

FACTORS ASSOCIATED WITH NON-ADHERENCE TO ANTIRETROVIRAL THERAPY AMONG HIV INFECTED ADOLESCENTS GUJI ZONE, SOUTH ETHIOPIA, 2018. A FACILITY BASED CASE CONTROL STUDY.



INSTITUTE OF HEALTH, FACULTY OF PUBLIC HEALTH
DEPARTMENT OF EPIDEMIOLOGY

BY BESHIR IBRAHIM (BSc)

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Factors associated with non-adherence to antiretroviral therapy among HIV-infected Adolescents Guji Zone, South Ethiopia, 2018. A Facility Based Case Control study

By Beshir Ibrahim

A Thesis Submitted to Department of Epidemiology, Institute of Health Jimma University in Partial Fulfillment for Degree of Master of Public Health in Field Epidemiology

Advisors

1. Dr. Fessahaye Alemseged (MD, Associate professor of Epidemiology)
2. Mr. Zerihun Kura (BSc, MPHE)

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Abstract

Background: Suboptimal adherence results in inadequate drug exposure and increases the likelihood of viral replication and resistance, limit future therapeutic options. High level of adherence is very crucial to maximize the usefulness of antiretroviral therapy.. This study examines factors associated with nonadherence to antiretroviral therapy among adolescents in Guji zone.

Method: Institution based case control study design was employed from 26 February to 20 April, 2018. Adolescents who have suboptimal adherence were considered as cases and those who have optimal adherence were considered as control for this study. Cases and controls were recruited by consecutive sampling. Analysis was done by using SPSS version 20. Binary logistic analysis was conducted to identify candidate variables at p value ≤ 0.25 for multivariable logistic regression. Finally, multivariable logistic regression analysis was conducted in order to identify the factors associated with the non-adherence. P -value ≤ 0.05 was used to observe whether there is statistical significance.

Results:-A total of 297(101 cases and 196 controls) adolescents on ART were participated in this study. Being rural residents AOR 1.9(1.1-3.6), Living with unmarried/widowed and separated caregivers AOR 2.1(1.2-3.8), living with unemployed caregivers AOR 4.2(2.0-8.9), not disclosing HIV Status AOR 5(2.8-9.4), having symptom of depression for adolescents AOR 2.7(1.5-4.9), not using reminding methods AOR 2.4(1.2-4.8) and Uses of other drugs besides ART AOR 2.6(1.5-5.0) were found to be independent factors associated with non-adherence to ART among adolescents.

Conclusion:-residence area, caregiver marital status, sources of income for family, disclosure status, depression status, uses of reminding methods and uses of other drugs besides ART were factors associated with non-adherence to ART among adolescents. Support from peers and family can promote adolescents adherence, as it buffers the stress associated with the illness, encourages optimism, reduces depression, and improves healthful behaviors. Provision of health education on importance of treatments and needs for adherence should be encouraged. Uses of reminding methods, continuous monitoring of clients on ART regarding uses of medications other than ART is important.

Key words: Non-adherence, ART, adolescents, Guji zone, Ethiopia

Tables of Contents

<i>Abstract</i>	i
Lists of Tables	iv
Lists of Figures	v
Acknowledgments	vi
Acronyms and Abbreviations	vii
1. BACKGROUND	1
1.1. INTRODUCTION	1
1.2. Statement of the Problem	3
2.LITERATURE REVIEW	5
2.1. Conceptual Framework	10
2.2. Significance of the Study.....	11
3. OBJECTIVES	12
3.1. General objective.....	12
3.1.1. Specific objectives.....	12
4. METHODS AND MATERIALS	13
4.1. Study area and period	13
4.2. Study design	14
4.3. Population.....	14
4.3.1. Source population.....	14
4.3.2. Study population.....	14
4.3.3. Inclusion criteria.....	14
4.3.4. Exclusion Criteria.....	14
4.4. Sample size and sampling procedure.....	14
4.4.1. Sampling Technique.....	15
4.5. Data collection Procedures (instruments, personnel)	16
4.6. Data quality management	17
4.7. Study Variables	17
4.7.1. Dependent Variable.....	17
4.7.2. Independent Variables.....	17
4.8. Operational definitions and definition of terms.....	18

4.9. Data analysis procedures	19
4.10. Ethical consideration	19
4.11. Dissemination plan	20
5. RESULTS.....	21
5.1. Socio-Demographic Characteristics of The Study Participants in Guji zone, Oromia, South Ethiopia	21
5.2. Clinical Characteristics of Adolescents	23
5.3. Reason for missing ART drugs Among Adolescents.....	24
5.4. Factors Associated with Nonadherence on Binary Logistic Regression	24
5.4.1. Socio-Demographic Factors Associated with Non-adherence to ART among Adolescents.....	24
5.4.2. Psychosocial Related Factors Associated with Non-adherence to ART	25
5.4.3. Health Care Delivery System Related Factors Associated with Non-Adherence	26
5.4.4. Disease related factors associated with non-adherence to ART	27
5.4.5. Multivariable logistic regression Analysis	28
6. DISCUSSION	30
6.1. Limitation of the Study.....	33
7. CONCLUSION AND RECOMMENDATIONS	34
7.1. Conclusion.....	34
7.2. Recommendation.....	34
REFERENCES	36
Annex 2: Questionnaire.....	41

Lists of Tables

Table1:- Sample Size calculation by using different Variables for the study in Guji zone Oromia, Ethiopia, 2018.	15
Table 2: - Socio-demographic Characteristics of the study participants in Guji zone, Oromia, south Ethiopia, 2018.	22
Table 3: Clinical Characteristics of study participants in Guji zone, Oromia, South Ethiopia 2018	23
Table 4: Socio-demographic factors associated with non-adherence to ART among adolescents, Guji zone, Oromia South Ethiopia, 2018.	25
Table 5: Psychosocial factors associated with non-adherence among adolescents in Guji zone, Oromia, Ethiopia 2018.	26
Table 6: Health care delivery system related factors associated with non-adherence to ART, Guji zone, Oromia, Southeast Ethiopia, 2018.....	27
Table 7: disease related factors associated with non-adherence to ART, Guji zone, Oromia, South Ethiopia, 2018.	28
Table 8: Multivariable Logistic Regression Analysis of factors associated with non- adherence among adolescents in Guji zone Health facilities, Oromia south Ethiopia, 2018.	29

Lists of Figures

Figure 1: Guji zone administrative map with its districts in 2017.....	13
Figure 2: diagrammatic representation of proportional allocation to size to selected health facilities in Guji zone 2018.....	16
Figure 3: Reason for missing ART drug by adolescents who were on ART for greater 3 months in Guji zone, Oromia, south Ethiopia, 2018.	24

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Acronyms and Abbreviations

ACTG	AIDS Clinical Trial Group
AIDS	Acquired Immune Deficiency Syndrome
ALHIV	Adolescent living with HIV
AOR	Adjusted Odds Ratio
ART	Antiretroviral therapy
AYLHIV	Adolescent and Young Living with HIV
CD4	Cluster of Differentiation 4
COR	Crude Odds Ratio
HAART	Highly Active Antiretroviral Therapy
HIV	Human Immune Virus
MTCT	Maternal to Child Transmission
PHQ	Patient Health Questionnaire
PLWHA	People Living With HIV/AIDS
PSI	Population Service International
SSA	Sub Saharan Africa
UNAIDS	United Nations Program on HIV/AIDS
UNAIDS	United Nations Program on HIV/AIDS
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization

1. BACKGROUND

1.1 . INTRODUCTION

Globally, an estimated 2.1 million adolescents are living with HIV in 2016, among which 150 adolescents dying from AIDS-related causes every day. This report emphasizes that between 2000 and 2015, annual AIDS-related deaths declined for all age groups except adolescents, where mortality more than doubled from 18,000 to 41,000 per annual (1).

Adolescents (10–19 years) continued to be vulnerable, both socially and economically, to HIV infection despite efforts to date. This is particularly true for adolescents especially girls who live in settings with a generalized HIV epidemic or who are members of key populations at higher risk for HIV acquisition or transmission through sexual transmission (2).

In sub-Saharan Africa (SSA), adolescent girls and young women accounted for 25% of new HIV infections among adults. The reason for the vulnerability in sub Saharan region were Harmful gender norms and inequalities, insufficient access to education and sexual and reproductive health services, poverty, food insecurity and violence, are at the root of the increased HIV risk of adolescent girls(3).Two out of three newly infected adolescents aged 15-19 years were girls in SSA. As a reason of successful scale up and effectiveness of antiretroviral therapy (ART), children living with HIV are surviving and growing into adolescence. This increasing population requires ongoing support to remain in care and adhere to ART, as well as to manage the changes related to adolescence (4).

AIDS is the leading cause of death among adolescents in Africa and the second most common cause of death among adolescents globally (5). Ethiopian adolescent communities today face many health-related challenges, and their lives vary considerably from those of their parents, grandparents and other relatives. A number of behaviors lead to increased risk of getting HIV/AIDS among adolescents in Ethiopia, were unprotected sexual intercourse and multiple sexual partners (6).

Regarding factors related with occurrence of HIV on adolescents, different factors that can lead to the occurrence of HIV/AIDS in adolescents are biological, transactional sex, violence, limited access to education and lack of access to service are some of the factors contributing for acquisition of HIV among adolescents globally (7).

WHO defines adherence as the extent to which a patient's behavior coincides with medical or patient follows medical instructions (8). Rates of adherence for individual patients are usually reported as the percentage of the prescribed doses of the medication actually taken by the patient over a specified period. In the treatment of patients with HIV infection or the acquired immunodeficiency syndrome, it is essential to achieve more than 95 percent adherence to highly active antiretroviral therapy (HAART) in order to suppress viral replication and avoid the emergence of resistance. Achieving such high rates of adherence is very challenging to such patients, because their regimens include multiple, often expensive medications that have complex dosing schedules and may cause food interactions and side effects that result in poor tolerability (9)

Measurement of adherence: Adherence can be measured in different ways like Self-reporting, Pill counts, Pharmacy records, Provider estimate, Pill identification test, Electronic devices—MEMS (medication events monitoring system), Biological markers—Viral load.

Self-reported adherence measurement: Various periods of recall - 1, 3, 4, 7, 30 Days can be used to assess the medication adherence by caregivers/ adolescent themselves. Self-report agrees well with actual medication intake and viral load, but the responses may not reflect true adherence as adolescents and caregivers learn the social desirability of reporting complete adherence. This method is most widely used method since it is simple and cheap to do in a clinic setting (10).

1.2 . Statement of the Problem

Adolescents represented the fastest growing age group of people living with HIV (PLHIV), accounting for 5.9% of the burden of HIV that underscores the need for greater understanding and suitable adaptation of HIV care and treatment services. Sustaining optimal ART adherence in adolescents (ALHIV) has emerged as a major healthcare challenge, fundamentally due to regimen complexity and adherence efficacy (11).

Human Immune Virus (HIV) risk is considerably higher among adolescent girls, in eastern and southern Africa which have high-prevalence of HIV infection among adolescents in Sub Saharan Africa. Measures including social protection and keeping adolescents in school might reduce HIV risks. Schools are also the most convenient vehicle for comprehensive sexuality education, which provides adolescents with the knowledge and skills necessary to make conscious, healthy and respectful choices about relationships and sexuality. The HIV-related effects of these measures are linked closely to the empowerment of adolescent girls that comes with an education and economic independence (12).

Suboptimal adherence is a major challenge worldwide and is associated with a diversity of patient- and program-related causes. It is estimated that over one third (38%) of adolescents globally are sub optimally adherent to ART, with substantial regional variation. This could be due to Adolescents are often left out of decisions and have limited opportunities to discuss their concerns, and there is limited availability of adolescent-specific treatment literacy and adherence (13).

The shift to the use of highly active antiretroviral therapy (HAART) for treating human immunodeficiency virus (HIV) disease has led to increasingly complex drug regimens. These present significant challenges to both patients and health-care providers with respect to adherence. Without adequate adherence, antiretroviral agents are not maintained at sufficient concentrations to suppress HIV replication in infected cells and to lower the plasma viral load. In addition to being associated with poor short-term virological response, poor adherence to antiviral medication accelerates development of drug-resistant HIV (14).

In Ethiopia studies done on ART Adherence reported different level of adherence ranging from 0-100%) (15–19) in study done in Addis Ababa, revealed that accounting for

average nonadherence rate of 26.5%(20).Another study in the same area among adolescent reported a self-reported nonadherence level as 20.9% (18).

Suboptimal adherence results in inadequate drug exposure and increases the likelihood of viral replication and resistance, limiting future therapeutic options and leading to disease progression. Maintaining strict adherence to dosage and regimen requirements has proven challenging for adolescents. Identifying factors affecting medication adherence and providing necessary intervention are critical to improve health outcomes of adolescents living with HIV (21).

Poor adherence to treatment in HIV is extremely complex both in its causes and its capacity to negatively affect patient outcomes, treatment options, and healthcare costs. Although the potential negative effects of poor adherence are known, in patients with HIV, adherence takes on particular importance as adherence may impact not only viral suppression, but also the emergence of permanent treatment resistance. Treatment-related factors, patient-related factors, provider-related factors, and healthcare system-related factors may all impact adherence (22).The reasons for nonadherence are varied and complex, and no one solution works for everyone. However, the most impactful solutions rely on early detection and individualized interventions (23).

Poor adherences possess significant challenges to both patients and health-care providers. Without adequate adherence, antiretroviral agents are not maintained at sufficient concentrations to suppress HIV replication (16). Therefore, high level of adherence (>95%) is very crucial to maximize the usefulness of ART. However, there are limited information on adherence and factors influencing it in this study area. Therefore, identifying and overcoming the factors that reduce adherence to combination antiretroviral agents is importance for prolonged viral load suppression and better outcomes of the adolescent taking HAART. To our knowledge, no published work in the study area has been found on assessing adherence to ART and its associated factors among adolescent for which reason the current study is designed.

2. LITERATURE REVIEW

Factors associated to adherence

A number of factors have been identified to be associated with non-adherence to ART. The factors associated with medication adherence are socio-demographic related variables, disease related factors, psychosocial related factors and health service delivery related factors. Understanding these factors can help to identify at risk individuals as early as possible and inform the development of interventions to improve adherence (24).

Socio-demographic factors

Many studies have analyzed Adolescents socio-demographic factors associated with ART adherence. Age of the adolescent was significant in few studies, study done in Nigeria reveal that age of the adolescent is associated with adherence (OR 0.541) (25) and adolescents age between 16-19 were also associated with suboptimal adherence to ART according study in Thailand (26), in contrast to these other studies in Addis Ababa Ethiopia(18) Malawi (27) and other African countries like Uganda, Kenya, Rwanda and Tanzania age was not found to be significantly associated with adherence (28–31). Regarding gender of the patients there is inconsistent finding across studies, study in Ambo Hospital, western Ethiopia revealed that Female are 3.9 times less likely to adhere to ART and study in Uganda also showed gender of the adolescents is associated with adherence to ART with girls were less likely to adhere than male(OR 1.73 , CI(.25–2.41) (32), in addition to the above another study in the same setup Uganda stated that female are less likely to adhere to ART than male patients (33). While another study in South Africa found that as there was no association between gender and adherence to ART among adolescents (34).

Marital status of the caregiver/ adolescent is another socio-demographic factors associated with ART adherence study in Addis Ababa revealed that Adolescents who live with widowed parents had more adherence to ART than those who were living with others AOR:0.087 (0.021-0.359). In support of the above statement study in Mekelle, northern Ethiopia on care givers reported adherence revealed that those patient who live with unmarried were (AOR = 15.17, 95% CI: 3.36-68.43) and married (AOR = 3.54, 95% CI: 1.23-10.13) were more likely to adhere than those with separated or divorced caregivers(35).

The literacy status of the adolescent or caregiver is also associated with ART adherence in studies conducted in various setup. Clients with no primary education/ illiterate were associated with non-adherence in studies conducted in Addis Ababa of Ethiopia, Nepal. In contrary to this literacy status has no association with adherence in studies conducted in Malawi, Eldoret Kenya and Uganda (20,22,28–31).

Residence is another socio-demographic associated with sub optimal adherence among adolescents. A cross sectional study in rural Uganda on adolescent revealed that adolescents from rural area have lower adherence to ART compared to those from urban residents. Rural residents were 2.6 times with AOR 2.64 (1.28-5.43) more likely to become non-adherent compared to urban residents and study conducted in Jimma Ethiopia also reported that being rural resident as associated with nonadherence (15,29).

Economic status of the adolescents or their family is also another factors associated with adherence status of the adolescents. A systematic review of adherence to ART in Sub Saharan Africa reported that both Those from poor family and those from higher income family were associated with sub optimal adherence while another systematic review on adolescent in sub-Saharan Africa reported as there were no association between economic status like family income and caregivers employment status (39,40). It was not found to be associated with ART adherence in studies conducted in Aksum, Mekelle Northern Ethiopia and same study in Addis Ababa (18,35,41).

Psychosocial related factors

Possible reason for adolescents non-adherence to ART in relation to psychosocial and related factors includes psycho-emotional (depression, anxiety, Denial of diagnosis, Patient autonomy level) and Social factors (Fear of adult patients, Stigma, low social support) (42,43).

Regarding social supports and related factors different studies had reported that social factors are related with adherence to ART with different degrees. Social factors like, knowledge of caregiver about ART medication (AOR =7.31, 1.72- 6.08), disclosure of the status (AOR = 5.02, 0.37-8.03) were associated with adherence to ART (44) in support of this study conducted in eastern Ethiopia found that patients those who did not disclose their sero-status (AOR = 0.45;95 % CI = 0.21–0.97) were less likely to adhere to ART (45). But One study at Tikur Anbessa Hospital Addis Ababa Ethiopia found that

Patients those who were not aware of their HIV sero-status (AOR = 2.35 (95% CI: 1.09, 5.06) were more likely to adhere to ART (46). In contrast to this Other study conduct in Harari Regional state eastern Ethiopia found as there was no association between disclosure of status and adherence to ART (47).study conducted in east Wollega of showed not disclosing HIV status to family or coworkers is associated with non-adherence to ART (48)

A systematic review of studies in Asian developing countries identified that Socio-cultural factors preventing adherence to ART were: stigma and discrimination, fear of being recognized, fear of disclosure of status to community and fear of stigma from family (38). Depression is also one factor associated with adherence among patients on ART. Different studies found that those patients considered as having depression have low ART medication adherence compared with those not having the condition, did experience depression (AOR = 0.36; 95 % CI = 0.21–0.61) (45), care givers reported depression of the patients depression status is also associated with drug adherence AOR=3.57 (1.86–6.86 CI)(31), depressed patients on ART have lower adherence AOR=3.3 (1.4–7.5 CI)(41), patients having self-reported depression have suboptimal adherence with AOR=2.21 (1.10-4.42 CI) (49).

Several studies have also analyzed the effect of stigma on ART adherence. A mixed method study conducted in 10 districts of Uganda and others revealed stigma as one of the biggest challenges to adherence among adolescent on ART (15,27,29,31,49,50). Study in Addis Ababa revealed stigma can be internalized or non-internalized both affects adherence of patients to ART but patients who experienced internalized stigma have lower adherence compared to those having non-internalized stigma with OR for male 5 2.9(1.4 -6.3) and OR for females 5 3.1(1.6 -5.8) (20).

Uses of memory aid/ reminding methods were also identified as factors associated with non-adherence among clients on ART. one study in north western Ethiopia reported as reminding methods like use of text messaging and unanswered call for reminding time to take ART (AOR = 2.67(1.34, 5.32) and use of cellphone alarm as medication reminder (AOR = 2.22(1.09, 4.52) associated with optimal adherence. In support of the above statement another study in south western Ethiopia found that uses of memory aids by

clients on ART enhances adherence compared to clients who didn't use reminding methods (48,51).

Regarding patient habits (use of substance, alcohol drinking) were found to be barriers of adherence to ART in different studies in Ethiopia and other sub Saharan African countries (15,16,18,24,28,38,41,44,46,52). Several studies assessed main reason for non-adherence as forgetting, traveling, and being busy doing other things, transportation problem run out of pills, pill burden, illness of adolescent or caregivers with varying degrees (16,18,27,29,35,37,47).

Disease related factors

Clinical related factors associated with non-adherence to ART among adolescents were also identified as factors associated with non-adherence to ART. Different studies in different parts of the world and sub Saharan Africa reported some clinical factors including; WHO clinical stage, CD4 count, duration of HIV infection, presence of opportunistic infections, HIV-related symptoms as associated with adherence status of the clients on ART (15,18,24,29,35,36).

Two studies in different setup of Ethiopia also identify clinical factors associated with non-adherence to ART among clients on ART. Study conducted in Addis Ababa and Ambo Hospital western Ethiopia, reported that advanced disease (WHO stage clinical stage IV) with (AOR 12.874 (2.079-79.706), and AOR (0.055) respectively were associated with non-adherence, while in other study conducted in Addis Ababa WHO clinical stage was not found to be associated with Adherence status to ART among adolescents and children (52).

The CD4 count of the clients on ART were also assessed by different studies in different setups in our country and sub-Saharan Africa and reported as there was no association between CD4 count and adherence status (15,16,46,52) in contrary to the above studies a cross sectional study conducted in south wollo, Ethiopia revealed that recent CD4 count >500 has been associated with adherence status of clients on ART. This study reported clients having recent CD4 count >500mm/cells were 1.9 times likely to adhere to ART than their counterpart those having recent CD4 <500mm/cells who were non-adherent (16).

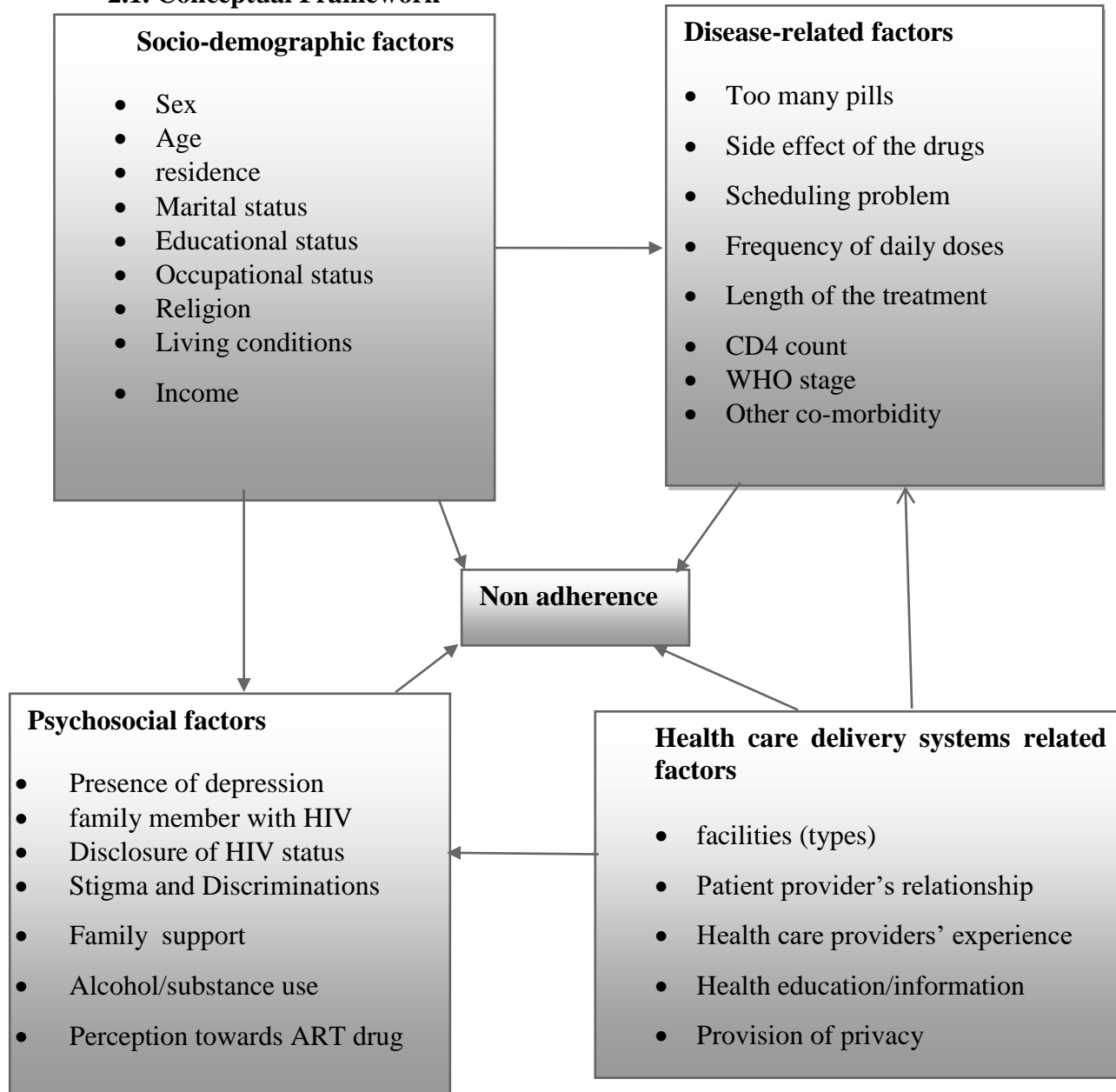
Study conducted in Addis Ababa reported as use of other drugs like for cotrimoxazole (CPT) for opportunistic infection is also associated with optimal adherence. Clients who were on CPT besides ART were 3.6 times likely to adhere to ART (52) but study conducted in Kenya among adolescents living with HIV who were on ART identified use additional drugs as factors associated with non-adherence among adolescents. The likelihood of non-adherence were also increased for adolescents who reported having additional drug use for other purposes (21,53).

Treatment related factors were also found to be associated with adherence, reported perceived difficulties with their routine medication (AOR=2.567), and having difficulty of taking medication at a particular time of the day (AOR_2.583,) were associated with non-adherence to ART. (AOR _2.65) (21).

Health care delivery system related factors

The way that the health care system is structured and distance of health facility <10KM were associated with optimal adherence (16),while in other study conducted in Tanzania distance >5KM is associated with sub optimal adherence (28). health care providers experience presence in ART clinic, patient-nurse and other provider relationships, health care providers' beliefs (54)and satisfaction to the service (50) has been found to be related to medication adherence among adolescents.

2.1. Conceptual Framework



Adapted from Determinants of Adherence to Antiretroviral Therapy among HIV-Infected Patients in Africa (a review of articles) (54)

2.2. Significance of the Study

Different studies in sub Saharan African context indicated that there is a deficit in the level of adherence of adolescent patients to ART and multiple factors have been mentioned to contribute to the existing gap. Few studies in Ethiopian assessed factors associated with non-adherence among adolescents. This study provided knowledge on the level of adherence of HIV infected adolescent patients and understand the potential barriers to optimal adherence in Guji zone and beyond. Moreover, the study provides important information with regard to aspects of adherence and forward recommendations to health care providers, health facilities and policy makers in enhancing the implementation of ART program and development of evidenced-based interventions to improve adherence to antiretroviral therapy among adolescents. This study will benefits the clients directly or indirectly through provision of appropriate and relevant information to the patients and their health care providers about the pervasiveness of non-adherence and will contribute to help them understand the need for patients to play active role in achieving the maximum required adherence level with due emphasis on the focus areas of improving adherence.

3. OBJECTIVES

3.1. General objective

- ❖ To identify factors associated with non-adherence to ART among adolescents patients in Guji zone Oromia Region,2018

3.1.1. Specific objectives

- To identify socio-demographic, psychosocial, disease and health care delivery system related factors associated with non-adherence to ART

4. METHODS AND MATERIALS

4.1. Study area and period

The study was conducted in Oromia Region, Guji zone Public health facilities. Guji zone is one of 18 zonal administrations in Oromia Region. The zone is found at south eastern part of Ethiopia 600km away from Addis Ababa. Total population of the zone is 1,432,527 of which 358,131 were adolescents aged (10-19) accounting for about 25% of total population. The zone has 17 districts of which 3 districts are urban. The zone has 4 district hospitals, 62 health centers and 291 health posts making the health service coverage 100% in terms of health centers to population and 100% for health post to population coverage for agrarian districts, while 56% health centers to population and 100% population to health posts in Pastoralist area. In the zone 16 public health facilities (4 Hospitals and 12 Health Centers) provides general Health care service and has been antiretroviral therapy ART for peoples living with HIV/AIDS (PLHIV). In Guji zone there are 4566 peoples receiving ART among these 463 are adolescents aged 10-19 years of age accounting 10.14% of the total peoples on ART services at ART centers in the zone during study period. Both first line and second line treatment were available in the zone ART centers. Total number of peoples newly infected and enrolled to ART in 2016/7 (2009 E.C) were 753 from these 6.4% were adolescents of which 89.6% were girls (55).

The study was conducted from February 26 up to April 20/2018 for two months.



Figure 1: Guji zone administrative map with its districts in 2017

4.2. Study design

A facility based case control study design was used on adolescent clients under selected ART clinics in Guji zone, 2018

4.3. Population

4.3.1. Source population

HIV/AIDS positive Adolescent subjects who have ART follow up in Guji zone Public health facilities providing ART services.

4.3.2. Study population

All HIV/AIDS positive adolescents who had been on ART for at least three months before a data collection period in Guji zone was considered as a study population of this study.

Cases: Adolescents taking ART doses those who missed doses completely or single missed dose of 3 or 7 days recall or those who have less than 95% adherence (missing >2 doses of 30 doses) (17,56)

Control: Adolescents taking ART doses those who take doses (95% or more adherence = missing \leq 2 doses of 30 days doses or no missed dose on 3 or 7 days recall (17,56)

4.3.3. Inclusion criteria

Adolescent clients on ART for at least three months at the selected ART Care Centers were included.

4.3.4. Exclusion Criteria

Adolescents too ill to participate in the study during data collection were excluded.

4.4. Sample size and sampling procedure

The sample size of the study was calculated by Epi-Info™ 7 software Statcalc program. Variables that are used to calculate sample size are disclosure status, felt depressed, gender, types of health facility, WHO staging (3 and 4), experienced ART side effect, distance of health facility. Sample size was calculated by using double population proportion formula. The expected prevalence of exposure among controls felt depressed 3.3% and prevalence of cases with exposure felt depressed 13.1% from study conducted in Malawi considering 5% level of significance, 80% power of the study and 2:1 controls to case ratio (table1).

Table1:- Sample Size calculation by using different Variables for the study in Guji zone Oromia, Ethiopia, 2018.

Variables	% of control (P2)	%cases with exposure	Control: cases	#cases	#controls	Total	References
Disclosure status(no)	85	66.7	2:1	69	138	207	(52)
Felt depressed	3.3	13.1	2:1	99	198	297	(27)
Gender (male)	35.5	65	2:1	38	76	114	(57)
Types of health facility(H/C)	15.6	41.57	2:1	39	78	117	(29)

Then the largest sample size selected for this study was as follows

Case = 99

Control = 198

Total =297

NB-Non respondents were replaced by next cases or controls. But, back ground information were tried to be taken from them for validity issue.

4.4.1. Sampling Technique

Purposively Sampled 6 government health facilities (2 hospitals and 4 health centers) based on number of adolescent on ART at health facilities (those having >5 clients) were included in this study. Based on these the recruited health facilities were Shakiso Health Center with 275 clients, Megado Health Center with 54 clients, Adola General Hospital with 35 clients Negelle General Hospital with 30 clients, Adola Health Center with 21 clients and Haraqalo Health Center with 6 clients were included based number of adolescents on ART in these facilities during data collection period. Then the calculated sample size were distributed to the selected health facilities using proportional to population size based on total adolescent on ART at each selected clinic. In this allocation, adolescents visited to ART clinic at respective health facilities during data collection period were approached. Cases and controls were selected by using consecutive sampling from each facility based on fulfillment of case definition criteria. Because fewer adolescent patients on ART, all those identified were approached and take part in the study. Recruitment was continued until 101 Cases and 196 controls adolescents were recruited. Allocation of the study participants by health facilities were as follows

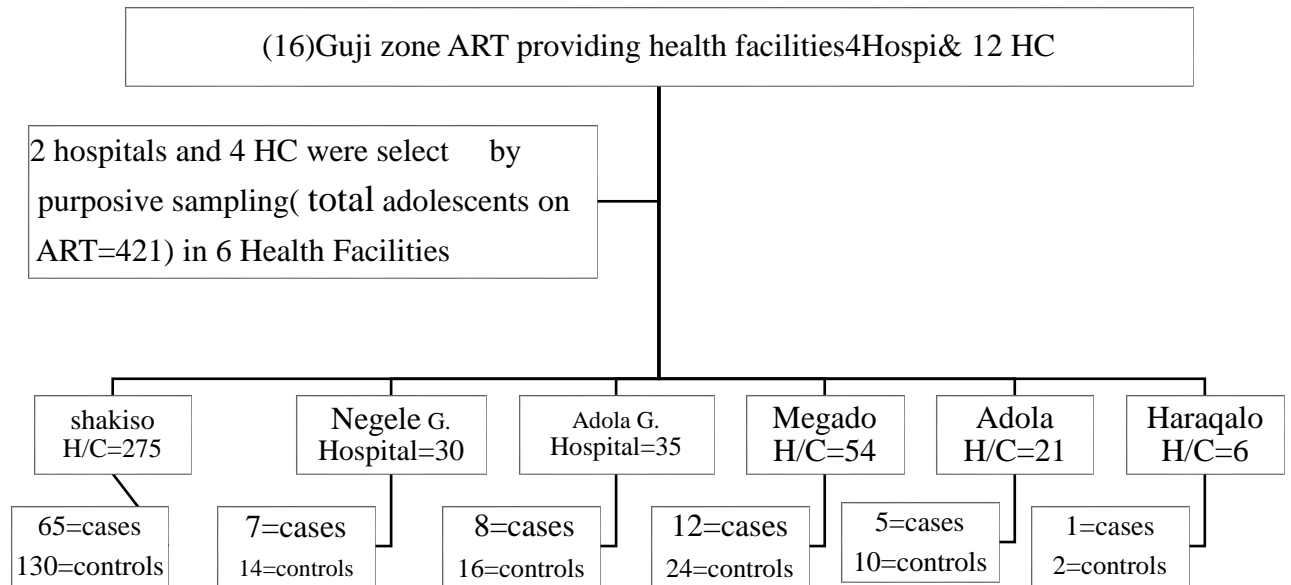


Figure 2: diagrammatic representation of proportional allocation to size to selected health facilities in Guji zone 2018

4.5. Data collection Procedures (instruments, personnel)

Secondary data were collected by data collectors from respective Hospitals and Health Centers ART clinic in Guji zone from ART follow up registration book. Standard structured questionnaire was used for interview. The adherence questionnaire was prepared from AIDS Clinical Trial Group (ACTG) and by reviewing different literature conducted in Ethiopia and sub-Saharan Africa. The patient health questionnaire (PHQ9) with 9-items on which score ranges from 0 to 27 was used to assess the depression of the study participants. Individuals up on their response categorized into five categories as (no depression, mild depression, moderate depression, moderately severe depression and severe depression) and then dummy coded as not having symptom of depression and having symptom of depression(41). Perception towards the drug questionnaire is developed by reviewing different literatures. Six data collectors three BSc and three diploma nurses who were working at ART clinic of respective health facilities were trained. Data collections were conducted on the arrival of the client to service provision point in separate ART room for privacy issue and controls were recruited after case. The supervisors followed the whole data collection process, updates were provided on progress of the team and feedbacks were given either by phone or on site to data

collectors. The group meeting was conducted every other evening to discuss on updates and problems encountered. Data consistency and completeness was reviewed on a daily basis.

4.6. Data quality management

To assure the quality of data, the following measures were undertaken. The data collection process was closely supervised by one BSc nurse who has experience in ART provision at health facility and the principal investigator. The data collectors and supervisor were trained for 2 days on the objectives, data collection techniques, data quality, and interview techniques for this study. The questionnaire originally prepared in English and was translated into the local language (Afan Oromo) by native speaker, and then was translated back into English by independent person to check the consistency. The collected data were checked and cleaned for its completeness before entering into Epidata version 3.1.1 software by principal investigator. Missing values and outlier were checked before analysis by running descriptive analysis.

4.7. Study Variables

4.7.1. Dependent Variable

Caregiver or self-reported adherence to ART among adolescent

4.7.2. Independent Variables

Socio-demographic related factors

- Sex ,Age , Residence, Religion, Marital status ,Educational status, Occupational status, Income

Psychosocial related factors

- Presence of depression, family member with HIV, Disclosure of HIV status, Stigma and Discriminations, Family support , Alcohol/substance use and perception towards ART

Disease-related factors

- Too many pills, Side effect of the drugs, Scheduling problem, Frequency of daily doses, Length of the treatment, CD4 count, WHO stage, Other co-morbidity

Health care delivery systems related factors

- Healthcare facilities (types), Patient provider's relationship, Health care providers' experience, Health education/information, Provision of privacy, distance of health facility.

4.8. Operational definitions and definition of terms

Suboptimal adherence: is the condition of missing doses (less than 95% adherence meaning missing >2 doses of 30 days doses or missing 3 or 7 days recall doses completely or single missed dose of 3 Or 7 days recall (17,56)

Optimal Adherence: is defined as taking one's medicine as prescribed and agreed between the patient and provider which is $\geq 95\%$ adherence to ART. Which means taking doses (95% or more adherence = missing ≤ 2 doses of 30 days doses or no missed dose on both 3 or 7 days recall (17,56)

Stigma: Self-imposed negative attitudes by ALHIV themselves and discrimination against them by parts of the society as result of HIV infection. Stigma measurement was adopted from the stigma scale that includes internalized stigma recommended for clients with HIV (1 question) and discrimination (4 question using yes /no(58). Individuals were categorized as experienced discrimination or not experienced based on their response (scoring above mean and below mean which is 2.3).

PHQ-9 score for depression (points): - A score of 1 to 4 - No depression, 5 to 9 - Mild depression, 10 to 14 - Moderate depression, 15 to 19 - Moderately Severe depression and 20 to 27 - Severe depression(17)

Baseline CD4 count: CD4 count done when an adolescent started ART

Current CD count: CD4 count done within 6 months of data collection

Care giver: A person who lives with the adolescents and participates in the adolescent's daily care and take the responsibility in giving the child medication and bring the child to clinic.

Adolescents: Individuals between the ages of 10 and 19(inclusive) years old are generally considered adolescents.

Youth: This term refers to individuals between the ages of 15 and 24

Young people: Individuals between the ages of 10-24 are considered as young peoples

Distance of health facilities: is measured by distance of health from the residence area of the client. The distance can be ≤ 5 KM (if it takes <60 minutes to reach the point of service provision) or > 5 KM (if it takes ≥ 60 minutes to reach the point of service provision)

Living condition: refers to a person that adolescent is living with currently

Family support: support that adolescents receive from the person around them in the course of ART treatment. We tried to evaluate the presence or absence of family support by using yes/no question not the level and intensity of the supports the adolescents are getting from family.

Experienced health professional: health professional that provided service at ART clinic for at least 2 years and trained special training concerning ART services.

Least experienced health professional: health professional that provided service at ART clinic for less than 2 years and trained special training concerning ART services or not

4.9. Data analysis procedures

After collecting the data were cleaned, coded, and entered to Epidata version 3.1. Data were checked for completeness and uniformity before entry in to Epidata. Analysis was by using SPSS version 20 statistical package. Descriptive analysis was conducted and the result was displayed in the form of tables, charts. Then binary logistic analysis was conducted to identify candidate variables for multivariable analysis. Independent variables having p value ≤ 0.25 were selected as candidate variables for multivariable logistic regression. Multicollinearity between independent variables was checked by logistic regression standard error coefficient (SE) and checking for variance inflation factors and tolerance. Backward stepwise multivariable logistic regression analysis was conducted in order to identify factors independently associated with the non- adherence. The Hosmer and Lemeshow goodness of fitness of the model were also checked. P-value ≤ 0.05 was used to decide whether there was statistical significance or not.

4.10. Ethical consideration

Ethical clearance letter was obtained from Jimma University Institute of Health institutional review board (IRB) through department of Epidemiology and additional permission was obtained from Guji Zonal Health Department. Permission was obtained to conduct the study from the medical directors and primary health care unit directors of the respective hospitals and health centers respectively. Adolescents and caregivers received information about the study before data collection. Informed consent was obtained from adolescents aged 18 and above. For adolescents under 18 years of age, consent was taken from parents or caregivers in addition to verbal assent by adolescents. To ensure confidentiality of all study participants, direct identifiers of the clients were not used in

the data collection, storage or report writing. All electronic documents were protected by password and all paper documents were stored in the locked cabinet.

4.11. Dissemination plan

The finding of the study was presented to Jimma University Institute of health. Thereafter it will be disseminated to the concerned body like governmental and non-governmental organizations working in the area through presentations on conferences as well to concerned health professionals and community; with that, it will help them to improve the problem. Publication of the finding on national and international journals will follow.

5. RESULTS

5.1. Socio-Demographic Characteristics of The Study Participants in Guji zone, Oromia, South Ethiopia

A total of three hundred six adolescents who are on ART were approached for interview and 297 (101 cases and 196 controls) adolescents were participated in the study making the response rate 97.4%. Among nine participants who refused to participate (three male and six female). Among these three of them were refused due to illness and the rest refused to give consent. Adolescents who have at least stayed three months to 14 years being on ART were participated in our study. The mean years on ART for study participant was 5 years and 13 days with SD 4 years of ART follow up at their respective ART clinics. The mean age of control participants was 14.9 years with SD of 2.8 years while the mean age for case participants was 15 years with SD of 2.8 years. About 58(57.4%) cases and 119(60.7%) controls were Females. Fifty seven (56.4%) of cases and 108(55.1%) of controls were from 14-19 age category and about 56(55.4%) cases and 124(63.3%) controls resides in the town. Concerning the religious status of the participants about 47(46.5%) cases and, 92(46.9%) controls are Orthodox, while 45(44.6%) cases and 72(36.3%) controls are Protestant followers. regarding caregivers marital status about 36(42.6%) for cases and 107(56.6%) for controls were married and living together. Concerning the ethnicity of the participants 48(47.5%) of cases and 99(50.5%) of controls were Oromo. In terms of source of income for the family about 75(74.3%) of the care givers for cases and 169(86.2%) caregivers for control were either self or government employed. concerning the occupational status of the adolescents 46(45.5%) cases and 94(48%) controls were students while nine (8.9%) cases and 14(7.1%) controls were commercial sex workers (table 2) .

Table 2: - Socio-demographic Characteristics of the study participants in Guji zone, Oromia, south Ethiopia, 2018.

Variables	Categories	Cases (%)	Controls (%)
Sex	Male	43(42.6%)	77(39.3%)
	Female	58(57.4%)	119(60.7%)
Age category	10-14	44(43.6%)	88(44.9%)
	15-19	57(56.4%)	108(55.1%)
Residence	Town	56(55.4%)	124(63.3%)
	Rural	45(44.6%)	72(36.7%)
Religion	Orthodox	47(46.5%)	92(46.9%)
	Muslim	5(5.0%)	27(13.8%)
	Protestant	45(44.6%)	72(36.7%)
	Catholic	4	5
Caregivers Marital status	Single	17(16.8%)	22(11.2%)
	Married	43(42.6%)	111(56.6%)
	Divorced	19(18.8%)	40(20.4%)
	Widowed	13(12.9%)	19(9.7%)
	Separated	9(8.9%)	4(2.0%)
	Can't read and write	15(15%)	23(11.7%)
caregivers Educational status	Able to read and write formal education (grade1-8)	58(57%)	113(57.7%)
	High school and above	13(4.4%)	34(17.3)
Ethnicity	Oromo	48(47.5%)	99(50.5%)
	Amhara	21(20.8%)	41(20.9%)
	Tegaru	5	6(3.1%)
	Sidama	22(21.8%)	41(20.9%)
	Others(Gedeo, Guraghe)	5	9(4.6%)
Caregivers Employment status	Employed	75(74.3%)	169(86.2%)
	Unemployed	26(25.7%)	27(13.8%)
Adolescents occupational status	Unemployed	5	12(6.1%)
	Drivers	10(9.9%)	13(6.6%)
	Students	46(45.5%)	94(48.0%)
	Daily laborers	13(12.9%)	33(16.8%)
	Merchants	16(15.8%)	24(12.2%)
	Commercial sex workers	9(8.9%)	14(7.1%)
	Others (shoeshine etc.)	2	6
Adolescents Living condition	Live with family	75(74.3%)	140(71.4%)
	Live with other adult or children	9(8.9%)	17(8.7%)
	Live alone	17(16.8%)	39(19.9%)

5.2. Clinical Characteristics of Adolescents

Majority of cases 88(87.1%) and 164(83.7%) controls were from health centers. Fifty nine (58.4%) cases and 109(55.6%) controls were categorized as WHO clinical stage II. Among the study participants 99(98%) cases and 191(97.4%) controls are taking first line ART drugs. Regarding baseline CD4 count about 55(54.4%) of cases and 112(57.1%) of controls have baseline CD4 count measured. Ninety eight (97%) of cases have less than 95% self-reported (caregiver reported) adherence of past one month while only three cases have greater than 95% adherence. All controls 196(100%) have greater than 95% self/caregiver reported adherence over past one month (table 3).

Table 3: Clinical Characteristics of study participants in Guji zone, Oromia, South Ethiopia 2018

Variables(N=297)	Categories	Cases (%)	Controls (%)
Health Facility Types	Health center	88(87.1%)	164(83.7%)
	Hospital	13(12.9%)	32(16.3%)
WHO Clinical staging	Stage I	27(26.7%)	61(31.1%)
	Stage II	59(58.4%)	109(55.6%)
	Stage III	13(12.9%)	20(10.2%)
	Stage IV	2	6(3.1%)
ART Drug Regimen	First line	99(98.0%)	191(97.4%)
	Second line	2	5
Baseline CD4 Count	≤350cells/mm	31(56.4%)	60(53.6%)
	>350cells/mm	24(43.6%)	52(46.4%)
Latest CD4 count	≤ 500ells/mm	26(25.7%)	26(13.3%)
	>500cells/mm	72(71.3%)	152(77.5%)
self-reported adherence (30 days)	<95%	98(97%)	0
	≥95%	3	196(100%)

5.3. Reason for missing ART drugs Among Adolescents

The reason for missing ART drugs among adolescents about 66(33.7%) controls who have missed ≤ 2 doses in past one month recall as well as who were adherent on their 3 and 7 days recall and all cases were responded on their reason for missing ART drugs. Among these Ninety three (31.3%) adolescents responded as simply forgetting, 79(26.6%) being busy with other things and 64(21.5%) away from home for different reasons were reason for missing their doses in the past one month which reflects <100% adherence to ART drugs (figure 3).

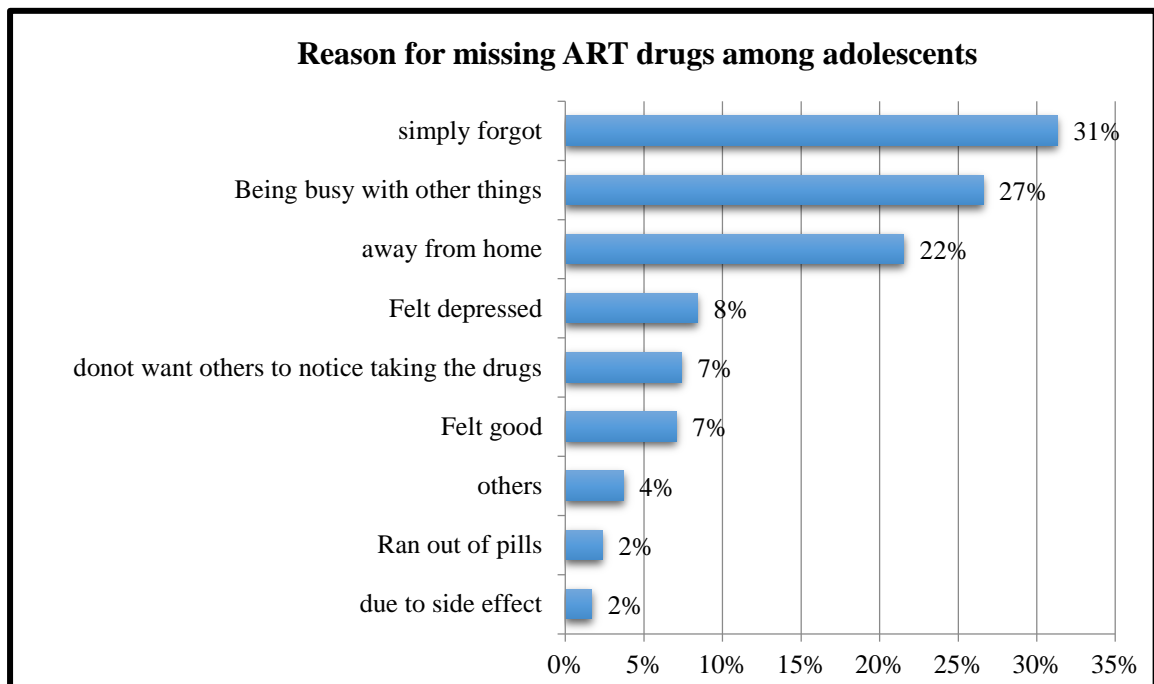


Figure 3: Reason for missing ART drug by adolescents who were on ART for greater 3 months in Guji zone, Oromia, south Ethiopia, 2018.

5.4. Factors Associated with Nonadherence on Binary Logistic Regression

5.4.1. Socio-Demographic Factors Associated with Non-adherence to ART among Adolescents.

Unmarried/widowed/separated caregivers with COR 1.8(1.1-2.9), source of income (unemployed) with COR 2.2(1.2-3.9) and area of residence (rural) COR 1.4(.85-2.3) were found to be a candidate variables associated with non-adherence status of the adolescents from socio-demographic factors (table 4).

Table 4: Socio-demographic factors associated with non-adherence to ART among adolescents, Guji zone, Oromia South Ethiopia, 2018.

Variables	Categories	Cases (%)	Controls (%)	COR (95%CI)	P.Value s
Sex	Male	43(42.6%)	77(39.3%)	Reference	
	Female	58(57.4%)	119(60.7%)	0.87(.54- 1.4)	0.584
Age	10-14	44(43.6%)	88(44.9%)	Reference	
	15-19	57(56.4%)	108(55.1%)	0.95(.58- 1.5)	0.827
Marital status of caregiver	Married	43(42.6%)	111(56.6%)	Reference	
	Single, widowed/separated	58(57.4%)	85(43.4%)	1.8(1.1-2.9)	0.022*
Family living together	Both are alive	51(50.4%)	101(51.5%)	Reference	
	One or both dead	50(49.6%)	95(48.5%)	1.04(0.64-1.7)	0.866
Adolescents Educational status	Attended formal education	71(70.3%)	147(75%)	Reference	
	Not attended formal education	30(29.7%)	49(25%)	1.3(0.74-2.2)	.385
Sources of Income	Employed	75(74.3%)	169(86.2%)	Reference	
	Unemployed	26(25.7%)	27(13.8%)	2.2(1.2-3.9)	0.012*
Monthly Income	<1000ETB	33(32.7%)	72(36.7%)	Reference	
	>=1000ETB	68(67.3%)	124(63.3%)	1.2(0.72-2.0)	0.48
Living arrangement	With Family	75(74.3%)	140(71.4%)	0.87(.50-1.5)	0.606
	Living alone	26(25.7%)	56(28.6%)	Reference	
Residence	Town	56(55.4%)	124(63.3%)	Reference	
	Rural	45(44.6%)	72(36.7%)	1.4(.85-2.3)	0.192*

*significant at p. value less than 0.25

5.4.2. Psychosocial Related Factors Associated with Non-adherence to ART

Psychosocial related variables that were found to be candidate variables were, not disclosing HIV status COR 4.6(2.7-7.7), adolescents without family support COR 1.9(1.1-3.4), no satisfaction to family support by adolescents COR .54(0.25-1.19), adolescents/caregivers who are not using method to remind drug taking time COR 1.5(.86-2.7), have experienced family death by adolescents with COR 1.4 (0.89-2.35), having symptom of depression among adolescents COR 3.3(1.9-5.7), having internalized stigma COR 1.6(0.96-2.5), history of alcohol drinking in past one month COR 2.4(1.4-4.1), history of smoking cigarette in past one month COR 2.3(0.93-5.5) and history of

chewing khat in past one month COR 2.9(1.5-5.6) were found to be candidate variables associated with non-adherence among adolescents (Table5).

Table 5: Psychosocial factors associated with non-adherence among adolescents in Guji zone, Oromia, Ethiopia 2018.

Variables	Categories	Cases (%)	Controls (%)	COR (95%CI)	P. Values
Disclosure status	Not disclosed	57(56.4%)	43(22%)	4.6(2.7-7.7)	0.000*
	Disclosed	44(43.6%)	153(78%)	Reference	
Family support	No	31(30.7%)	36(18.4%)	1.9(1.1-3.4)	0.017*
	Yes	70(69.3%)	160(81.6%)	Reference	
Satisfaction to support family	No	9(8.9%)	30(15.3%)		
	Yes	92(91.1%)	166(84.7%)		
Reminder method used	Yes	74(73.3%)	158(80.6%)	Reference	
	No	27(26.7%)	38(19.4%)	1.5(.86-2.7)	0.148*
Experienced family death	One or more	50(49.5%)	79(40.3%)	1.5 (0.89-2.4)	0.130*
	No one died	51(50.5%)	117(59.7%)	Reference	
Depression status	Have depression	45(44.5%)	38(19.4%)	3.3(1.9-5.7)	0.000*
	No depression	56(55.5%)	158(80.6%)	Reference	
Internalized stigma status	Experienced	61(60.4%)	97(49.5%)	1.5(0.95-2.5)	0.075*
	Not experienced	40(39.6%)	99(50.5%)	Reference	
Discrimination status	Experienced	54(53.5%)	83(42.3%)	1.2(0.72-1.9)	0.491
	Not experience	47(46.5%)	113(57.7%)	Reference	
Substance use in past one month					
Alcohol Drinking	Yes	41(40.6%)	43(21.9%)	2.4(1.4-4.1)	0.001*
	No	60(59.4%)	153(78.1%)	Reference	
Cigarettes Smoking	Yes	11(10.9%)	10(5%)	2.3(0.9-5.5)	0.071*
	No	90(90.1%)	186(95%)	Reference	
Khat chewing	Yes	24(23.7%)	19(9.6%)	2.9(1.5-5.6)	0.002*
	No	77(76.3%)	177(90.4%)	Reference	

*significant at p. value less than 0.25

5.4.3. Health Care Delivery System Related Factors Associated with Non-Adherence

Only adolescents who are following drugs instruction provided by health care provider half of the time or less time with COR 1.9(1.1-3.6) was found to be candidate variable associated with adherence status from health care delivery system related factors(table 6).

Table 6: Health care delivery system related factors associated with non-adherence to ART, Guji zone, Oromia, Southeast Ethiopia, 2018.

Variables	Categories	Cases (%)	Controls (%)	COR (95%CI)	P.Values
Health facility distance	<=5 KM	63(62.4%)	115(62.2%)	Reference	0.799
	>5 KM	38(37.6%)	74(37.8%)	0.94(0.57-1.5)	
Duration to reach H/F	>60 minutes	31(30.7%)	51(26%)	1.3(0.74-2.1)	0.394
	<=60 minutes	70(69.3%)	145(74%)	Reference	
Means of travel to H/F	Vehicles/motor	68(67.3%)	124(63.3%)	Reference	0.488
	On foot	33(32.7%)	72(36.7%)	0.83(.50-1.4)	
counseled	No	1	2		
	Yes	100(99%)	194(98.9%)		
Privacy kept	No	3	5		
	Yes	98(97%)	191(97.4%)		
instruction for drug	No	44(43.6%)	81(41.3%)	1.1(0.67-1.8)	0.711
	Yes	57(56.4%)	115(68.7%)	Reference	
Following instruction	Mostly	76(75.2%)	168(85.7%)	Reference	0.027*
	sometimes	25(24.8%)	28(14.3%)	1.9(1.1-3.6)	
Facility types	HC's	88(87.1%)	164(83.7%)	Reference	0.432
	Hospitals	13(12.9%)	32(16.3%)	1.3(0.66-2.6)	
Health professional experience	Least experienced	6(6%)	18(9.2%)		
	Experienced	95(94%)	178(90.8%)		

*significant at p. value less than 0.25

5.4.4. Disease related factors associated with non-adherence to ART

Two variables; latest CD4 count \geq 500mm/cells with COR 0.47(0.26-0.87) and adolescent who use other drugs besides ART COR 2.1(1.3-3.5) were identified from disease related factors to be candidate variables associated with non-adherence status of the adolescents (table 7).

Table 7: disease related factors associated with non-adherence to ART, Guji zone, Oromia, South Ethiopia, 2018.

Variables	Categories	Cases (%)	Controls (%)	COR(95%CI)	P.Value s
ART pills taken at once	1(One)	62(61.4%)	118(60.2%)	Reference	0.843
	≥2(Two)	39(38.6%)	78(39.8%)	0.95(0.58-1.6)	
Daily frequency ART	Once	52(51.4%)	88(44.9%)	Reference	0.282
	Twice or above	49(48.6%)	108(55.1%)	0.77(.47-1.2)	
Duration on ART	≤2 years	26(25.7%)	51(26%)	Reference	0.959
	> 2 years	75(74.3%)	145(74%)	1.0(0.57-1.8)	
Baseline CD4count	<350cells/mm	31(56.4%)	60(53.6%)	Reference	0.733
	≥350cells/mm	24(43.6%)	52(46.4%)	1.1(0.58-2.1)	
	Missing	46(45.5%)	87(45.4%)		
Latest CD4 Count	<500cells/mm	26(25.7%)	26(13.3%)	Reference	0.017*
	≥500cells/mm	72(71.3%)	152(77.5%)	0.47(.26-0.87)	
	Missing	3	18(9.2%)		
WHO clinical Staging	Stage I & II	86(85.1%)	170(86.7%)	Reference	0.707
	Stage III & IV	15(14.9%)	26(13.3%)	1.1(0.57-2.3)	
Other drugs besides ART	Yes	44(43.7%)	52(26.5%)	2.1(1.3-3.5)	0.003*
	No	57(56.3%)	144(73.5%)	Reference	
ART regimen	First line	99(98%)	191(97.4%)		
	Second line	2	5(2%)		

*significant at p. value less than 0.25

5.4.5. Multivariable logistic regression Analysis

After running backward stepwise multivariable logistic regression; Residence, Marital status of caregiver, sources of income for family, disclosure status, depression status of adolescents, uses of reminding method and uses of other drugs besides ART were found to be significantly associated with non-adherence to ART among adolescents. Being rural resident is associated with nonadherence to ART among adolescents. Adolescents who resides in rural area have 1.9 times less like to adhere to ART compared to those residing in urban AOR=1.9(1.1-3.6). Adolescents who lives with unemployed caregivers were 4.2 times less likely to adhere to ART compared to those with employed caregivers with AOR 4.2(2.0-8.9). Adolescents whose caregivers were unmarried/ widowed or separated have 2.1 times likely to become non-adherent compared to adolescents whose care givers were married and living together AOR 2.1(1.2-3.8). Adolescents those who fail to disclose their HIV status with another partner (or any other person), were 5 times more likely to become non-adherent as compared to adolescent who had shared their HIV

status with AOR 5(2.8-9.4). Adolescents with reported symptom of depression were 2.7 times more likely not to adhere to ART compared to those who were without symptom of depression with AOR 2.7 (1.5-4.9). Adolescents who did not use memory aid /reminding methods were 2.4 times more likely to become non-adherent compared to adolescents who use reminding method with AOR 2.4(1.2-4.8). Adolescents who use other drugs other than ART were 2.6 times more likely to become non-adherent with AOR 2.6 (1.5-5.0) as compared to adolescents who took only ART drugs (table 8).

Table 8: Multivariable Logistic Regression Analysis of factors associated with non-adherence among adolescents in Guji zone Health facilities, Oromia south Ethiopia, 2018.

Factors	Categories (N=297)	Cases (%)	Controls (%)	AOR(95% CI)	P. Values
Residence	Rural	45(44.6%)	72(36.7%)	1.9(1.1-3.6)	0.026**
	Town	56(55.4%)	124(63.3%)	Reference	
Uses of Other drugs besides ART	Yes	44(43.7%)	52(26.5%)	2.6(1.5-5.0)	0.002**
	No	57(56.3%)	144(73.5%)	Reference	
Disclosure status of Adolescent	Disclosed	44(43.6%)	153(78%)	Reference	0.000**
	Not disclosed	57(56.4%)	43(22%)	5(2.8-9.4)	
Caregiver Marital status	Unmarried/widowed/separated	58(57.4%)	85(43.4%)	2.1(1.2-3.8)	0.012**
	Married	43(42.6%)	111(56.6%)	Reference	
Family income Source	Employed	75(74.3%)	169(86.2%)	Reference	0.000**
	Unemployed	26(25.7%)	27(13.8%)	4.2(2.0-8.9)	
Adolescents Depression status	No depression	56(55.5%)	158(80.6%)	Reference	0.002**
	Have depression	45(44.5%)	38(19.4%)	2.7(1.5-4.9)	
Alcohol use in past one month	Yes	41(40.6%)	43(21.9%)	1.1(0.5-2.3)	0.9
	No	60(59.4%)	153(78.1%)	Reference	
Reminding method use	Yes	74(73.3%)	158(80.6%)	Reference	0.014**
	No	27(26.7%)	38(19.4%)	2.4(1.2-4.8)	
Internalized stigma	Not experienced	40(39.6%)	99(50.5%)	Reference	0.060
	Experienced	61(60.4%)	97(49.5%)	1.8(.98-3.1)	

**factors significantly associated with nonadherence to ART at P. Value ≤ 0.05

6. DISCUSSION

The finding of this study anticipated in determining factors associated with non-adherence among adolescents living with HIV who were on ART for greater than or equals to 3 months. We found that rural residence, marital status of the caregivers (unmarried, separated/widowed), unemployed caregivers, having reported symptom of depression, not disclosing HIV status, not using memory aid to remind medication taking time and uses of other drugs besides HAART were significantly associated with non-adherence among adolescents both on binary and multivariable logistic regression analysis.

We found significant association between non-adherence and rural residence that indicates Adolescents from rural area were 1.9 times more likely to not adhere to ART compared to urban residents. This finding has agreement with studies conducted in Uganda and Kenya (53,59) as Adherence was worse among the rural compared to urban living adolescents. This finding of association between non-adherence and rural areas residence may indicate difficulties in access to health services and cost of transportation to refill their medication. Non adherence among adolescent from rural descent might emphasizes the need for more decentralization of ART provision to all facilities at the level of health centers that can be accessible by clients at their nearby health facilities. This underlines the importance of provision of geographically closer HIV treatment services such as through mobile clinics may offer promising returns for greater ART uptake and adherence among adolescent populations.

We also found that Adolescents whose caregivers were unmarried/widowed/separated among those who were living with care givers were 2.1 times likely to not adhere to ART compared with adolescents whose caregivers were married and living together. This finding has agreement with study conducted in Mekelle town of northern Ethiopia (35). while the study conducted in Addis Ababa reported as Adolescents with widowed caregivers were more likely to have the adherence to ART (18). The reason for nonadherence among adolescents with unmarried caregiver might be due to family support from married couples than their counterparts. These also emphasize the potential importance of family structure, caregiver support, and caregiver involvement in adolescent adherence.

A source of income for family was also another independent factor associated with nonadherence among adolescents in our study. Adolescents whose families were unemployed were 4.2 times more likely to become non-adherent compared with adolescents whose caregivers were employed. Contrary to this finding study conducted in eastern Ethiopia reported that being with employed caregivers increases the likelihood of non-adherence among adolescents (44). It was not found to be associated with ART adherence status in studies conducted in Aksum, Mekelle Northern Ethiopia and same study in Addis Ababa (18,35,41) and another systematic review on adolescent in sub-Saharan Africa reported as there were no association between caregivers employment status and adherence status of the adolescents (39,40). The reason for nonadherence among adolescent with unemployed care givers might be related with supports including financial and psychosocial supports provided to adolescents by caregivers. This may arise from lack awareness on the need for support by family to adolescents living with HIV and knowledge gap of unemployed care givers on HIV /AIDS and its treatment.

Disclosure of adolescents HIV status had various outcomes at the individual and interpersonal levels. At the same time, it occasionally strained adolescents' sexual relationships, although it did not always lead to rejection. Our finding highlights the importance of the disclosure status among adolescents was strongly associated with adherence status of the adolescents, adolescent who did not disclosed their HIV status were 5 times more likely to become non-adherent compared to adolescents who had disclosed their sero-status by themselves or by their caregivers. This finding of our study also has agreement with study conducted in south wollo and Aksum northern Ethiopia (16,41) and study conducted in Nepal southeast Asia (60) reported as not disclosing the HIV status had significantly associated with non-adherence. In support of our finding two studies conducted in Tanzania indicated that not disclosing HIV status has strongly associated with non-adherence to ART (28,61). In contrary to this study conducted at Tikur Anbessa Hospital Addis Ababa Ethiopia found that clients who were not aware of their HIV sero-status were more likely to adhere to ART (62). While study conduct in Harari Regional state eastern Ethiopia found as there was no association between disclosure status and adherence to ART (47) . The possible explanation for this finding might be as due to disclosure creates opportunities for adolescents to access adherence support and other forms of psychosocial support from family members, peers and health care providers.

Depression is common among adolescents living with HIV (ALHIV) worldwide, and has been associated with non-adherence to highly active anti-retroviral therapy (HAART), leading to poor virologic suppression, drug resistance. However, few studies have explored the relationship between depression and ART adherence among adolescents in Ethiopia. We found strong association between depression status and nonadherence as adolescents who have reported as having symptom of depression were 2.7 times likely to become non-adherent compared to adolescents without reported symptoms of depression. Different studies found that those patients considered as having depression have low ART medication adherence compared with patients not having the condition, studies conducted in different parts of Ethiopia in Diredawa and Harari town (45) and study conducted in Aksum town of northern Ethiopia reported as depressed clients have lower ART adherence (41). This finding also supported with other studies conducted in Rwanda and Uganda that reported as care givers reported depression status of the clients is associated with ART non-adherence (31,63).

This study also revealed that uses of memory aids were also found to be associated with non-adherence. Use of communication devices as reminder tools, for example alarms, pagers, text messages and telephone calls could improve adherence to ART. Adolescents not using memory aids/ reminder methods to take medication were 2.4 times more likely to become non adherent compared to adolescents using reminding methods. This finding has an agreement with prospective study conducted in Jimma University specialized hospital southwest Ethiopia and study conducted in Nekemte referral Hospital of western Ethiopia(48,64). One of the reasons for missing ART drug in our study was simply forgetting. About 31% of the adolescent who missed their medication was due forgetting thus, uses of memory aids help adolescents and care givers to remind the medication taking schedule take/give the drug at recommended time which might in turn foster good adherence.

Another important finding of current study is uses of other drugs besides ART; we found adolescents using other drugs besides ART were 2.6 times more likely to become non-adherent compared to adolescents who were only on ART drugs. The finding is comparable with study conducted in Kenya that reported use of additional drugs beside ART increase the likelihood of non-adherence among adolescents (53). Contrary to this study conducted in Addis Ababa revealed that as uses of additional drugs cotrimoxazole besides ART increases the adherence status (52). While study conducted in south wollo of

north eastern Ethiopia reported as there was no association between taking additional drugs besides ART and Adherence status (16). The possible explanation for this particular finding might be drug interaction between ART and other drugs, pill burden from non-ART and ART in combination and also the side effects both non ART and ART drugs on adolescents might lead to non-adherence among adolescents.

Finally unlike previous studies, socio-demographic factors such as sex, age did not show statistically significant associations with non-adherence of ART among adolescents. This might be due to difference in location and difference in socio economic characteristics of the study participants.

6.1. Limitation of the Study

Our study has the following limitations.

We used to measure adolescents adherence to ART by caregivers/ self-report, which may be subject to recall bias and social desirability bias that overestimate/underestimate adherence. Generalizability of our results may be limited to the selected health facilities of same setup, as our study participants were only those Adolescents on ART who received care during our study period. Despite these limitations, this study provided factors associated with non-adherence among HIV-infected adolescents in Ethiopia, our findings may have relevance for HIV-infected adolescents in other countries of sub-Saharan Africa.

7. CONCLUSION AND RECOMMENDATIONS

7.1. Conclusion

We found that, living with unmarried caregivers and being rural residents were associated with non-adherence to ART. Living with unemployed caregivers was found to be strongly associated with nonadherence to ART among adolescents from socio-demographic related factors. This study also demonstrates psychosocial related factors such as having symptom of depression, not disclosing HIV status and not using reminding methods were strongly associated with non-adherence among adolescents on ART. On the other hands uses of other drugs besides ART was found to be strongly associated with non- adherence to ART among adolescents from disease related factors.

7.2. Recommendation

The following recommendations are made on the basis of our study.

Health care providers

Support for adolescents regarding disclosure needs to be strongly encouraged by health care providers with consideration that ways to strengthen adherence among adolescents.

Health care providers need to ensure engagement, commitment of adolescents themselves when organizing sessions for adolescents on awareness raising and consider visit time adjustment for adolescents based on the out of school schedule for students.

Inclusion of family or friends needs to be encouraged by health care providers: - Indeed, support from peers and family can promote adolescents adherence, as it buffers the stress associated with the illness, encourages optimism, reduces depression, reminds time to take medication and improves healthful behaviors. Health education should be given for families and caregivers of the adolescents living with HIV as this may increase the awareness of the families and care givers that can increase their commitment towards monitoring of adolescents' adherence to HAART.

Uses of reminding methods such text messaging, alarms and unanswered call from peers, adherence supporters and family members needs to be encouraged by health care providers since this methods helps adolescents to remind their medication taking time.

Strategies to improve ART adherence must fully engage adolescents, and adolescent-centered care must involve strategies to help them better understand their conditions and treatments. These efforts also must support providers in effectively communicating the

importance of following treatment plans and early initiation of treatment after diagnosis and in providing medication support services to patients and caregivers. This also helps the health care providers' needs for additional treatment needed for clients, discussion on side effects of drugs and drug interaction with their clients.

District and zonal Health Offices

Preparation of safe, fun and adolescent-friendly environment that facilitate adolescents to be feeling comfortable, sharing their thoughts and wishes together and their health care provider.

Multi-sector partnership and coordination for peer support for adherence of adolescents in HIV treatment care and support is needed for implementation of the three 90's program and effective follow up in the better way that helps adolescents. It is important to strengthen collaboration between youth organizations and Health sectors for joint action targeting adolescents' people living with HIV for better outcome of adolescents on ART

Regional Health Bureau and stakeholders at regional level: Provision of training for health care provider focused on adolescent care specially those living with HIV and capacity building at all levels is needed in order to ensure data analysis that can able to track policy implementation and inform program planning.

Federal Ministry of Health: - Increase investment and attention to connecting Adolescents and families affected by HIV with essential services and community based support. This can be achieved by strengthening the capacities of community-based organizations and their relationship with local service providers.

The need for decentralization of services those are free and closer to home in the community to improve access to ART provision to reach adolescents those who were underserved due to lack of access to ART at their nearby health facilities in rural area.

Tools and materials that are used for adolescent must be provided to support health worker decision-making, minimize variations in service standards and ensure care that is non-judgmental and evidence based.

Finally, Defining the adherence status with nutritional functionality, viral load suppression, other comorbidities, drug interaction and identifying the treatment outcome of adolescents with non-adherence is recommended for future researcher to work on.

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Annex 2: Questionnaire

Jimma University

Institute of Health

Faculty of Public Health

Department of Epidemiology

Consent form for study participants

Welcome to this interview,

My name is _____. I am working here at this clinic. We are conducting an assessment about the health of people who are taking ART at Guji zone in different health facilities. We would very much appreciate your participation in this study. I would like to ask you about your health and associated matters regarding ART. This information will help Zonal Health department and other concerned bodies to plan better health services for adolescents like you. The questionnaire usually takes about 30-40 minutes. Whatever information you provide will be kept strictly confidential and will not be shown to other persons. Participation in this interview is entirely on voluntary basis and you can choose not to answer any individual questions or all of the questions. There is no payment that we are going to pay for you for your participation in this study. However, we hope that you will participate fully in this assessment since your views are important.

Again, I want to assure you that all of your responses will be confidential and it is meant only for research purpose. As it is known, people in the world have difficulties to take medications

always properly and on time. Though this is fact, even your Physician will not have access

to your responses on this interview. Please do not hesitate to ask any question that may not be unclear. *Are you willing to participate in the interview?*

If YES, continue the interview and if NO, thank and stop the interview here?

Interviewer who took the consent:

Name _____

Sign _____

Date _____

1. Patient study ID _____
2. Questionnaire ID number _____
3. Name of health facility _____

S.No	Questions	Response	Skip
Part one: Socio-demographic Characteristics			
Instruction: Fill the following question circle on number and fill the clients response on blank space			
101	Where is your address?	0. Town 1. 2. Rural	
102	How old are you?	In years _____	
103	What is Sex of the respondents?	0. Male 1. Female	
104	What is the marital status the caregiver?	0. Single 1. Married 2. Divorced 3. Widowed 4. Separated	
105	Are your families living together?	0. Both are alive 1. Father is dead 2. Mother is dead 3. Both are dead	
106	With whom did you live?	0. Live with family members 1. Live with other adult or children 2. Live alone 3. Other specify _____	
107	What is the educational status of caregiver?	0. I can't read and write 1. Read and write 2. _____ formal grade completed 3. High school graduate 4. Technical school training 5. College graduate(BSc/ BA) 6. Master degree and above	
108	What is your Occupational status?(for adolescent themselves)	0. Unemployed 1. Government employee 2. driver 3. Student 4. Daily laborer 5. Merchant 6. others, (specify) _____	

109	What is the occupational status of the caregiver	0. Unemployed 1. Government employee 2. driver 3. Student 4. Daily laborer 5. Merchant 6. others, (specify)_____	
110	What is your religion	0. Orthodox 1. Muslim 2. Protestant 3. Catholic 4. Others, specify ____	
111	What is your Ethnicity	0. Oromo 1. Amhara 2. Tigre 3. Sidama 4. Others, specify _____	
112	What is your family estimated monthly income?	_____ETB	
<p>Part Two: Adherence Questionnaire</p> <p>The answers you give on this form will be used to plan ways to help other people who must take pills on a difficult schedule. Please do the best you can to answer all the questions.</p> <p>Instruction: Please fill carefully the response and circle to appropriate number</p>			
201	Have you missed taking your medication over the last three days?	0. Yes 1. No	If no skip to <u>Q.203</u>
202	How many doses did you miss over last three days?	0. One 1. Two 2. three 3. more than three	
203	Did you miss taking any of your ART medications in the past 7 days?	0. Yes 1. No	If no skip to <u>Q. 205</u>
204	If yes to Q -203 how many dose did you miss over last seven days?	Write in number of doses missed_____	
205	Did you miss taking your ART medications in the past one month?	0. Yes 1. No	If no skip to <u>Q. 207</u>
206	If yes to Q- number 205 How many doses did you miss in last one month	_____in number	
207	How closely did you follow your specific schedule over the last seven days?	0. Once per day 1. Twice per day 2. Three time per day 3. Four time per day.	

208	How often did you take your medication within 2hours as prescribed to you by health care provider in past 3 (three) days?	0. Always 1. often 2. sometimes 3. rarely 4. I don't know	
209	How often did you take your medication within 2hours as prescribed to you by health care provider in past 7 (seven) days?	0. Always 1. often 2. sometimes 3. rarely 4. I don't know	
210	What were your reasons for missing any of your ART medications within the past 7 days ? (It is possible to give more than one response.)	0. Being away from home 1. being busy with other things 2. Simply forgot 3. Having too many pills to take 4. Wanted to avoid side effects 5. Do not want others to notice taking medication 6. A change in daily routine 7. Felt like the drug was harmful 8. felt sick or ill 9. Felt depressed 10. Ran out of pills 11. felt good 12. Lack of transportation 13. Shortage of food 14. Others, specify_____	Skip these Q. 210 for controls

Part Three: Health service related factors

Instruction: circle on the number holding the answer given by the respondent

301	What is Distance of health facility that providing you ARV medication from residence area?	_____Kilometers	
302	How long does it take on you to reach Health Facility?	_____hours	
303	What is your means of travelling to ART clinic?	0. On Foot 1. by motor bicycle 2. by Vehicle 3. others(specify_____)	
304	Does a health care provider give you information about taking your medications?	0. Yes 1. No	
305	Were you told the importance of taking the full course of treatment?	0. Yes 1. No	
306	How many pills did you take at one time?	In number_____	

307	Were you told about the side effects and interactions of these drug(s) given?	0. Yes 1. No	
308	Have you received any counseling during your treatment?	0. Yes 1. No	
309	Do you think counseling is useful for HIV patients on treatment?	0. Yes 1. No	
310	Was privacy maintained during consultation with the health professional?	0. Yes 1. No	
311	Does any of your ARV medication have special instructions from a clinician, such as “take with food” or “on an empty stomach” or “with plenty of fluids?”	0. Yes 1. No	If no skip to <i>part four</i>
312	How often did you follow those special instructions over the last seven days?	0. Never 1. Some of the time 2. About half of the time 3. Most of the time 4. All of the time	
Part Four: Psycho social factors.			
Instruction: This form asks about the psychosocial factors that the respondent give based on questions. Be genuine and respectful. Circle on the on each answer carefully.			
401	Have you disclosed your HIV status to your friends &/or family members?	0. Disclosed and have shared with someone 1. Disclosed, have not shared with anyone 2. Not disclosed	
402	Do you have a family/friend that supports taking your medications?	0. Yes 1. No	If no skip to Q. no 406
403	3. If yes, who was the person who supported you?	0. Spouse 1. Immediate member of family (Mother, Father, Sister/brother) 2. Health worker 3. Social Worker/Community Worker 4. Others (specify) _____	
404	How satisfied are you with the support you get from your friends and/or family members?	0. Very dissatisfied 1. Somewhat dissatisfied 2. neither dissatisfied nor satisfied	

		3. Somewhat satisfied Very satisfied	
405	How often do your friends and/or family members help you remember to take your medication?	0. Never 1. Sometimes 2. Most of the time 3. Always	
406	Do you use any method to remind taking your ARV medication?	0. Yes 1. No	If no skip to next part 4.1
407	If yes what method you use to remind you time?	0. Alarm 1. Messaging 2. Other (specify _____)	
4.1.perceptions towards ART			
instruction: Circle on the number based on responses of the respondent			
408	Do you think that ARV will have a positive effect on your health?	0. Yes 1. No	
409	What benefits have you gained from using ARV drugs?	0. Gained more weight/energy 1. No more frequent sickness 2. I feel well 3. Others _____	
410	Is there any one in your house hold taking ARV drugs like you?	0. Yes 1. No	
411	Did you have experienced any of your family/household deaths?	0. Nobody in my family has died 1. One or more people have died	
4.2.Depression Assessment Questionnaire			
Instructions: (Note to interviewer: Please use the below paragraph to introduce the scale to the participant, with further explanation if necessary) The following questions asks about how you've been affected by depression on taking your medication as prescribed			
412	Over the last 2 weeks how often have you been bothered by any of the following problem		
	A. little interest or pleasure in doing things	0. Not at all 1. Several days 2. More than half the days 3. Nearly every day	
	B. Feeling down, depressed or hopeless	0. Not at all 1. Several days 2. More than half the days 3. Nearly every day	
	C. Trouble falling/staying asleep, sleeping too much	0. Not at all 1. Several days 2. More than half the days 3. Nearly every day	
	D. Feeling tired having little energy	0. Not at all 1. Several days	

		2. More than half the days 3. Nearly every day	
	E. poor appetite or overeating	0. Not at all 1. Several days 2. More than half the days 3. Nearly every day	
	F. feeling bad about yourself or that you are failure or have let yourself or your family down	0. Not at all 1. Several days 2. More than half the days 3. Nearly every day	
	G. trouble concentrating on things such as reading, watching television	0. Not at all 1. Several days 2. More than half the days 3. Nearly every day	
	H. Moving or speaking slowly that other people could have noticed or the opposite; being so fidgety or restless that you have been moving around a lot more than usual.	0. Not at all 1. Several days 2. More than half the days 3. Nearly every day	
	I. Thoughts that you would be better off dead or of hurting yourself in some way	0. Not at all 1. Several days 2. More than half the days 3. Nearly every day	
4.3. The following question asks about stigma and discrimination. Read carefully and fill the response of the client			
414	In the last 12 months, have you experienced any of the following feelings because of your HIV status?	0. I feel ashamed 1. I feel guilty 2. I blame myself 3. I blame others 4. I have low self esteem 5. I feel I should be punished 6. I feel suicidal 7. Not experienced any of the	
415	Do you avoid your friends or relatives because of your illness?	0. Yes 1. No	
416	In the last 12 months, have you been aware of being gossiped about because of your HIV status?	0. Yes 1. No	
417	In the last 12 months, have you been excluded from social gatherings or activities?	0. Yes 1. No	

418	In the last 12 months, have you been denied health services, including dental care, because of your HIV status?	0. Yes 1. No	
4.4. The following questions ask about your alcohol and drug use, past and current. Instruction for interviewer :Circle on the number carefully			
419	Have you ever had a drink containing alcohol?	0. Yes 1. No	If no skip to Q-421
420	If yes, have you had a drink within the past 1 month?	0. Yes 1. No	
421	Have you ever smoked cigarette?	0. Yes 1. 2. No	If no Skip to Q-423
422	If yes, have you smoked within the past 1 month?	0. Yes 1. No	
423	Have you ever chewed „khat“?	0. Yes 1. No	If no skip to part: five(5)
424	If yes, have you chewed it within the past 1 month?	0. Yes 1. No	

The following questions are about clinical information of the client that can be taken from the ART registration from the initiation of ART to current. Carefully read and fill the question for each respondent from the registration.

Part Five : Information regarding the clinical information of the client from registration			
501	How long has it been since the client diagnosed with HIV infection?	_____years	
502	What was the clinical stage of the patient at the time of ART initiation?	0. Stage I 1. Stage II 2. Stage III 3. Stage IV 4. Unknown	
503	What was the baseline CD4 count at the time of ART initiation?	_____cells/mm ³	
504	What is the latest CD4 count after at least 6 months of treatment?	_____cells/mm ³	
505	How long have he/she been started on antiretroviral treatment?	_____years	
506	Did the client taking other drugs currently (besides anti-retroviral)?	0. Yes 1. No	If no skip to Q no. 508

507	If yes to Q-506 which of the following drugs is she/he taking?	0. Pain killers 1. Appetitive stimulants/vitamins 2. Sleeping pills 3. TB treatments 4. Antibiotics (other than f TB) 5. treatments for Fungal infection 6. Oral contraceptive pills 7. Others specify_____	
508	Which regimen she/he taking now?	0. First line ART regimen 1. Second line ART regimen	

Part 6: The following Only for health professional providing ART service at ART Clinic in respective health facilities (Fill only one for one health facilities)

601	How many health professionals are providing ART service at this clinic?	_____in numbers	
602	For how long they have served in this ART clinic?	_____in years	
603	Did they receive special training concerning ART service?	0.Yes 1.No	

----- **THANK YOU!** -----

UNIVARSITII JIMMAA INSTITIYUUTII FAYYAA FAAKALITII FAYYAA HAWAASAATTI DIPPAARTIMANTII IPPIDIMOLOJII

Guca walii galtee hirmaattota qorannoo

baga nagaan dhuftan!!

Maqaan koo _____ jedhama. Kanin hojjadhu asuma dhaabbata fayyaa kana keessa. nuti qorannoo waa'ee namootaa qoricha farra dhibee HIV/AIDS dhaabbilee fayyaa Godina Gujii keessatti argaman irratti gaggeessaa jirra. Ati/isanis gama keessaniin qorannoo kana keessatti hirmaachuu keessaniif galanni keenya guddaadha. Gaaffilee keenya kan irratti xiyyeeffatan qoricha farra HIV fi dhimmoota isaan wal qabataniidha. Ragaan isan amma nuuf kennitan kun dhabilee fayyaa sadarkaadhaan jiran fi dhaabbilee mit mootummaa kanneen dhimma kana irratti hojjatan fulduraaf karoora hundaa galeessa ta'e kan kenniinsa tajaajila fayyaa namoota akka keessaniif tolu akka kennan gargaara. Gaaffileen keenya daqiiqaa 30-40 fudhachuu dana'a. Gama biraatiin ragaan kamiyyuu kan isan asitti nuuf kennitan iccitiidhaan kaa'amu, dabarfamee qaama biraatiif hin kennamu. Asirratti hirmaannaan keessan fedhii keessan irratti kan hundaa'eedha yoo hirmaachuu hin feene deebii kennuu dhiisuu mirga qabdu. kaffaltiin qorqanno kana irratti waan hirmaattaniif isinnif kafalamu hin jiru. Haata'u malee ni hirmaattu jennee abdanna ilaalchi fi yaadni keessan qorannoo kanaaf barbaachisaa waan ta'eef.

Irra deebinee wanti nuti waadaa isanii seenuu dandeenyu ragaan isin asitti nuuf kennitan qaamaa lammaffaa kamiifuu dabarfamee(maaliif ogeessa fayyaa isin hordofu hin taane) hin kennamu, ragaan kun kan ooluuf dhimma qorannootiif qofa ta'uu isaati. Akkuma beekamu namoonni addunyaa keesaa jirru keessatti hanqina qoricha isaanii yeroo isaanii eeggatanii fudhachuu qabu. Kanaaf kun dhugaa ifa galaadha isinis gama keessaniin shakkii tokko malee akka qoranno kanarratii hirmaattan isiniin jechaa gaafiifi shakkii yoo qabaattan gaafachuu mirga qabdu.

Himaachuudhaaf qophii dhaa?

eeyyeen gaaffiin itti fufa ...

yoo miti ta'e galatoomaa jechuun gaggeessi!

Eenyummeessa hirmaataa _____

Eenyummeessa gaaffii _____

Maqaa dhaabbata fayyaa _____

Kutaa 1^{ffaa}: Gaaffilee dimograafii hawaasaa			
<i>Ajaja: lakkoofsa deebii hirmaataa qabate irra marsi/ bakka duwwaa jecha isaatiin guuti</i>			
lakk.	Gaaffii	Deebii	Utaali
101	Eessa jiraatta?	0. Baadiyyaa 1. Magaala	
102	Umriin kee hagam?	waggaadhaan _____	
103	Saala hirmaataa qorannichaa?	0. Dhiira 1. Dhalaa	
104	Haalli fuudha fi heeruma maatii kee hoo?	0. hin heerumne/fuune 1. heerume/fuudhe 2. hike jira 3. boqate/tte(widowed) 4. gargari bane	
105	Maatiin kee wajjiin jiraattuu?	0. lamaanuu jiru 1. abbaan koo boqateera 2. haadhi koo boqatte jirti 3. lamaanuu boqataniiru	
106	Eenyu wajjiin jiraatta?	0. maatii koo wajjiin 1. ga'eessa/daa'ima dhibii wajjiin 2. kophaa koo 3. kanaan addaa ibsi _____	
107	Sadarkaa barumsaa kee hoo?	0. dubissuf barreessuu hindanada'u 1. dubbisuuf barreessu nandanda'a 2. barumsa idilee kutaa _____ ^{ffaa} 3. safarkaa lammaffaa xumure 4. Leenjii teknikaa fixee(dippilooma) 5. Digrii jalqabaa 6. Digrii lammaffaafi isaa ol	
108	Haalli Hojii kee maali?	0. Hin qacaramne 1. Hojii mootummaa 2. Konkolaachisaa 3. Barataa/ttuu 4. Hojjataa humnaa(guyyaa) 5. Daldalaa 6. kan hin eeramne, ibsi _____	
109	Hojiin maal hojjatta(hirmaattotaa qaxaleeef)	0. Hin qacaramne 1. Hojii mootummaa 2. Konkolaachisaa 3. Barataa/ttuu 4. Hojjataa humnaa(guyyaa) 5. Daldalaa 6. kan hin eeramne, ibsi _____	

110	Amantaa kam hordoofa?	0. Orthodoxii 1. Muslima 2. Protestaantii 3. Kaatolikii 4. Hin eeramne, ibsi_____	
111	Sabummaan kee kami?	0. Oromoo 1. Amaara 2. Tigree 3. Sidama 4. Gede'oo 5. hin eeramne, ibsi_____	
112	Tilmaami galii maatii kee kan ji'aa hagam ta'a?	Qarshii Etiyoophiyaa_____	

Kutaa 2^{ffaa}: Gaaffilee qorichaatti madaquu

Deebiin isan asirratti deebifan namoota akka keessan haala ulfaataa keessa ta'anii qoricha fudhataniif furmaata akka barbaadamuuf karoora fulduraaf qaamni dhimmi ilaalu akka baafatuuf gargaara waan ta'eef maaloo gaaffilee kana karaa sirrii ta'een deebisuuf yaalaa.

Ajaja: lakkoofsa deebii hirmaataa ofirra qabu of eeggaannoodhaan irra marsi yknbakka duwwaa irratti jecha isaanii barreessi

Lakk.	Gaaffilee	Deebii	Utaali
201	Guyyoota sadan darban qoricha osoo hin fudhatin dhiiftee beektaa	0. eyyen 1. miti	miti gara lakk.203
202	Hamma fudhachuu maltu meeqa irra dabarte?	0. Tokko 1. lama 2. sadi 3. sadii oli	
203	Guyyoota turban darbaniif guyyaan qoricha kee osoo hin fudhatin kan sirra darbe ni jira?	0. Eeyyen 1. Miti	Miti gara lakk.205
204	Gaaffii 203'f eeyyen yoo ta'e marsaa hagam osoo hin fudhatin sirra darbe?	Lakkoofsaa barreessi_____	
205	Ji'a darbe kana keessa qoricha farra AIDS osoo hin fudhatin sirra dabree beekaa?	0. Eeyyen 1. Miti	Miti gara lakk.207
206	Gaaffii 205'f eeyyen yoo ta'e marsaa hagam osoo hin fudhatin sirra darbe?	Lakkoofsaa barreessi_____	
207	Guyyoota turban dabraniif qorichaa kee hangam takka hordofaa turte?	0. Guyyatti yeroo tokko 1. Guyyatti yeroo lama 2. Guyyatti yeroo sadi 3. Guyyatti yeroo afur	
208	Qoricha kee akkaataa siif ajajamee yeroo fudhachuu qabda jedhame sa'aatii lamaa keessti fudhachuu irratti guyyoota sadan darbaniif maal fakkaatta?	0. yeroo hundumaa 1. gara caalu yeroo kana keessatti fudha 2. darbee darbee yeroo nan dabarsa 3. yeroo hedduu sa'aatii isaa hin	

		eegu 4. hin beeku.	
209	Qoricha kee akkaataa siif ajajamee yeroo fudhachuu qabda jedhame sa'aatii lamaa keessti fudhachuu irratti guyyoota torban darbaniif maal fakkaatta?	0. yeroo hundumaa 1. gara caalu yeroo kana keessatti fudha 2. darbee darbee yeroo nan dabarsa 3. yeroo hedduu sa'aatii isaa hin eegu 4. hin beeku.	
210	Guyyota turban darbaniif Sababiin ati qoricha farra HIV kee osoo hin fudhatin irra darbiteef maali?	0. manarra fagaadhee waan tureef 1. hojiidhaaf yeroo waan natti dhiphateef 2. haaluma salphatti nan dagadha 3. qoricha biraa hedduu waan qabuuf 4. rakkina cinaa qorichaa hambisuu jedhee 5. namoonni biraa akka nah in argineef 6. haalli guyyaatti ittin fudhatamu waan jijjirameef 7. qorichi hamaa waan natti fakkateef 8. waan ana dhukkubeef 9. dhiphinni waan natti dhagahameef 10. Qorichi waan na jalaa dhumeef 11. fayyummaan waan natti dhagahameef 12. geejjiba waan dhabeef 13. Nyaata waan dhabeef 14. kan hin eeramne jira_____	

Kutaa 3^{ffaa}: Dhiibbaawwaan karaa kenninsa tajaajila fayyaatiin jiran ilaallata.

Ajaja: lakkofsa deebii hirmaataa ofirraa qabutti marsi ykn deebii isaanii bakka duwaa kenname irratti guuti

Lak.	Gaaffiilee	Deebii	Utaali
301	Dhaabbanni fayyaa tajaajila qorcha farra AIDS siif kennu hangam isiniraa fagaata?	_____kilomeetran	
302	Sa'aatii hagam deemtuu dhaabbata fayyaa kana gahuu dhaaf?	Sa'aatii _____	
303	Geejjiba bifa kamiin dhaabbaticha deemtu?	0. Miilaan 1. doqdoqqeedhaan 2. konkolaataadhaan(bajaj&car) 3. kan biraa, ibsi _____	
304	Ogeessonni fayyaa hubannoo qoricha fudhattan kana irratti isaniif kennuu?	0. Eeyyen 1. Miti	
305	Faayida qoricha kana guutuu isaa itti fufiinsaan fudhachuu isan gorsu?	0. Eeyyen 1. miti	
306	Yeroo tokkotti dawaa(kinina) meeqa	Lakkoofsaan_____	

	liqimsita?		
307	Rakkoo cinaa fi walitti bu'iinsa qorichi fudhattan qoricha biraa wajjiin qabu isnitti himamee beekaa?	0. Eeyyen 1. miti	
308	Yaala keessan irratti gorsa fudhattanii beektuu?	0. Eeyyen 1. miti	
309	Gorsi isaniif kenname kun namoota akka keessan dhukkubsatan kanneen biroof barbaachisaadha jettanii yaaddu?	0. Eeyyen 1. Miti	
310	Ogeessa fayyaa wajjiin yoo mari'aattan bakka icciitiin keessan isanii eegamutti?	0. Eeyyen 1. Miti	
311	Qoricha farra AIDS fudhattan keessaa ajaja addaa(gara duwwatti fudhachuufi kkf) kan fudhattan ni jira	0. Eeyyen 1. Miti	Miti gara kutaa4^{ffa}
312	Ajajoota addaa kanniin haala kamiin hordoftu?	0. gonkumaa hin hordofu 1. darbee darbee non hordofa 2. walakkaa isaa nan hordofa 3. yeroo baayyee nan hordofa 4. yeroo hundumaa nan hordofa	

Kutaa 4^{ffa}: Gaaffilee dhiibbaa xiinsammuu hawaasaan wal-qabatan

Ajaja: gaaffileen armaan gadii dhiibbaa xiinsammuu hawaasaatiin wal-qabatu waan ta'eef haala of eeggannoo qabuun lakkoofsa deebii qabate irratti marsi ykn bakka duwwaa irratti deebii isaanii guuti.

Lakk.	Gaaffilee	Deebii	Utaali
401	Haala dhukkuba keetii hiriyoota keef maatii keetti ibsitee jirtaa?	0. gamtokkee isaaniif ibsee jirra 1. ibsee jira garuu waliin hin hiranne 2. tasuma hin ibsineef	
402	Maatii ykn hiriyoota kee keesaa akka ati qoricha fudhattuuf kan si gargaaru ni jira?	0. Eeyyen 1. Miti	Miti gara lakk-406 utaali
403	Yoo gaaffii 402 "eeyyen" ta'e eenyutu si gargaara?	0. adaadaa koo 1. maatii keessaa nama tokko(abba, haadha, obboleessa, obboleettii fi kkf.) 2. ogeeyyii fayyaa 3. hojjattoota hawaasaa 4. kan hin eeramne, ibsi _____	
404	Deeggarsa maatiin kee siif irratti hangam takka itti quufiinsa qabda?	0. baayyee itti hin quufe 1. hanga takka itti hin quufe 2. itti hin quufne itti hin gaddine 3. hanga takka itti quufe 4. baayyee itti quufe	
405	Maatiin kee ykn hiriyootti kee hangam takka akka ati qoricha kee yaadattee fudhattu si taasisu	0. gonkumaa 1. darbee darbee 2. yeroo baayyee 3. yeroo hundumaa	

406	Qoricha farra AIDS kana akka yaadattee fudhattuf malli ati itti gargaaramtu ni jiraa?	0. Eeyyen 1. Miti	Miti gara kutaa 4.1 utaali
407	Gaaffii 406 “eeyyen” yoo ta’e mala kamiitti fayyadamta?	0. Alarmi 1. ergaa(SMS) nama biraa irraa 2. mala kan biraa, ibsi_____	

Kutaa 4.1: Gaaffileen armaan gadii ilaalcha qoricha farra AIDS irratti qaban gaafata.

Ajaja: deebii hirmaattotaa irratti hundaa’uun lakkoofsa deebii isaanii qabu irratti marsi

408	Qorichi farra HIV fudahttu kun fayyaa kee irratti dhiibba qaba jettee yaaddaa?	0. Eeyyen 1. Miti	
409	Faayidaan ati qoricha farra HIV fudhachuudhaan argatte maal fa’a?	0. ulfaatina qaamaa dabale 1. dhibee amma na qabuu dhiisee 2. fayyummaa natti dhagahama 3. kan biraa, ibsi_____	
410	Mana keessan keesan namni biraa kan qoricha farra HIV fudhatu ni jiraa?	0. Eeyyen 1. Miti	
411	Kanaan dura maatii keessan keessaa namni dhibee kanaan du’ee beekaa?	0. Eenyuyyuu maatii koo keessaa hin duune 1. nama tokko ykn isaa ol matii koo keessaa boqataniiru	

Kutaa 4.2 : Gaaffilee rakkoo dhiphinaa sammuu(depression) ittiin adda baasan

Gaaffileen armaan gadii hangam takka akka rakkinni dhiphina sammuu akka qoricha farra AIDS fudhachuu irratti dhiibbaa geessisu ittin beekuuf kan gargaaraniidha.

Ajaja: haala tasgabii qabuun deebii hirmaataa lakkoofsa qabu irratti marsi.

Lakk.	Gaaffii	Deebii	Utaali
412	Kanneen armaan gadii keessa torbee lamaan dabran kana keessa kan baayyee si yaachisan kam fa’i?		
	A. hojiidhaaf fedhii dhabuu	0. gonkumaa/tasumaa 1. guyyaa hedduu 2. walakkaa guyyota kanaa oli 3. guyyoota hundaa jechuu danda’a	
	B. Hamilee dhabuu, abdi murachuu fi dhiphachuu	0. gonkumaa/tasumaa 1. guyyaa hedduu 2. walakkaa guyyota kanaa oli 3. guyyoota hundaa jechuu danda’a	
	C. yeroo dheeraa hirribaan/ ciisichaan dabarsuu	0. gonkumaa/tasumaa 1. guyyaa hedduu 2. walakkaa guyyota kanaa oli 3. guyyoota hundaa jechuu danda’a	
	D. dadhabuu/humnaa dhabuu	0. gonkumaa/tasumaa 1. guyyaa hedduu	

		2. walakkaa guyyota kanaa oli 3. guyyoota hundaa jechuu danda'a	
	E. Fedhiin nyaataa gadi bu'uu/ baay'ee dabaluu	0. gonkumaa/tasumaa 1. guyyaa hedduu 2. walakkaa guyyota kanaa oli 3. guyyoota hundaa jechuu danda'a	
	F. ofii keef maatii kee kufaatiin isaan ga'eera jettee akka sababatti of fudhachuu.	0. gonkumaa/tasumaa 1. guyyaa hedduu 2. walakkaa guyyota kanaa oli 3. guyyoota hundaa jechuu danda'a	
	G. waan hojjatamu irratti xiyyeeffanoo dhabuu (fkn dubbisuu,TV daawwachuu)	0. gonkumaa/tasumaa 1. guyyaa hedduu 2. walakkaa guyyota kanaa oli 3. guyyoota hundaa jechuu danda'a	
	H. haala namoonni biraa nurraa hubachuu danda'anitti kophaa dubbachuu,asiif achi deemuu, boqonnaa dhabuu fi kan biro kan yeroo fayyaa qabanii oli	0. gonkumaa/tasumaa 1. guyyaa hedduu 2. walakkaa guyyota kanaa oli 3. guyyoota hundaa jechuu danda'a	
	I. miirri jiraachuu irraa du'uu ykn of miidhuu wayya jedhu qabaachuu	0. gonkumaa/tasumaa 1. guyyaa hedduu 2. walakkaa guyyota kanaa oli 3. guyyoota hundaa jechuu danda'a	

Part 4.3: gaaffiiwwan armaan gadii dhiibbaa loogii fi adda baasuun wal qabataniidha.

Ajaja: lakkoofsa deebii qabu irratti marsi

lakk	Gaaffiilee	Deebii	Utaali
414	Ji'oottan 12 dabran kana keessaa rakkooleen armaan gadii kunniin sitti dhagahamanii beekuu sababa ati HIV qabduuf	0. ofitti qaana'uu 1. akka badii uumetti natti dhagahama 2. ofi yakkuu 3. namoota biroo yakkuu 4. ofitti amanamumma koo gad bu'uu 5. adabamuu qaba jedhee amanuu 6. of ajjeessi waan jedhu natti dhagaamu	
415	Sababa dhukkuba kanaaf hiriyoota kee irraa ni fagaattaa?	0. Eeyyen 1. Miti	
416	Namoonni sababa HIV'n dhiiga keessa jiruuf ji'oota 12'n darban kana keessa waan kaasanii si hamatu?	0. Eeyyen 1. Miti	
417	Sababa HIV'n dhiiga kee keessa jiruuf ji'oota 12'n darban kana keessa bakka hawaasniwalitti qabaman irra	0. Eeyyen 1. Miti	

	haftee beektaa ?		
418	Sababa HIV'n dhiiga kee keessa jiruuf ji'oota 12'n darban kana keessa yaala fayyaa si didanii beekuu?	0. Eeyyen 1. Miti	
Part 4.4: gaaffiiwwan armaan gadii haala itti fayyadama alkoolii, qoricha seeraan alaa kan ammaaf yeroo durii gaafata.			
<i>Ajaja: deebii hirmaattotaa lakkoofsa qabu irratti marsi.</i>			
Lakk.	Gaaffii	Deebii	Utaali
419	Dhugaatii alkoolii qabu dhugdee beektaa?	0. eeyyen 1. miti	Miti lakk-421 utaali
420	Gaaffii 419'f "eeyyen" yoo ta'e ji'a darbe kana dhugdee beektaa?	0. eeyyen 1. miti	
421	Sigaaraa xuuxxee beektaa?	0. eeyyen 1. miti	Miti gara lakk-423
422	Gaaffii 421'f eeyyen yoo ta'e ji'a darbe kana keessa sigaaraaxuuxxee ni beektaa?	0. eeyyen 1. miti	
423	Jimaa/caatii ni qaamtee beektaa?	0. Eeyyen 1. Miti	Miti gara kutaa 5^{ffaa}
424	Gaaffii 423'f "eeyyen" yoo ta'e ji'a darbe kana keessa qaamtee beektaa?	0. Eeyyen 1. Miti	

Gaaffiiwwan armaan gadii ragaa yaalaa (clinical information) hirmaattota qorannichaa galmee mana yaalaa (ART registration book) irraa fudhatamuudha. ragaalee tokko tokkoo isaanii galmee ART irraa guuti

Kutaa 5^{ffaa} Ragaa yaalaa hirmaattota qorannichaa			
Lakk.	Gaaffiilee	Deebii	Utaali
501	Erga dhibeen HIV dhiiga keessatti argamee waggaa meeqa	waggaa _____	
502	Yeroo qoricha farra AIDS jalqabu sadarkaa WHO yaalaa kamirratti argama/ti	0. sadarkaa I 1. sadarkaa II 2. sadarkaa III 3. sadarkaa IV 4. hin beekamu	
503	Lakkofsi CD4 yeroo jalqaba qoricha eegaluu/tu ture meeqa	_____ cells/mm ³	
504	Lakkoofsi CD4 yeroo dhiyoo/ji'a jaha as hojjatame	_____ cells/mm ³	
505	Qoricha farra AIDS erga jalqabee waggaa meeqa?	Waggaa _____	
506	Qoricha gosa biraa kan farra AIDS'n ala fudhachaa jiraa/jirti?	0. Eeyyen 1. Miti	miti lakk. 508 utaali
507	Gaaffii 506 eeyyen yoo ta'e qorichoota kanneen keessaa isa kam?	0. kan dhukkubbii qaamaaf fudhatamu 1. fedhii nyaataa kan dabaluu	

		<ul style="list-style-type: none"> 2. kinina hirriibaa 3. yaala daranyoo sombaa(TB) 4. farra lubbootaa(Antibiotics) 5. yaala fangasii(Fungal treatment) 6. kinina karoorra maatii(OCP) 7. kan hineeramne, ibsi_____ 	
508	Ramaddii qorichaa kam fudhachuutti jira/jirti?	<ul style="list-style-type: none"> 0. Jalaqaba irratti kan kennaman(first line) 1. lammaaffaa irratti kan kennaman(second line) 	