drug resistance is more likely to develop and cause of treatment failure (WHO, 2015). Due to cross-resistance, the virus can become resistant to an entire class of ARTs in that way representation that class ineffective not just for the individual but also for the society. This can lead to change of treatment regimen to more expensive second-line drug (WHO, 2010*).*

Adherence is increasingly silent as an active behavior influenced by a matrix of interrelated factors that change over time and periodic assessment is recommended. Additionally, the rapid scale up and current early initiation of ART may be associated with an increase in HIV drug resistance in the population, if appropriate assessment and prevention measures are not taken. Because this early initiation leads people to start before they are ready, with adverse consequences for adherence and treatment outcomes. Because of these, evaluation of adherence was recommended in the literature in order to develop appropriate adherence interventions.

2.5. Factors influencing adherence to ART

The commonly identified factors for poor adherence are forgetfulness, poor understanding of the relationship between poor adherence and disease progression, side effects of drugs, alcohol and drug abuse, poor social support, poor health provider patient relationships, being away from home, fear of disclosure, educational level, and others (Negesa*et al.,* 2017). Factors affecting adherence to ART can either be biomedical or non-biomedical.Disease characteristics include staging of HIV infection and presence of prior-opportunistic infections which are assessed in the form of symptoms, immune status and illness status. Symptomatic and disease progression has been associated with decreased adherence (Spire *et al*., 2002).The therapy related factors include complexity of the therapy, scheduling demands, medication accommodation, side-effects and cognitive demand. Adherence to medication tends to decrease when the amount of medication per day is high (Chesney, 2008).

Medications which are too demanding in terms of interruption of work, daily routine, lifestyle, coinciding with travel or have food restrictions like being taken on an empty stomach contribute to poor adherence (Weiser *et al*., 2003). The anticipation and fear of side-effects also have an impact on adherence. Poor adherence has also been associated with PLWHA‟s desire to avoid uncomfortable side-effects such as sweating and also the demands exerted by the drugs on the mind, for instance, forgetfulness and treatment fatigue, are also known to reduce adherence levels among patients (Uldall*et al*., 2004).

Non-biomedical factors affecting PLWHA‟s adherence to ART which were the focus of this study, include cost of drugs and laboratory tests for opportunistic infections, cost of transport to health facilities, cost of nutrition, cultural and religious beliefs and social support from health care-providers, family members and support groups. A study that evaluated adherence to ART among 125 PLWHA in the University of Benin Teaching Hospital, Benin City revealed that adherence was dependent on educational level of PLWHA, poor financial status, medication adverse effects, lack of confidentiality, occupational factors and stigmatization (Erah and Arute, 2008).

2.6. Antiretroviral Therapy and drug interactions with HIV/AIDS.

ART are medications that treat HIV. The drugs do not kill or cure the virus. However, when taken in combination they can prevent the growth of the virus. When the virus is slowed down, so is HIV disease. Antiretroviral drugs are referred to as ARV. Combination ARV therapy (cART) is referred to as highly active ART (HAART) (UNAIDS, 2014). The first class of anti-HIV drugs was the nucleoside reverse transcriptase inhibitors (also called NRTIs or "nukes".) These drugs block where the HIV genetic material is used to create DNA from RNA, Non-nucleoside reverse transcriptase inhibitors, also called non-nukes or NNRTIs also block where the HIV genetic material is used to create DNA from RNA, Protease inhibitors or PIs, block where the raw material for new HIV virus is cut into specific pieces, Entry inhibitors prevent HIV from entering a cell by blocking HIV attaches to a cell, HIV integrase inhibitors prevent HIV from inserting its genetic code into the human cell's code. (UNAIDS, 2014)

2.7. CD4 Status of HIV/AIDS Patients

The CD4 cells are subgroups of lymphocytes and are major determinant of the truth of human immune system. It is responsible for the way the body responds to immune gens. The estimation of CD4 counts is a critical limitation in the establishment and monitoring of the immune status of an individual both in healthy and disease states (Tsegaye*et al.,* 1999). Determination of CD4 count is of particular importance in this age of HIV deadly disease. It is used to stage the severity of HIV infection, determine the initiation of highly active antiretroviral therapy (HAART), and also monitor the response to HAART (Uppal*et al.,* 2003). These qualities of CD4 count are quite relevant where viral examine is not readily available, cost effective, or just impractical as found in some resource-poor nations. There are several factors that affect the interpretation and the level of CD4 count in healthy and disease states; some of these are genetic inheritance, nutritional pattern, age, gender, and race (Chin *et al*., 2009). For instance, the CD4 count in healthy children is known to be much higher than that of the adults and varies from one ethnic population to the other (Ampofo*et al*., 2003).Immune status of adults with HIV infection is evaluated by number of $CD4^+$ cells of the patient. The CD4 cell count/mm3 of the patient greater than five hundred is Normal or not significant deficiency; between 350-499 is Mild deficiency, between 200-349 is advanced deficiency and less than 200 is Severe deficiency(FMOH, 2011).

3. Materials and Methods

3.1. Study area, period and study participants

The study was conducted in Gebretsadik Shawo General Hospital, Bonga Town, SNNPR, and Ethiopia. Bonga town is located about 449 km Southwest of Addis Ababa, capital of Ethiopia. The town has one public hospital, one public health center and many other private health centers. The hospital has rapidly expanding in terms of services it provides and infrastructures. It provides multidimensional aspects of care to the clients who need health service at the hospital. Currently, there are about 739 registered people living with HIV/AIDS in the Gebretsadik Shawo General Hospital. Among these, 221 were males and 518 were females.The study was conducted from January to august, 2019.

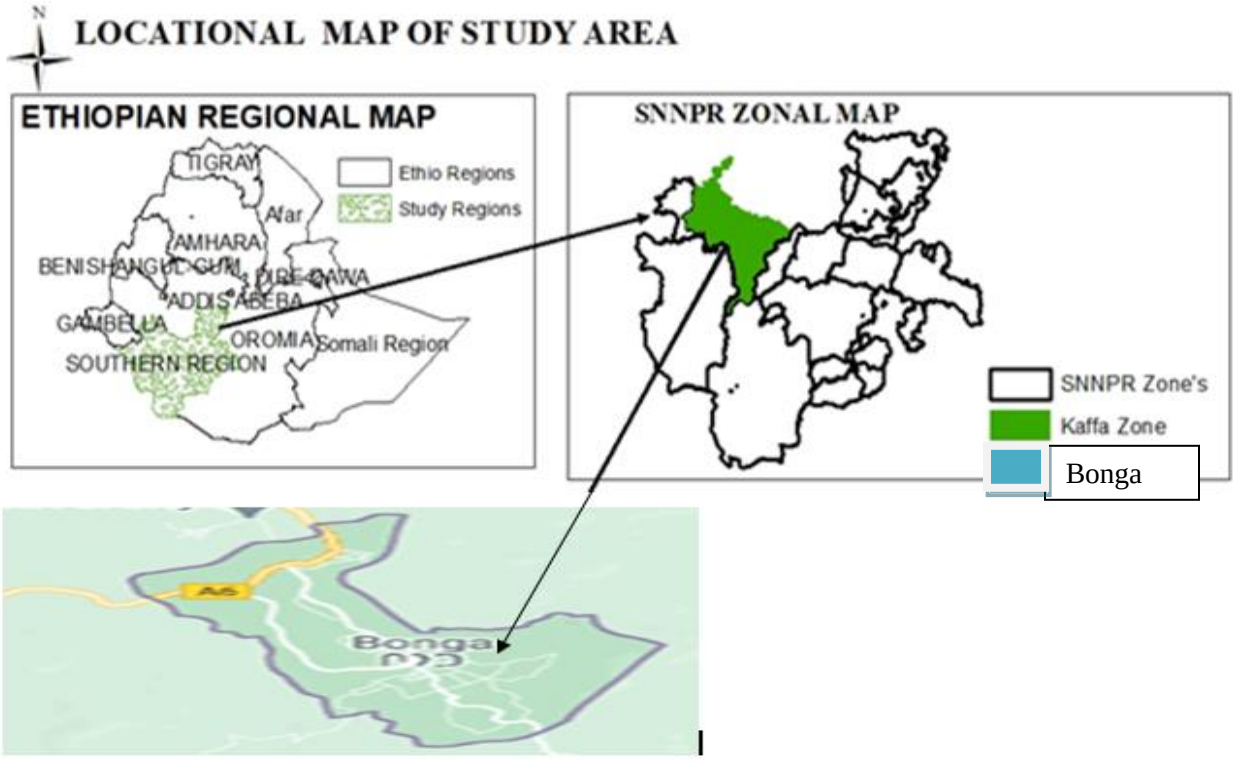

Figure 1: Map of the study area.(GIS arck, 2021)

3.2. Study design

Cross sectional study design was employed.

3.3. Inclusion and Exclusion criteria:

People living with HIV/AIDS who were at age above 18 years, because they give unbiased information about adherence setuationand those on ART for at least five months or more were included in the study.

People on ART follow up for length of below five month, Age below 18 years, who take pill by representative, critically ill, unwilling, and patients with documented mental illness were excluded from the study.

3.4. Study population:

All people living with HIV/AIDS and registered in Gebretsadik Shawo General Hospital,

3.5. Study participants

Patients whose follow up in ART clinic during the study period and who fulfill the inclusion criteria were the study participants.

3.6. Sample size and sampling technique:

3.6.1. Sampling Techniques

In this study purposive sampling technique was used to select the participants. Then data was collected from those who were willing to participate in the study.

3.6.2. Sample size

Among the 739 people living with HIV/AIDS attending the hospital and on the follow-up, 80 of them were age below 18 years.From the remaining 659 targeted population, two of them were mentally ill, 73 were absent during study period, and lastly 531 patients were become the study participants.Detailed procedure has pictoriallydescribed below (Figure 1).

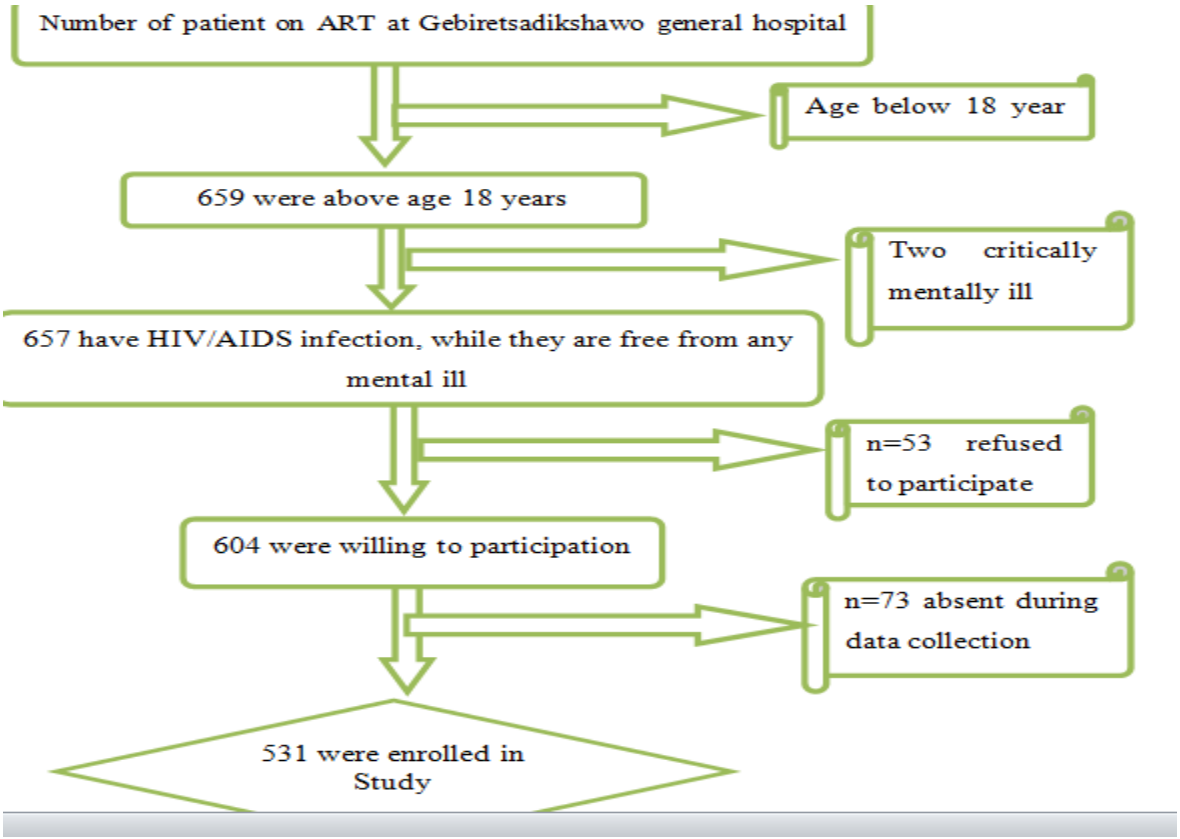

Figure 2: Schematic representation of sampling procedure during the period of data collection

3.7. Study variables

3.7.1. Dependent variable

Adherence to ART

3.7.2. Independent variables

Demographic (age, sex ,marital status) Socio-economic factors (ethnicity, education status, occupation status, residence, monthly income, and living condition), Disease related variables(duration of antiretroviral therapy, serological -status of sex partners, pervious history of hospitalization after antiretroviral therapy, experiencing stigma, average $CD4^{+}$ level, and use of treatment other than HAART, knowledge of adverse effective of ART drug, level of adherence, perception toward effectiveness of HAART), medication and facility related variables (type of 1^{st} line ART regimens, type of 2^{nd} line ART regimens, number of pill take per day,

frequency of dose per day and other concurrent medication), and patients related variables(tuberculosis, fungal infections, depression, heart failure and others).

3.8. Data collection method

Data were collected through structuredandclose ended questionnairewhich were translated into the local language. Moreover, to collect patient information on socio-demographic, socio-economic and information on medication adherence, face to face structured and unstructured interview was used. Finally information about $CD4^+$ cell count, viral load and length of antiretroviral therapy of the date were taken from documents of patents.Thissoures of data such as questionneries , intervies and patient profile information of each individualshas been organized by using their comfrmation code which has been given by ART cilinic.

3.9. Data processing and analysis

Data was analyzed using statistical package for social science (SPSS) statistical soft ware version 25.0. Descriptive analysis such as frequency and percentages were calculated to describe variables and data were also summarized in tables.Differences between the expected frequencies and the observed frequencies in the categories were analyzed using chi-square test (χ^2). The bivariate logistic regression model was used to identifying confounders andriskfactors, and multivariable logistic regression analysis was carried out, to measure the level of association between variables. For all analysis significance level were considered at 95%CI.

Self-reported adherence was classified as being adherentwhen not even a single dose is missed corresponds to dose adherence. If the patient admitted having missed at least one dose corresponds to poor adherence (Birhane*et al*., 2018). Adherence measurement of 95% or more is classified as adherent and less than 95% is classified as having poor-adherence. Therefore, self-report supported by pill count of month end recall adherence rates and patientsappointment profile was measured as proportion using the formula: Adherence rate =Number of pills (doses) taken ÷ (doses prescribed or supposed to be taken × 100 for each respondents greater than or equal to 95% was good adherence and less than 95% was poor adherence (Birhane*et al*., 2018).

3.10. Ethical considerations:

An ethical consideration of the study wasethically approved by Research and Ethical Review Board members of the College of Natural Science, Jimma University. Then an official letter was sent to the hospital forthestudy cooperation prior to data collection. Data were collected after permission was obtained from the study subjects, following a brief discussion with the patients about the purpose of the study. Data were collected only from those who were willing to participate and confidentiality was maintained. They were also informed about their full right not to participate or withdraw from the study at any time, and deciding not to participate had no impact on their services. Since it is a cross-sectional study, participating in this study cannot result any negative consequences on the study participants. Hence, informed verbal consent was obtained from study participants before the data collection. This was also approved by the Ethical Review Committee. Confidentiality was maintained during data collection, storage, analysis, and report.

4. Result.

4.1. Demographic and socioeconomic attribution ofHIV/AIDSpatient.

Among the 739 adult patients on ART, 531 were participated in the study. Out of this, 368 (69.3%) were females and 163 (30.7%) were males. Majority of the respondents were married (n=332, 60.6%), found in age range 26-35 (n=253, 47.6%), from Kaffa ethnic group (n=480, 90.4%), 1 to 8 grade complete (n= 260, 49%),occupational status others (n=433, 81.5%), urban resident (n=428, 80.6%), and most ofthem live alone (n=363, 68.4%) and from monthly income between 1000-1500(n=252,47.5)(Table 1).

Table 1: Demographic and socio-economic characteristics of HIV/AIDS patients at GebiretsadikShawo General Hospital 2019, (n=531).

Variables	**Alternative**	**Frequency (%)**
Sex	Male	163(30.7)
	Female	368(69.3)
Age	18-25	109(20.6)
	26-35	253(47.6)
	36-45	147(27.7)
	> 45	22(4.1)
Marital status	Single	177(33.3)
	Married	322(60.6)
	Divorcee	32(6.0)
Ethnicities	Kaffa	480(90.4)
	Amhara	15(2.8)
	Oromo	18(3.4)
	Others	18(3.4)
Religion	Orthodox	416 (78.3)
	Muslim	40(7.5)
	Catholic	18(3.4)
	Protestant	57(10.7)
Educational	Illiterate	85(16.0)
	1-8	260(49.0)
	9-12	141(26.6)
	Diploma and above	45(8.5)
Occupational	Government employer	44(8.3)
	Farmers	43(8.1)
	Driver	11(2.1)
	Others	433(81.5)
Place of residence	Urban	428(80.6)
	Rural	103(19.4)
Living condition	Alone	363(68.4)
	Live with family	157(29.6)
	Collage / university	4(8)
Monthly income of the respondent	below 500	56(10.5)
	500-1000	104(19.6)
	1000-1500	252(47.5)
	above 1500	119(22.4)

4.2. Level of $CD4^+$ cells count and viral load of Adult PLWHA on ART

The average value of three consecutive visit of CD4+ cell count/mm3of 10.57% HIV/AIDS patients were registered under advanced deficiency (200-349 CD4+ cell count/mm3), 28.20%

among HIV/AIDS patients were registered under moderate deficiency (350-499 CD4+ cell count/mm3), 55.84% of HIV/AIDS patients were registered under normal (>500CD4 cell count/mm3). Only 3.95% of the patients were with severe deficiency of CD4 count (<200 CD4 cell count/mm3). From the chi-square test result, using TDF+3TC+ EFZ first line ART regimes had significantly (χ^2 = 88.5, P<0.001)higherlevel of CD4 cell count(>500) than other groups. Similarly, those patients with length of ARTbelow one year had significantly (χ^2 = 33.89, P<0.001) higher level of CD4 cell count. Also, those patients whose current viral load found less than one thousand (<1000) had significantly (χ^2 = 78.57, P=0.001) higherlevel of CD4 cell count. Whereas, those using the second line of ART regimes, and medication adherence were didn't show significant difference on the level of CD4 cell count (Table 2).

Table 2: The level of CD4+ cell count of Adult PLWHA on antiretroviral therapy at GebiretsadikShawo General Hospital, Bonga, Kaffa South West Ethiopia, 2019(n = 531).

Variable	Alternative	$CD4^+$ cells				χ^2	P. value
		<200	200-349	350-499	>500		
		Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)		
Sex	Male	8(4.9)	20(12.26)	52(31.90)	83(50.94)	3.39	0.345
	Female	13(3.53)	37(10.05)	100(27.17)	218(59. 24)		
Length of ART	below one year	0(0)	1(1.20)	19(22.89)	63(75.90)	33.89	0.001
	1-5year	3(2.36)	11(8.67)	30(26.62)	83(65.35)		
	6-10year	11(5.82)	24(12.9)	66(34.92)	88(46.56)		
	11-15year	7(5.30)	21(15.9)	37(28.03)	67(50.75)		
Types of 1st line ART regimens using	AZT+3TC+EFZ	0(0)	3(5.76)	17(32.69)	32(61.53)	88.52	0.001
	AZT+3TC+NVP	0(0)	14(18.8)	36(47.36)	26(34.21)		
	TDF+3TC+EFZ	0(0)	14(4.65)	66(21.92)	221(73.42)		
	TDF+3TC+NVP	2(3.38)	11(18.4)	29(49.15)	17(28.81)		
	ABC+3TC+AZT	0(0)	0(0)	2(100)	0(0)		
2^{nd} line ART regimens using	AZT+3TC+ATV/r	10(62.5)	3(18.75)	1(6.25)	2(12.5)	3.86	0.277
	TDF+3TC+ATV/r	9(36)	12(48)	1(4)	3(12)		
Current viral load of	<1000	5(1.15)	39(8.98)	114(26.27)	276(63.59)	78.57	0.001
	>1000	16(16.49)	18(18.5)	38(39.17)	25(25.77)		
Medication adherence	Good	10(2.69)	38(10.2)	110(29.65)	213(57.4)	5.78	0.123
	Poor	11(6,87)	19(11.8)	42(26.25)	88(55)		

4.3. Viral load and treatment history of patients

About 434(81.73%) of patient's had viral load <1000 and 97(18.26%) of the patient's had viral load >1000.According to the chi-square test result, longer use of ART (>6 years) and using TDF+3TC+ EFZ first line ART regimes had significantly (P<0.001) lower viral load (<1000) than other groups. Similarly, those patients with higher CD4 cells count (>500) had significantly (χ^2 = 78.57, P<0.001) lower viral load. Also, those patients found on T1 current WHO clinical stage had significantly (χ^2 = 10.07, P=0.006) lower viral load. Whereas, those using the second

line of ART regimes, with current and history of co-morbidity, and found on different WHO stage of pathogenesis didn't show anydifference on the level of viral load, as there was no significant differences (P>0.05) where not observed (Table 3)

Table 3: Comparison of current viral load of Adult PLWHA on ART and Treatment history at GebiretsadikShawo General Hospital, Bonga, Kaffa South West Ethiopia, 2019 (N = 531).

Variables	Alternatives	Current viral load		χ^2	P. value
		<1000, Proportion (%)	>1000, Proportion (%)		
Length on ART use	Below one year	79(95.18)	4(4.82)	24.96	0.001*
	1-5year	110(86.61)	17(13.38)		
	6-10year	153(80.95)	36(19.04)		
	11-15year	92(69.69)	40(30.39)		
Mean $CD4^+$ count for the last three consecutive visits (mm^3)	<200	5(23.80)	16(76.19)	78.57	0.001*
	200-349	39(68.42)	18(31.58)		
	350-499	114(75)	38(25)		
	>500	276(91.69)	25(8.30)		
Types of 1st line ART regimens using	AZT+3TC+EFZ	46(88.46)	6(11.54)	61.6	0.001*
	AZT+3TC+NVP	57(75)	19(25)		
	TDF+3TC+EFZ	286(95.01)	15(4.99)		
	TDF+3TC+NVP	40(67.79)	19(32.21)		
	ABC+3TC+AZT	0(0)	2(100)		
Types of 2nd line ART regimens	AZT+3TC+ATV/r	0(0)	16(100)	3.6	0.056*
	TDF+3TC+ATV/r	5(20)	20(80)		
History of co-morbid conditions	No	259(81.70)	58(18.30)	3.23	0.519
	anti TB drug	19(82.60)	4 (17.40)		
	CPT*	63(77.78)	18(22.22)		
	CV- drug	19(95)	1(5)		
	Others	74(82.23)	16(17.77)		
Current co-morbidity conditions	No	269(80.54)	65(19.46)	3.78	0.42
	Tuberculosis	9(100)	0(0)		
	Fungal infection	45(88.24)	6(11.76)		
	Depression	28(82.35)	6(17.65)		
	Others	83(80.58)	20(19.42)		
WHO stage of pathogenesis	stage I	155(86.59)	24(13.40)	6.33	0.096
	stage II	71(83.52)	14(16.48)		
	stage III	181(78.69)	49(21.31)		
	stage IV	27(72.97)	10(27.03)		
Current WHO clinical stage	T1	405(81.16)	82(16.83)	10.07	0.006*
	T2	14(58.33)	10(41.67)		
	T3	15(75)	5(25)		

4.4. Levels of adherence of adult PLWHA to ART, at Gebretsadikshawo general hospital in 2019.

Proportion of patients with good adherence of medication or not even a single dose is missed by different sex (male and female), age group, place of residence, and types of 1st line ART regimens, living condition and WHO pathogenesis stage was comparably similar. However, in terms of current WHO clinical stage, majority of them 353(72.48) in T1 stage had good adherence to ART while, majority of those on T2 WHO clinical stage 21(87.5) had poor adherence to ART medication. Similarly, proportion of patients with viral load <1000 were higher (318, 73.27%) than those with >1000 viral load (Table 4)

Table 4: The level of adherence of adult PLWHA to ART at GebretsadikShawo General Hospital, Bonga, Kaffa, south west Ethiopia, 2019 (N = 531).

Variables	Categories	Drug adherence	
		Good (%)	Poor (%)
Sex	Male	107(65.64)	56 (34.4)
	Female	264 (71.74)	104 (28.1)
Age	18-25	81 (73.31)	28(26.7)
	26-35	177 (69.96)	76(30.04)
	36-45	102 (70.75)	45(29.25)
	above 45	11(50)	11(50)
Religion	Orthodox	293 (70.43)	123 (29.56)
	Muslim	23 (57.5)	17 (42.5)
	Catholic	17 (94.44)	1 (5.55)
	Protestant	38 (66.67)	19 (33.33)
Place Residence place	Urban	297(69.40)	131(30.6)
	Rural	74(71.84)	29(28.16)
Living condition	Alone	255(70.25)	108(29.75)
	with families	112(71.34)	45(28.7)
	Collage/ university	3(75)	1(25)
	Others	1(14.26)	6(85.7)
Length on ART	below one year	69(83.13)	14(16.86)
	1-5year	83(65.35)	44(44.6)
	6-10year	128(67.72)	61(32.3)
	11-15year	91(68.94)	41(31.1)
Current history of hospitalization fine	Yes	356(71.34	143 (29.7)
	No	15(46.87)	17 (53.13)
Types of 1st line ART regimens users	AZT+3TC+EFZ	28(53.85)	24(46.15)
	AZT+3TC+NVP	54(71.05)	22(28.95)
	TDF+3TC+EFZ	224(74.42)	77(25.68)
	TDF+3TC+NVP	47(79.66)	12(20.34)
	ABC+3TC+AZT	2(100)	0(0)
Current viral load of the patient	<1000	318(73.27)	116(32.73)
	>1000	53(54.64)	44(43.36)
Average CD4 level	<200	10 (47.61)	11 (52.38)
	200-349	38 (66.67)	19 (33.33)
	350-499	110 (72.23)	42 (27.63)
	>500	213 (70.76)	88 (29.23)
WHO stage of pathogenesis	stage I	129(72.07)	50(27.93)
	stage II	66(77.65)	19(23.35)
	stage III	160(69.57)	70(30.43)
	stage IV	16(43.24)	21(56.86)
Current WHO clinical stage	T1	353(72.48)	134(28.52)
	T2	3(12.5)	21(87.5)
	T3	15(75)	5(25)

4.5. Demographic and socio-economic factors on the adherence to ART in APLWHA

Sex, age, marital status,occupational status, educational status, residence, and Living condition were identified as a basic demographic and socioeconomic factor on the medication adherence.Multivariate logistic regression analysis showed that sex and age amongdemographicfactors were not significantly associated (P>0.05) with the medication adherence to antiretroviral therapy. Whereas, being divorced (AOR= 0.409, CI: 0.18-0.93, P=0.034), being government employee (AOR=0.13, CI: 0.03 -0 .67, P=0.015), lower educational status (1 to grade 8) (AOR=0.3, CI: 0.17 - 0.17, P<0.001), living with family (AOR=0.076, CI: 0.008- 0.703, P=0.02) were less likely to poor adherence or they could have good adherence to ART.Muslim religious follower had significantly higher risk of (AOR= 13.49, CI: 1.16-157.23, P=0.038) poor adherence to ART (Table 5).

Table 5: Effect of demographic and socioeconomic factors on the adherence to ARTamong Adult PLWHAatGebiretsadikShawo General Hospital2019, (N=531)

Variables		Adherence		AOR(95% CI)	P-value
		Good (%)	Poor (%)		
Sex	Male	107(65.64)	56(34.36)	1.00	0.876
	Female	264(71.73)	104(28.27)	0.76(0.47-1.22)	0.252
Age	18-25	81(74.31)	28(25.69)	0.58(0.19 -1.77)	0.664
	26-35	177(69.96)	76(30.04)	0.80(0.29-2.25)	0.338
	36-45	102(69.38)	45(30.62)	0.77(0.28 -2.16)	0.675
	>45	11(50)	11(51)	1.00	0.087
Marital	Married	228(70.80)	94(29.20)	0.45 (0.19 -1.08)	0.074
	Divorcee	16(50)	16(50)	0.41 (0.18-0.93)	0.034*
	Single	127(71.75)	50(28.25)	1.00	1.00
Religion	Orthodox	293 (70.43)	123 (29.56)	7.91(.8-78.43)	0.077
	Muslim	23 (57.5)	17 (42.5)	13.49(1.16-157.25)	0.038*
	Protestant	38 (66.67)	19 (33.33)	12.083(1.07-136.73)	0.054*
	Catholic	17 (94.44)	1(5.55)	1	0.097
Educationa l	Illiterate	44(51.76)	41(48.24)	1.00	1.00
	1-8	199(76.53)	61(23.47)	0.3 (0.17 - 0.17)	0.000*
	9-12	93(65.95)	48(34.05)	0.539(0.292- 0.292)	0.048*
	Diploma and above	35(77.77)	10(22.23)	0.477(0.160-0 .160)	0.183
Occupation	government employer	36(81.81)	8(18.19)	0.131 (0.026 -0 .671)	0.015*
	Farmers	30(69.76)	13(3024)	0.313 (.075- 1.311)	0.112
	Driver	5(45.45)	6(54.55)	1.00	0.096
	Others	300(69.28)	133(30.72)	0.328 (0.088- 1.222)	0.097
Place of residence	Urban	297(69.39)	131(30.61)	1.316 (0.758- 2.287)	0.329
	Rural	74(71.84)	29(28.16)	1.00	0.56
Living condition	Alone	255(70.24)	108(29.76)	1.00	0.12
	with families	112(71.33)	45(28.67)	0.076 (0.008- 0.703)	0.020*
	collage/ university	3(75)	1(25)	0.039 (0.001 - 0.992)	0.023*
	Others	1(14.28)	6(85.72)	186.882	0.000*

4.6. Predictorsfactors of medication adherence information of HIV/AIDS patient.

From the logistic regression analysis result it was found that those patients experienced stigma from other in their life because of the HIV/AIDS infection had lower risk of poor medication adherence to ART (AOR=0.35, CI: 0.16 -0.73, P =0.006) than those without stigma or self-stigma. Those patients with positive perception toward effectiveness of HAART had less likely to have poor adherence (AOR=0.103, CI: 0.03-0.4, P =.001) than others. On the other hand those patients on second line drug regime (TDF+3TC+ATV/r) had significantly higher risk to poor adherence (AOR= 2.76, CI: 2.16-25.5, P=0.003). Those patients with co-morbidity had significantly higher risk to poor medication adherence (AOR =11.324, CI: 1.950-65.756,

P=.007) than those without co morbidity. Also those on concurrent medication with other infection has higher risk topoormedicationadherence (AOR=1.5, CI: 1.25-1.79, P<0.001) (Table 6).

Table 6: predictor factors of medication adherence among patients on ART at GebiretsadikShawo General Hospital, Bonga, Kaffa South West Ethiopia, 2019(N = 531).

Variable	Category	Medication adherence		AOR(95% CI)	p-value
		Good (%)	Poor (%)		
Experiencing stigma	no stigma	66 (63.46)	38 (36.53)	1	0.34
	self-stigma	62 (62.37)	39 (37.2)	0.82(0.34-1.97)	0.660
	stigma from others	243 (74.53)	83 (25.46)	0.35(0.16-0.73)	0.006*
Average CD4 level	<200	10 (47.61)	11 (52.38)	1	0.223
	200-349	38(66.67)	19 (33.33)	0.22 (0.03-1.53)	0.124
	350-499	110(72.37)	42 (27.63)	0.21(0.04-1.31)	0.095
	>500	213(70.76)	88(29.23)	0.23 (0.04-1.46)	0.120
Perception towards effectiveness of HAART	Effective	357(73.00)	132(26.99)	0.103(0.03-0.4)	0.001*
	Ineffective	3(23.07)	10(76.92)	1.39(.15-12.9)	0.773
	Not sure	11(37.93)	18(62.06)	1	0.779
Numbers of pills taken per day	<3	298(70.78)	123(29.21)	1.21(0.59-2.51)	0.600
	3-5	73(73)	37(27)	1	0.875
Frequency of doses taken per day	1	239(75.39)	78(24.60)	0.66(0.05-9.19)	0.756
	2	127(62.25)	77(37.74)	0.96(0.07-13.44)	0.978
	3	5 (50)	5(50)	1	0.121
Second line drug regime	AZT+3TC+ATV/r	7 (43.75)	9(56.25)	1	0.234
	TDF+3TC+ATV/r	3 (12)	22(88)	2.76(2.16-25.5)	0.003*
Concurrent medication taking	No	245 (77.28)	72(22.71)	1	0.5430
	Yes	64 (51.61)	60(48.39)	1.5 (1.25-1.79)	P<0.001
Co-morbidity	Yes	126 (62.68)	75 (37.32)	11.32(1.95-65.8)	0.007*
	No	245 (74.24)	85 (25.27)	6.86(0.58-80.8)	0.126

4.7. Perceived reasons for being poor adherent to the ART drug.

Among the 531 HIV/AIDS patients enrolled in this study, 69.9% of them had good dose adherence and the remaining 30.1% were not adherent to their ART drugs. Their perceived reasons for being poor adherent to the ART drug were forgetfulness (n=39, 24.3%), fear of drug side effect (n=32, 20%), distance of home from health facility (n=25, 15.62%), distance of work place from home (n=8, 5%), loss of hope (n=20, 12.5%), and fear of sero-negative partner (n=11, 6.87%).

5. Discussion

In Ethiopia 2018, there were 690,000 people living with HIV, 23,000 newly diagnosed cases and 11,000 people died from an AIDS related illness. But only 79% of expected PLWHA know their status and, 65% of them were enrolled in highly active antiretroviral therapy (HAART) program (USAIDS, 2018).Unlike other chronic conditions, very high levels of medication adherence (>95%) are required for ART to be effective for long term and to prevent the emergence of resistant viral strains (Birhane*et al*., 2018). Poor adherence to ART can cause drug resistance, higher mortality rates, lower rates of increase in $CD4^+$ cell count, lower rates of undetectable viral load, lower therapeutic success, emergence, and increased hospitalization (Koyra, 2018). It is demonstrated that it is difficult to measure adherence in the outpatient setting with absolute precision and accuracy as it may result in recall biases due to its dependence on only use patients' self-report or pill count (Koyra, 2018).

Despite all this, the medication (ART) adherence level of HIV/AIDS patient at GebretsadikShawo General Hospital documented in the current study 69.9%. This adherence was investigated through a patient self-report and pill count. The finding was higher than reports from St. Marry Hospital (60 %) and Kenya (43.2%) (Talam*et al*., 2008; Koyra, 2018), but comparable with some studies conducted in Wolayta Sodo (67%), and Yirgalem hospital and, where adherence level of 67% and 74% respectively were reported (Amberbir*et al.*, 2008; Fain, 2009). On the other hand, it was a bit lower than report from Felegehiwot hospital in Gonder town (82.7%), Harar town (87%) and North-west Ethiopia (80.9%) (Mitiku*et al*., 2013; Hassen *et al.*, 2015; Tsega*et al.*, 2015).

This variation observed in different location may have different reasons, for example, it could be related to the heterogeneity in measurement methods since there is no consensus exists about the gold standard measurement of adherence. According to Billoro*et al* (2018), the difference might be due to different study designs, different methods of measurement and definitions of adherence used and also by different contexts where patients are. Current study used patientsself reports and pill count which might underestimate the measure of adherence. But multi-method adherence assessment consisting of self- report, the visual analog scale and the pill identification test and pill count was done by one trained diploma nurses from the health centre. Some use

questionnaires (self report) prepared by the authors or using standardized questionnaires validated by other, and another have obtained the data through questionnaires in interviews. It is worth noting that some measure the rate of compliance by percentage of drugs taken in the last two, three, four or seven days by patients.

The observed adherence level to ART (69.9%) was seems better compared to other reports from the same country or elsewhere, but, much lower than the recommended level (≥95%). Evidence suggests that greater than 95% adherence may be necessary to adequately suppress viral replication, produce a durable response and stop disease progression (Paterson *et al*., 1999). In addition to this Poor medication adherence is linked to the development of drug resistance, higher mortality rates, and lower rates of increase in $CD4^+$ cell count, lower rates of undetectable viral load, lower therapeutic success and increased hospital days.

Suboptimal adherence is a major challenge in all regions, at all stages of HIV disease, and is associated with a diversity of patient- and program-related challenges. As a report of WHO(2015), suggested that when adherence rates are between 50% and 85%, drug resistance is more likely to develop and cause of treatment failure. Among 531 HIV-AIDS patient (n= 41, 7.72%) gotten to second line drug regime. As a confirmations of WHO (2010), due to cross-resistance, the virus can become resistant to an entire class of ARTs in that way representation that class first line drug regime were ineffective not just for the individual but also for the society. This can lead to change of treatment regimen to more expensive second-line drug.

Multiple determinants of the poor adherence should be identified and addressed well. The present study revealed that most of the study participants took prescribed pills as per the instruction while some of them missed it. The main reason for missing doses were forgetting, being too busy with work, far distance from hospital, and being hopeless, fear of drug side effects and HIV sero-negative partner. This finding was slightly similar to reports of WHO (2010) and Adeniyi*et al*. (2018). As confirmed by many past studies too majority of ART patients mention forgetting as the most common reason for their poor adherence. This might be due to effect of the virus on thinking ability of the patients or subsequent depression.

In this study the second risk factors that follows to forgetting was fear of drug side effect.The possible justification is when the hope and fear of drug side-effects also have an impact on adherence. Poor adherence has also been associated with PLWHA‟s desire to avoid uncomfortable side-effects such as upsetting of stomach , sweating and also the demands exerted by the drugs on the mind, for instance, forgetfulness treatment fatigue, are also known to reduce adherence levels among patients (Uldall*et al*., 2004).

The other risk factor of poor adherence in current study was fear of sero-negative partner and stigma from other seronegative peoples. For instance in current study, experienced stigma from other in their life because of the HIV/AIDS infection had lower risk of poor medication adherence to ART (AOR=0.35, CI: 0.16 - 0.73, P =0.006) than those without stigma or self-stigma. As a confirmation of (Negesa*et al.*, 2017), the patient with ART are exposed for forgetting but when they are supported by their families or friends they were restricted with treatment protocol and this may lead to then to have good adherence level to their ART medication than those do not have nearby support of seronegative partner.

According to Nakinyemba*et al.* (2004), travel time and access to treatment centers were barriers to ART adherence. Some participants reported travelling 32-100KM or having to cross rivers in order to access the health services.Access to health facility regardless of distance and time is of great concern to PLHIV. patients who were willing to take ART they became non-adherent because of difficulties in reaching the treatment centers due to unexpected transport and other strikes; long travel distance; geographical difficulty including lack of transportation services in many remote areas; and the seasonal deterioration of poorer roads during the rainy season. And other author confirmed that better access to care was significantly associated with optimal adherence in other studies (Adefolaluand Nkosi, 2013).

In agreement to this finding a review study showed that reasons for non-adherence to ART in sub-Saharan Africa are giving birth at home, quality and timing of HIV testing and counseling, fear of stigma, lack of male involvement, non sero-status disclosure, young age and lack of education are linked to low adherence (Colombini*et al*., 2014). Other identified predictor factors for Poor medication adherence were co-morbidity, being second line drug regime (TDF) users

and Con-current medication user. This finding has consistency with findings of other authors(Birhane*et al*., 2018).Those patients with co-morbidity had significantly higher risk to poor medication adherence (AOR =11.324, CI: 1.950 - 65.756, P=.007) than those without co morbidity. Poor weather was also cited as cause for some patients to fail to beat the appointment schedule, especially during rainy seasons, roads may be impassable, some feel weak to walk while raining(Gesesew, *et al*., 2017).

In current study patients use concurrent medication with other infection has higher risk to poor medication adherence (AOR=1.5, CI: 1.25 - 1.79, P<0.001). Koyra (2018) reported thatcombination therapy leading cause of forgetting, lack of inspiration, and narrow-mindedness of side effects. As reported in the study conducted in southwest Ethiopia at the ART unit of Jimma University specialized hospital, depression was associated with poor adherence.The Second line drug regime (TDF) users had significantly higher risk to poor adherence (AOR= 2.76, CI: 2.16 - 25.5, P=0.003).

As a confirmation of Park (2015), some classes of antiretroviral drugs (such as combination of emtricitabine and Tenofovir TDF) actually cause adverse side effects when taken without food, such as nausea, vomiting, and stomach pain. On the other hand, other classes of drugs (such as Didanosine and Indinavir) cause side effects when taken with food, such as increased appetite**.** For patients living in poverty, reducing thesenegative side effects naturally become priorities in the context of scarce food and income. In this case, non-adherence seems more convenient and advantageous to the patient.

Viral load testing and CD4 count is the best predictor for disease status and immediate risk of death by HIV/AIDS patients. Thus should be used to identify those who have advanced disease. It is strongly recommended that patients with advanced HIV disease (CD4 count below 200 cells/mm3 and viral load below 1000) should receive a package of care as defined in the 2017 WHO Guidelines for managing advanced HIV disease and rapid initiation of antiretroviral therapy (WHO,2017, UNAIDS, 2018). Equally important that those at risk (whose CD4 count <200cells/mm3) and on ART medication should be adherent to the medication. However, almost equal number of them (52.38%) had poor adherence to ART. This shows that unless early

intervention is in place these patients are at risk. Likewise, viral load showed inverse association with CD4 count in those who had good ART adherence.

Among patients who viral load <1000copies/mL, 91.69% had >500CD4 cells count/mm3, and most of them (79.34%, 219/276) were those who had good adherence to ART drug. Usually levels of adherence below 95% have been associated with poor suppression of HIV viral load and a lower increase in CD4 count (Carter, 2005).Necessity of ART adherence is linked to the reduce of drug resistance HIV-AIDS, reduce HIV-AIDS related mortality rates, higher rates of increase in CD4 cell count, higher rates of undetectable viral load, increases therapeutic success and decrease hospital days (Paterson *et al*., 2000; Hogan and Salomon, 2005).

In current study the patients with length of ART below one year had significantly (χ^2 = 33.89, P<0.001) and Also, those patients whose current viral load found less than one thousand (<1000) had significantly (χ^2 = 78.57, P=0.001) higher level of CD4 cell count. As confirmed (Koyra, 2018), partly explained adherence status by physicians, increased awareness about medication adherence and change in attitude they got from health professionals at the time of hospitalization could result in improved medication taking behaviors, because level of adherence have direct proportional with higher CD4 cell count and inversely proportional with viral loads.

6. Conclusion

In General, the adherence to ART observed in this study was (69.9%). Among female respondents 71.74% were adherent to ART while 65.64% of male were adhered to treatment. The ART adherence documented was relatively good compared to others similar studies from the same country or elsewhere, but far behind the expected optimal adherence level (>95%). The major reasons for missing doses were forget, being too busy, distance from hospital, hopeless , long distance from home, drug side effects fear and HIV/AIDS negative partners fear. Experiencing stigma, perception towards effectiveness of HAART, second line drug regime, Con-current medication taken by patient and Type of disease happen on the patient were identified predictor of risk factors for medication adherence. Finally effect of demographic and socioeconomic factors, level of $CD4^+$ cell count and viral load suppressions were identified.

7. Recommendations.

Based on the findings of the study, the following recommendations are forwarded:

- Governmental and nongovernmental organization should be designed thestrategies of health related education that enhance patients' awareness regarding ways to improve their poor adherence levels, on how to manage adverse effects of the drug, and predictor factors of medication adherence and effectiveness of HAART.
- Continuous community HIV/AIDS related health education programs should be provided by governmental organization to avoid stigma, and increasing awareness on effectiveness of HAART.
- Eventual, especially health education programs should be need by GebretsadikShawo General Hospital administrationfor PLWHA, whose $CD4^{+}$ cell counts less than two hundred, and between two and three hundred forty nine, and their viral load greater than one thousand
- Strategies should be designed to enhance patients' awareness regarding ways to improve adherence, adverse effects and effectiveness of HAART.
- Refreshment trainings and clinical updates should be provided to heath care providers.
- Despite the continued effort from the government to enhance ART adherence, the combined adherence level found in Gebretsadikshawo General Hospital, is suboptimal. This is yet still comparable tothe findings of resource-limited settings like Ethiopia. Co-morbidity ,co-infection orgating, Lack of money, pill - burden, not disclosing HIV positive status e and non-use of memory aids were factors influencing the patients' suboptimal adherence. On the other hand, ART users are vulnerable to forgetfulness as their treatment to be taken daily with routine personal activities.
- PLWHA should disclose their status to others and use mechanical reminders to improve adherence.
- Additionally, the government should consider local language translator group at the facility level and health care providers should also give emphasize to translation for local and understandable language, encourage PLWHA to be engaged in any income-generating activity through ongoing counselling, and if feasible, reduce the number of pills per dose with consideration of ART regimen to optimize their adherence.
- Educating patients continuously about drug side-effects and how they can cope with treatment through Individualized counselling is advantageous. Clinicians have to identify HAART

users who are in a clinically deteriorated condition which can alter adherence behavior and offer relevant medical management and counselling to maximize treatment success.

- Finally, longitudinal study should be considered using multiple adherence measurements like, bio-makers and others as adherence is a dynamic process.

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Appendix

Questioners for commitments:

My name is **ASRAT TEKLE**; I am a post graduate student from Jimma university department of Biology and carrying out a research study on assessing adherent to ART people with HIV/AIDS in GebretsadikShawo General Hospital. The questionnaires are designed for this research only. You are kindly requested to contribute and fill in the questioners which were used in the study. I assure you that the information gathered were used for the purpose of this research only and will be treated with the respect confidentiality. Data collection procedures of this study, interviews were carrying out first then after those questioners were followed. Data collector was one trained diploma nurses from the health centre. Researcher wasas a supervisors to handle any problem; ensure data quality and to check proper carrying outof interview and completeness of questionnaire.

The demographic characteristics of the respondents.

1. Marital status: Single () Married () Divorced () Widowed () Separated (not confirmed legally) ()
2. Sex: Female () Male ()
3. Age of respondents: 18-25() 26-35() 36-45() above 45()

Socio-economic characteristics of the respondents.

1. Write your Ethnicity and religion on prepared space.
2. Ethnicity of respondent's……religion ……..
3. Educational status: Illiterate () Grade1-8() Grade9-12 () Diploma and above ()
4. Occupational status: Government employee () Merchant () Driver () Farmers () Police men () others ()
5. Place of residence: Urban () Rural ()
6. Monthly income: Below 500() 500-1000() 1000-1500() above 1500()
7. Living condition: alone () with family () College/university () Support centers () other() Military camp () prisoner()

Questioners

Thank you in advance for your co-operation.

Tick (X) The appropriate answer to you level best.

1. The patient uses what treatments other than HAART?

Traditional medicine () Religious methods () Only HAART ()

2. What Perception towards effectiveness of HAART?
   Effective () Ineffective () Not sure ()
3. What Types of 1st line ART regimens you used now?
   AZT + 3TC + EFZ () AZT + 3TC + NVP ()
   TDF + 3TC + EFZ () TDF + 3TC + NVP ()
   ABC + 3TC + AZT ()
4. What Types of 2nd line ART regimens you used now?
   AZT + 3TC + LPV/r () AZT + ABC + LPV/r ()
   TDF + 3TC + LPV/r () AZT +3TC+ATV/r ()
   TDF +3TC+ATV/r ()
5. Where is your WHO stage of pathogenesis? Stage I ()
   Stage II () Stage III () Stage IV ()
6. Current WHO clinical stage: Stage T1 () Stage T 2() Stage T3()

Interview for commitments:

1. Do you taken other concurrent medications like as?Yes() No ()
2. Where is the experiencing stigma facing? From others () Self-stigma () No stigma ()
3. Do you have knowledge on adverse effects of ART drugs?I know () I don't know ()
4. You forget to take dose of your medicine within seven days? Yes () no()
5. How many of pills are remaining after monthly end on your strip of pill?
   One() two() greater than or equal to three()
6. Anti TB drugs () CPT*() CV drugs () Contraceptives () others ()
7. Is there distribution Co morbid conditions happen?
   Yes () No ()
8. What seem like Serological -status of your sex partner?
   Positive () Negative () not known ()
9. Is there other disease conditions happen? Like us
   Tuberculosis () Fungal infections () Depression () Heart failure () UTI () others ()
10. Do you smoking cigarette? Yes () No ()
11. Do you drinking alcohol? Yes () No ()
12. Do you chewing chat? Yes() No ()

13. Do you drink alcohol and chewing chat? Yes () No ()
14. Do you using alcohol, chat and Cigarette? Yes() No ()
15. Previous history of hospitalizations was good? Yes () No ()
16. If you have good previous history of hospitalization after ART? Yes () No. ()
17. Do you take your medicine on schedule? Yes () no()
18. How many of Frequency of doses you taken per day?Once () 2times () 3times () More than 3 times ()
19. How about your health described after ART? Better () Same () Worse ()
20. How many Numbers of pills you taken per day?Less than three () Three-five () More than five drugs ()
21. What are the major factors that cause messing of adhering to antiretroviral therapy?

.....

Information from patients appointment profile:

1. When you start ART or (length of time of ART in years)?
   Below one yea () 1-5 years () 6-10 years () 11-15 years () above 15 years ()
2. How many of your Average CD4 level of the last three consecutive visits (in cells/m3)?
   Below <200() 200- 349 () 350- 499 ()> 500() not functional ()
3. What seem like Current viral load of the patient? <1000()>1000()

Appendix: 2, Calculation of adherence rates.

Adherence rate =Number of pills (doses) taken ÷ (doses prescribed or supposed to be taken × 100 for each respondents greater than or equal to 95% was good adherence and less than 95% was poor adherence

Qihoo

Echeena'onwochiyemmina'och

Ta shigo ASRAT TEKLI getteehe: JimmiYuuniversitichguttineedigirinbaayiloojidoyecho ta tunemmona; doyooniciichoonaphiraboshoEchi -Aay -Vii AIDS ogisheegishyee ate daammitoomoochGaxaariqiShaawikiceeHosipitaloochshuunoo ta qaawitiqoodoochJimmiyuuniversitybayolojidoyeekuxokooritikorichoontimotuniyoona tawaatotunoonarichiyaabe; ta qaawitiqihoon teach ittoimmemmochoogiyoonaechaabee; hiniqihogaaccemmohiniphiraboshooyichbaachtunoonarichiyoochqawiyo.

Qihoo:1 Ashibeemishahoonaanimoona

Asheena'ochiqelliamittinoagenoochboonodaneebeetigamiyeedaqqo

Yaroo…….....Gibeno……..

Shaageeshaahoo ;shaagaano () shaaggito () gafireetina'o () gafireechiarichiyaaneena'o()

Animoo; anaamo()maachee()

Eeno; 18-25() 26-35 () 36-45 () 45 damiba()

Yeyiyeeshaaho

Doyeedaqqo; hullo () 1-8 () 9-12()dipilomona are damiba()

Shuuneeshaahoo ; taateeshuunecho()giixecho()gochecho()gengeriyecho()pooliso()baroo()

Beemixaa'oo ;katamooch()maggeekitaamito()

Deggiibeetikoco ;biqelloona()xiboona()kolleejoona()yuuniversitina()

KooreeEcheena'o

Ichetikaacoochetatemmiwochoon (X) malletoongedonakaaciwochib..

1. Echi-Ayi-Vi Ediseebiiyechina'ohiniattoyee "HAART" bare ameeattonyeboonogaachebeeto?
   Qoceeatton () Gimeneeatton () Only HAART ()
2. AmishaahegibenoobiiyechinochhiniHAARTatteetoomoochbeete?
   Ceeno () shappo () ameegibenollaaalle()
3. Ameeshaahebattibattiattooniye ne daamaabeeto?
   AZT + 3TC + EFZ () AZT + 3TC + NVP ()
   TDF + 3TC + EFZ () TDF + 3TC + NVP ()
   ABC + 3TC + AZT ()
4. Ameeshaaheguttineeguttineedaqqeeattooniyeeneedamabeeto?

AZT + 3TC + LPV/r () AZT + ABC + LPV/r ()

TDF + 3TC + LPV/r () AZT +3TC+ATV/r ()

TDF +3TC+ATV/r ()

5. Ne iiwooameeagetteedaqeeiiweedaqqoochiyebibeeto? Daqqe I ()

   Daqqe II()Daqqe III ()Daqqe IV ()

6. Ne iiwooameeagetteedaqeeiiweekilinikeedaqqoochiyebibeeto :Daqqee T1 ()Daqqee T 2 ()Daqqee T3()

Qaaree echo

1. SheexeEchi-Ayi-Vi Ediseeattoyeebaroondaamabeetie?Daamoo()Daammach ()
2. Koniwaaneniyebariyoowaabeeto?bareeasheena'owaaneen () taqellocheen () bariyoo alle ()
3. NeechiSheexeEchi-Ayi-Vi Ediseeatto bi deewineetiiritoonariine? Ariiho () ariyaach ()
4. ShabaateqemidagoochSheexeEchi-Ayi-Vi Ediseedaamon batta ariine?eehi () batta ariyaach()
5. Amoomiattoageneciiroochneechecheeariihe?

   ikkoo() guttoo() keemoyeedamba ()
6. Bare attonedaamabeetoSheexee TB () CPT*() CV atto () shimiqiddo () baroo ()
7. Bareebiiyoneenibiijjibeeto?beete () aalle ()
8. Ne animeenuucheena'ochEchi-Ayi-Vi Ediseebeete?

   Beete () aalle () arichiyaache ()
9. Netoomoochbekeebeeti bare biiyo ? sha

   TB () qoochiyareebiiyo () Taahoo () Mullebiiyo () UTI () baroo()
10. Tubaa'oncufiine ?cufiiho()cufiyaachi()
11. Alikooleeuyeen'onuchenee ?Uchoo()uyaachi()
12. Caatoonqaachene ?Qaacho()Qaayaach()
13. Alikooleeuyeen'ona, Caatoonqaachene?halliyo ()hallach ()
14. Caato, Alikooleeuyeen'ona, Caatoonqaachene?halliyo ()hallach ()
15. EbiyeeaafiSheexeEchi-Ayi-Vi Ediseeattonedaamoyeeaafibeetiiweeshaahogaaweebeete ?gaawetone ()gaaweyaache ()
16. SheexeEchi-Ayi-Vi Ediseeattonedaametoyeehachineechibeetiiweeshaahogaaweebeete ?gaawetone()gaaweyaache ()

17. Ne attoontatoonagooroonquyaadaamabeetine ?daammo () Daa()
18. Ambichekaalloniyeheeyoochattoonnedaamabeeto?Ikkekaallon () guttekaallon () kejjekallon () kemoyeedamba ()
19. Ne iwooSheexeEchi-Ayi-Vi Ediseeattoonnedaametoyeehachiabichibeete ?gaaweto()baraache ()gondoone ()
20. Ambichekiniinooniyeheeyooch ne daamaabeeto?3dechi() 3-5 bedaahana () 5 damba ()
21. Ameeindenabooneattoondaammonbattibeeto?

.....

Biiyechina'ochikoberoocheehammitiqiho

1. AmeegooroochiyeSheexeEchi-Ayi-Vi Ediseeattodaamon ne kotteto? Ikkenattoyeedechi () 1-5 nattibedite () 6-10 nattibedite () 11-15 nattibedite() 15 nattoyeedamba ()
2. Ne CD4 seelledaqqokeejjekaallhamaa-dabephiroonaameedaqqochibeette (in cells/m3)?

<200() 200- 349 () 350- 499 ()> 500() gaacoonimmache ()

3. Ne dame daggoochbeettivayireseeoogishooamoonishaahiye?<1000()>1000()

Qihe: 2 attedabbegaawagoondoonshuunegoomo

Atteedaamishaahoo = ((qoocheetikiniino / qoochebegeteetooch) X 100) 95% kishoonaarooyedambabitunegaatagaawetoebiyedechingondo.