Original Article

Factors Influencing Adherence to Antiretroviral Therapy (ART) among Adolescents Living with Human Immunodeficiency virus (HIV) in Rwanda

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Abstract

Background
HIV continues to be an important public health concern among adolescents. To reduce the high rate of mortality and improve the quality of life among people with HIV, WHO guidelines emphasize the early initiation of ART drugs in HIV-infected persons regardless of their CD4 count and clinical status. However, adherence to ART remains low in adolescents between 10 to 19 years from low and middle-income countries (LMICs).

Objective
To determine the factors influencing adherence to ART among adolescents with HIV in Rwanda.

Method
A cross-sectional design using proportional stratified random sampling to select 166 adolescents was conducted. Data were analyzed using descriptive and inferential statistics with a p-value <0.05 and a CI of 95%.

Results
The overall adherence to ARTs was 38%. Assistance of clinical staff in taking medication ($p<0.001$) and the help of parents in taking medication ($p<0.001$) positively influenced adherence to ART. Insufficient health care providers, forgetfulness ($p=0.009$), and dosage too complex ($p=0.044$) negatively influenced adherence to ART.

Conclusion
Factors such as someone reminding adolescents to take medication, non-stigmatization, and absence of side effects were positively associated with ART adherence. On the other hand, forgetfulness, complex dosage, being isolated and inadequate education about medications negatively affect adherence to ARTs. There is a need to set strategies to increase adherence to ARTs, including expert clients and trustable guardians in care provision. All adolescents should receive adequate counselling and health education before the initiation of ARTs.

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Keywords: Adherence, adolescents, antiretroviral therapy, and Rwanda

Background

Human immunodeficiency virus (HIV) continues to be an important public health problem. In 2020, globally, it was estimated that around 37.7 million people were living with HIV and the African region accounted for over 75%.[1] Sub-Saharan Africa remains on the top with 60% of the new daily cases, of which 31% are youths (18-24 years).[2] Despite the increase in HIV new infections, the HIV prevalence in Rwanda has been stabilized and maintained at 3% since 2005.[3] However, the prevalence of HIV infection among people aged 15-49 in Rwanda remains high at 2.6%.[4]

Accessibility to antiretroviral therapy (ART) was highly expanded worldwide and in sub-Saharan countries. The World Health Organization recommends that all people living with HIV start lifelong ART regardless of their CD4 cell count or clinical status. WHO also recommends the rapid initiation of ART to newly diagnosed individuals on the same day of being diagnosed positive.[1] By 2021, 82 LMICs adopted these recommendations. Adherence to ARTs improves the quality of life and reduces mortality. However, it was reported to be low in adolescents between 10 to 19 years of LMICs.[3] The non-adherence to ART among adolescents living with HIV is related to a low level of knowledge.[4] However, the main challenges to adhering to ART faced by adolescents have also been classified as individual (forgetting, being away from home, and a change to daily routine), interpersonal (relationship with partners, depression, alcohol/substance misuse), community-level (secrecy/stigma) and structural factors (health system use and engagement including health worker attitude or support group participation, access to services, distance to clinic and stock-outs).[5,6]

More than 95% of prescribed medication is recommended for optimal virologic suppression and to reduce the rate of treatment failure where virologic failure is linked with less than 95% of adherence rate.[7]

A study conducted in Rwanda revealed that only 45% of children, including adolescents, had a significantly higher adherence associated with a better understanding of combined ART. The same study found that the barriers to the adherence were; physical and emotional changes, stigma and school conditions.[8]From the quantitative analysis of a study that explored the factors influencing antiretroviral treatment sub-optimal adherence among prenatally HIV-infected adolescents in Thailand, 48.4% adolescents were considered to have suboptimal adherence if they showed one or more of the following criteria: self-reported missing doses in the past seven days, being rated by caregiver as having sub-optimal overall adherence, or having latest HIV-RNA viral load ≥1000 copies/ml.[9]

A study in Uganda revealed that feeling some improvement after the same drug period, alcohol consumption, being too ill to take medication, stigma and medication stock out were associated with poor adherence.[10] A survey conducted in Ethiopia reported that HIV-infected adolescents had low adherence to ART due to the marital and living status of the parents, whether the parents were on ART or not, and having special instructions on ART medications were associated with optimum adherence.[7]

Another study done in Rwanda focusing on how living conditions affect adherence to combination therapy in HIV-infected adolescents and showed that lack of privacy to keep and take medication came out as a significant barrier for adolescents living in congested households, as well as the institutionalization of boarding schools where privacy is almost non-existent.[8] Although some barriers to non-adherence to ART were identified in Rwanda, there remains a need to understand the relative importance of different factors influencing adherence to different target interventions and future research. Therefore, this study was conducted to determine the factors influencing adherence to ART among adolescents living with HIV in Rwanda.

Methods

Design

The study used a non-experimental cross-sectional design with a quantitative approach. This study was conducted between March and May 2019 at Ruhango district located in Southern Province in Rwanda. This district has two district hospitals and 15 health centers providing ART services to adolescents.

Study setting

The study was conducted at Gitwe district hospital and its catchment area and Ruhango Provincial Hospital and its catchment area. All these selected sites are located in the southern province, Ruhango District. The area was chosen because; there were some anecdotal reports about poor adherence to ART among HIV+ adolescents. The selected study sites were: Gitwe hospital, Gitwe health center (HC), Karambi, Munanira HC, Byimana HC, Muyunzwe HC, Muremure HC, Mwendo HC, Gishweru HC, Ruhango Provincial Hospital, Kinazi HC, Mukoma HC, Nyarurama HC, Mbyuye HC, Kigoma HC, Kizibere HC, and Ruhango HC.

Participants' recruitment

A total of 283 adolescents aged 10-19 years received ART with at least three months of follow-up in the two hospitals and 15 health centers in the Ruhango district. The participants were recruited using a proportionate stratified random sampling technique.

Inclusion and exclusion criteria

The inclusion criteria that were considered in this research were: being an adolescent of any gender living with HIV either acquired perinatally or not, having received antiretroviral therapy for at least 3 months, being aged between 10 and 19 years, being available in the period of data collection and accept to participate in the study, agree to sign the assent form, parent signed the consent form to participate in the study. The exclusion criteria in this study were: Not being capable of speech, not in good mental state, too ill to talk or write, not registered in the selected district hospitals' catchment area.

Sample size

The sample size was calculated based on the number of adolescents who attended the health facilities using Yamane's formula [11] as follows:

$$n = \frac{N}{1+N(e^2)}$$

Where n: is the sample size; N: is the total population, and e: is the marginal error set at 5%= 0.05. Therefore

$n = 283/1+283(0.05^2)$

Then, n= 166 adolescents

Measures

The data were collected using a self-administered questionnaire adopted from a study done by Musembi and Mbithi.[12] Permission to use the original questionnaire was sought and granted. The instrument was composed of two-parts, including demographic characteristics and factors influencing adherence to antiretroviral therapy. Part 1 included Socio-demographic characteristics: gender, age, education status. Part 2 included factors influencing adherence: client, medication, health care provider and institutional factors, extent the family members and health care providers help the adolescents to take medications. In the section on demographic characteristics, three questions out of six were adopted. In the section of factors influencing ART adherence, seven questions out of eight were adopted. The authors granted the permission to use and modify the tool to suit the context of Rwanda. Other questions for the second section about factors influencing adherence to ART were derived from further in-depth literature review.[13–16]

Validity and reliability of the data collection instrument

The validity of the research instrument was evaluated in terms of face and content validity. In this study, face validity was observed in two sections of the questionnaire. However, since face validity is the weakest measure, only content validity of the instrument was considered. In this study, the content validity was enhanced by using the adopted tool and other questions from in-depth literature review relating to factors influencing adherence to ART. After that, the questionnaire was sent to one HIV specialist and one experienced person in the provision of ART to the adolescents. The reliability was used to identify any inconsistencies seen in the research tool. The researcher administered this tool to 17 adolescents who were not part of the sample to evaluate its internal consistency. Each adolescent responded to the questionnaire in 2 week interval. All adolescents responded to the questionnaire in the same way and the consistency of the instrument was observed. The instrument was translated to Kinyarwanda, and a back translation was done to evaluate the tool's consistency. During data collection, the same tool was used for all participants. Moreover, the internal consistency of the instrument was generated, and the Cronbach's alpha coefficient was equal to 0.792. This means that the instrument was a reliable measure of all variables under study.

Data collection

Eligible adolescents were approached and invited to participate in the study at the health facility voluntarily. To find the participants, the researchers collaborated with the health care providers working in ART department to know specific days of appointment; these are the days when clients go to the health facilities to pick drugs. These days were targeted for data collection because it is when the clients were available at the health facilities. The purpose of the study and other related information were explained to the study participants before signing the assent and consent forms.

The identity of the study participants was kept firmly confidential, and the data was accessed by only authorized individuals who had to be given a key or password. The survey was available in Kinyarwanda or English, depending upon the participant's preference.

Data analysis

The data were coded, entered into SPSS (version 21) and analyzed using descriptive and inferential statistics. Descriptive statistics were used to calculate Frequencies. Inferential statistics were used to determine factors and their possible association with the adherence level to ART using Chi-square test at less than or equal to 0.05 level of significance. After that all variables that had a P value less than 0.2 were recruited to the multi-variable model. The final model was developed using a manual backward stepwise elimination of factors stopping when all remaining variables were significant at P value less than 0.05.

Ethical considerations

Approval was obtained from the University of Rwanda, College of Medicine and Health Science Institutional Review Board (Ref: CMHS/IRB/043/2019), Gitwe district hospital and health centers in its catchment area (No: 324/HOPG/2019 and Ruhango Provincial Hospital and health centers in its catchment area (No: 083/RPH/2019). Participants 18-19 signed the consent form themselves, and those under 18 years signed the assent forms and the parents or guardians signed the consent forms. The consent and assent forms and the completed questionnaires were locked in the cupboard, only accessible to the research team. The study participants were assured of anonymity and confidentiality of the information provided.

Results

This study assessed the factors influencing adherence to antiretroviral therapy among adolescents living with HIV in Rwanda. The response rate was high because out of 166 sampled adolescents, 166 (100%) completed the questionnaire.

Demographic Characteristics

Table 1 illustrates the socio-demographic characteristics of the study participants. Of the 166 participants, the majority were females (54%). More than half (51.8%) were aged between 10-14 years. Most of the participants (85.5%) were schooling, 5.7% of whom were in boarding schools. (Table 1)

Table 1 Distribution of participants according to social demographic data, n=166

Variables	Frequency	Percent
Age		
10-14 years old	86	51.8
15-18 years old	67	40.4
19 years old	13	7.8
Gender		
Male	77	46
Female	89	54
Adolescents who are studying		
Yes	142	85.5
No	24	14.5
Adolescents who are in boarding school (n=142)		
Yes	8	5.7
No	134	94.3

Factors influencing adherence to antiretroviral therapy

Table 2 illustrates factors influencing adherence to antiretroviral therapy

Client factors: the majority of adolescents (62%) stated that they see ART drugs as good and did not get many other illnesses when they took them consistently. These were followed by 77.1% who declared that they felt better whenever they took the drugs. The majority (62%) has missed some of the prescribed medication in the previous three months, and missing the medicine was due to forgetting among 60.8%; 35.5% stated that dosage schedules were too complex, and 34.3% reported bad side effects. Some reasons for not missing medications; was mentioned whereby 36.7% of the adolescents said that someone reminded them to take medication, while 28.3% asserted that there was non-stigmatization at home. The majority of adolescents experienced negative treatment by family members, mostly (51.2%) by stigmatization, followed by social support withdrawal by family members (40.4%), and the least, 6.0%, reported poor financial support.

Table 2. Adolescents' opinion about ART compared to other drugs and reasons for missing/ not missing to take medication, how they were treated negatively by family members (n=166).

Variables	Yes	No
	N (%)	N (%)
Adolescents' opinion about ART compared to other drugs		
They are good, I always feel better whenever I take them	128(77.1)	38(22.9)
I would rather go for prayers or takes herbs	6(3.6)	160(96.4)
I do not get any change whenever I take them	30(18.1)	136(81.9)
Since they do not cure the disease, there is no need of taking them	2(1.2)	164(98.8)
They are good; I do not get many other illnesses when I take them consistently	103(62)	63(38)
Reasons for missing medication		
Have you missed any prescribed medications	103(62)	63(38)
Forgetfulness	101(60.8)	65(39.2)
Bad side effects	57(34.3)	109(65.7)
Did not understand instruction	37(22.3)	129(77.7)
Felt better	19(11.4)	147(88.6)
The dosage schedule is too complex	59(35.5)	107(64.5)
My care giver was not around	2(1.2)	164(98.8)
I was at school	4(2.4)	162(97.6)

Table 2. Adolescents' opinion about ART compared to other drugs and reasons for missing/ not missing to take medication, how they were treated negatively by family members (n=166).

Variables	Yes	No
	N (%)	N (%)
Reasons for not missing to take medications		
Someone reminds me to take medication	61(36.7)	105(63.3)
Non stigmatization at home	47(28.3)	119(71.7)
I don't have any problem with these medications	52(31.3)	114(68.7)
I don't have any side effects on these medications	55(33.1)	111(66.9)
Have you ever been treated negatively by family members	102(61.4)	64(38.6)
The manner how the family members treated the adolescents negatively		
Social support was withdrawn by family members	67(40.4)	96(57.8)
Discriminated	16(9.6)	150(90.4)
Stigmatized	85(51.2)	80(48.5)
Isolated by family members	22(13.3)	144(86.7)
Poor financial support	10(6.0)	156(94.0)
The elements that affected taking regularly medications		
Judgmental attitude of the health care providers	73(44)	93(56)
Not given adequate health education about how medications should be taken	26(15.7)	140(84.3)
Delay in decision for taking the required specimens	55(33.1)	111(66.9)
Absence of the results of the collected specimens	111(66.9)	55(33.1)
Not given adequate information about the follow up	51(30.7)	115(69.3)
Have you ever been treated negatively by family members	102(61.4)	64(38.6)
How medications were taken in a day		
Once per day	72 (43.4)	94(56.6)
Twice per day	97(58.4)	69(41.6)
Quantity of pills taken in a day		
Below 5 pills per day	138 (83.1)	28(16.9)
Between 6-10 pills per day	26 (15.7)	140(84.3)
Between 11-15 pills per day	2(1.2)	164(98.8)

Medication factors

The majority of adolescents (56.6%) took drugs twice per day, most (83.1%) took below five pills per day, and a minority (1.2%) took between 11-15 pills per day. Most (65.7%) of the participants were reminded by staff to take drugs and a minority (1.8%) were not reminded by staff, while 80.1% were reminded by parent or guardian to take medication.

Health care provider factors

Over a half of adolescents (66.9%) reported that the absence of the results of the collected specimen affected regular taking of medication, 73(44%) were affected by the judgmental attitude of the health care providers, 30.7% by not being given adequate information about follow up.

Institutional factors

The significant elements that were hindering adolescents from taking medication appropriately; 58.4% of the respondents stated insufficient health care providers in the service, 47.6% reported that ART department was together with some other services in the same building, and then 38.6% were hindered by travelling a long distance to the health facility.

Association between factors influencing adherence and adherence level

Table 3 illustrates the association between factors influencing adherence and adherence level. There was a significant association between some of the client factors and adherence level, including missing of any prescribed drugs (p=0.013), forgetfulness (p=0.009), complex dosage (p=0.044), being reminded to take medication (p=0.001), non-stigmatization at home (p=0.046), not having any problem with the medications (p=0.031), being isolated by family members (p=0.012). Lack of side effects from the medications (p=0.064) was not statistically significant. There was also a significant association between medication factors and level of adherence; such as taking drugs twice a day (p=0.037), the extent to which the clinical staff helped the adolescents to take medication (p<0.001) and how much the parents/guardians assist the adolescents to take medication (p<0.001). Similarly, a significant association was observed between health care providers not providing health education about medication and the level of adherence (p=0.021). There was no significant association between institutional factors and the level of adherence. (Table 3)

Table 3. Association between client, medication, health care provider and institutional factors and level of adherence cross tabulation

Variable	Pearson Chi-square	df	p-value
Client factors			
Have you missed any prescribed medications	16.14	6	0.013
Forgot	17.03	6	0.009
The dosage schedule is too complex	12.75	6	0.044
Someone reminds me to take medication	21.86	6	0.001
I don't have any problem with these medications	13.85	6	0.031
Non stigmatization at home	12.85	6	0.046
Isolated by family members	16.30	6	0.012
Medication factors			
Twice per day	13.38	6	0.037
To what extent does the clinical staff help you to remember to take drugs	241.61	12	0.000
To what extent do your parents/guardians help you to remember to take drugs	245.25	12	0.000
Health care factors			
Not given adequate health education about how medications should be taken	14.90	6	0.021
Institutional factors			
Travelling long distance to the health facility.	3.14	6	0.791
Insufficient health care providers in the service of ART.	6.67	6	0.352
Drugs are always available in the clinic.	25.17	18	0.120
The health care clinic is easily accessible	13.61	18	0.754

Multiple regression analysis of factors associated with adherence level

Table 4 shows the factors influencing adherence to ART positively or good adherence, such as someone reminding the adolescent to take medication, non-stigmatization at home and absence of any problem with these medications were influencing good adherence. It also shows factors influencing adherence negatively or non-adherence like forgetfulness, complex dosage and being isolated by family members. (Table 4)

Table 4. Multiple logistic regression analysis of factors associated with adherence level

Variable	Direction to influence adherence	T	P-value	95% CI	
				Lower limit	Upper limit
Have you missed any prescribed medications in the last three months	-0.186	-0.513	0.609	-0.903	0.531
Forgot	-0.613	-1.764	0.080	-1.300	0.073
Dosage is too complex	-0.082	-0.477	0.634	-0.257	0.421
Someone reminds me to take medication	0.698	2.160	0.032	-1.336	-0.060
Non-stigmatization at home	0.133	0.516	0.606	-0.376	0.643
I don't have any problem with these medications	0.003	0.010	0.992	-0.625	0.618
Isolated by family members	-0.008	-0.035	0.972	-0.413	0.428
Not given adequate health education about how medications should be taken	-0.477	-2.426	0.016	-0.866	-0.089

Discussion

Demographic characteristics

This study was conducted to determine the factors influencing adherence to antiretroviral therapy among adolescents living with HIV in Rwanda. Regarding demographic characteristics, most of the study participants were females. The results corroborate with the study done in Uganda on factors affecting adherence to antiretroviral therapy at Kampala international University Teaching hospital, which showed that 159(62%) were females and 96(43%) were males.[10]

It is also similar to the study conducted in Arsi Zone, Oromia, on factors associated with non-adherence to antiretroviral therapy among patients with HIV/AIDS, which has shown that 167(54.6%) were females and 139(45.4%) were males.[16]

This female vulnerability compared to males is probably due to their structural, social and biological factors. Research conducted in Southern Africa revealed that adolescent girls are eight times more likely to contract HIV infection compared to males owing to different factors like engagement in age disparate or transactional relationships, few years of schooling, experience of food insecurity, experience of gender based violence, increased genital inflammation etc.[17]

Regarding the age of the study participants, the study revealed that they were between 10-14 years old and, followed by the participants who were between 15-18 years old, and only 7.8% were 19 years old.

Our finding is comparable to the study done on mental health and antiretroviral adherence among youth living with HIV in Rwanda where the 47% were between 10-13 years old, and 53% were between 14-17 years old.[18] This is probably because this age group is characterized by an increased scope of feelings and increased importance of peer group values and risk-taking behaviours.

Finally, the study revealed that most adolescents were still studying while a low number (14.5%) were not going to school. These contrast to the findings of the study conducted in Rwanda, which showed that 31% did not attend school, 44% were still in school, and 25% had finished their studies. [18] This is also different from the study done in Nepal on factors influencing adherence to antiretroviral treatment, which has revealed that 127(38.5%) of the respondents did not attend school and 203(61.5%) were studying. [19] This difference could be explained by the fact that these studies were done in different study settings.

Factors influencing adherence to antiretroviral therapy

First, the assessment of client factors revealed that adolescents considered ART drugs as good and do not get many other illnesses when they take them, while over half stated that they felt better whenever they took ART drugs. This is similar to the study conducted in Ethiopia, which revealed that 281(80.1%) of the respondents were comfortable taking ART while 42(11.9%) were not.[20]

There are several reasons for not missing taking medications, where adolescents in this study reported that some people reminded them to take medication, and others declared non-stigmatization at home. This is supported by the survey done in southern Uganda which showed that strengthening family relationships and promoting social support within families caring for adolescents who have HIV can be important in addressing ART challenges among adolescents in sub-Saharan Africa. [21]

The respondents in this study revealed that adolescents had missed some of the prescribed medications in the last three months because of forgetfulness; dosage schedules too complex, bad side effects, inattention to the instructions, social support withdrawn by a family member and poor financial support. These results are similar to the study conducted in Northwest Ethiopia that has shown reasons for missing medications to be forgetfulness 44(52.3%) and caregivers' fear of giving drugs 12 (14.3%),[22] and due to traveling 18.9%.[12,23]

Negative treatment by family members has been identified as among the negative factors, whereby 61.4% had ever been treated negatively by family members. Among the adolescents who had experienced bad treatment by family members, this survey discovered that the major reason (83.3%) was stigmatization, social support withdrawal by a family member (65.6%), discrimination (15.6%) and poor financial support (9.8%).

Our study shows that there was no significant association between adherence level and discrimination (p=0.487), bad side effects (p=0.115) and poor financial support (p=0.551). These results are contrary to the findings from the survey conducted in Zambia, which demonstrated that stigma, forgetfulness, ART side effects and lack of assistance were affecting adherence.[24]

This is in contrast to the survey done in sub-Saharan Africa, which has demonstrated that there was a significant positive association between some factors and adherence to ART; including poor financial support (OR=3.36; 95% CI 2.22-5.93), discrimination (OR=2.88; 95% CI 1.31-3.87), and side effects (OR= 2.20; 95% CI 1.58-3.07).[25] This is also different from the study done in Malawi, where multivariable analysis showed that the variables significantly associated with suboptimal adherence to ART were forgetfulness (90%, p=0 .001),

and being busy performing other issues (11%, p=0.001).[14,26]

Medication factors were surveyed and it was found that the majority of adolescents took drugs twice a day whereas 43.4% received them once a day; the majority took below five pills per day, and the minority of adolescents were taking drugs between 11-15 pills per day. This is similar to the study done in Kenya which revealed that 74 (87%) of the respondents reported to take below 5 pills per day, while 9 (11.1%) mentioned taking between 6-10 pills a day and 99% of those participants stated taking their ART twice a day with less than 5 pills.[15] Frequency of taking medication was among the challenges where this survey revealed a significant positive association between adherence level and frequency of taking drugs twice a day (p=0.037). These results are similar to the findings from the survey performed in Eastern Ethiopia, which has shown that 86.5% of the participants were taking <5 pills per day.[12]

This study also revealed that there was a significant association between adherence level and the extent guard/parents helped the adolescent to take medication. Likewise, there was a significant association between adherence level and extent to the clinic staff helped these adolescents to take medications. This is contrary to what was revealed in the study done in Malawi, which showed no significant association between adherence to ART and the level to the friends and family help to remind to take medication among adolescents.[14] However, our study findings corroborate results from a study done in South Africa, which demonstrated that patients who use reminders to take drugs were more likely to experience better adherence compared to those who didn't use any reminders, and clients that used memory aids were three times more likely to adhere to the medication than the ones who were not using any aids.[16] Further confirmation of the results of our study is the report from a research done in Nigeria which has shown that support from friends and the family was significantly associated with treatment adherence.[18]

The role of health care providers in influencing adherence to ART drugs is significant in that the absence of the results of the collected specimen after taking regular medication was not encouraging the adolescents to adhere to drug taking schedule. In addition, 44% were affected by the judgmental attitude of the health care providers, 30.7% by not being given adequate information about follow up. This result was supported by the study done in Kenya which has shown that non-judgmental attitude of health care providers contribute to better adherence to ART.[27]

Health care providers can contribute to the ART drugs adherence by giving proper health education. This study showed a significant association between the level of adherence and not being given health education about medication (p=0.021). This is contrary to the survey conducted in Uganda, where the participants reported that the facilitators of adherence were counselling, supportive health care workers and provision of adequate information on the prescribed medication.[19]

Finally, our study reported institutional factors that affect taking medication appropriately as follows: insufficient health care providers in the service, ART department being together with some other services in the same building and then long travel distance to the health facility. These results are similar to the findings shown in the study conducted in Malawi in which the stated barriers to adherence to ART, include long distance to travel from home to the clinic.[26,28]

In the view of participants about drug availability, this survey revealed that half of the participants agree that drugs are always available in the clinic and comprehensive care clinic is easily accessible. This study revealed no significant association between

adherence level and accessibility of ART in the health facilities. This is similar to the study done in South Africa, which showed no significant association between level of adherence and some institutional factors where drug availability (p=0.07) and reported that the poor adherence was related to the long-distance where the clients had to travel to the health facility.[27,29] This is in contrast to the study showed that adherence was negatively affected by stock outs.[5]

Conclusion

This study revealed that the following factors were positively associated with ART adherence: someone reminds the adolescents to take medication, non-stigmatization at home, absence of any problem with medications and the extent to which the clinical staff and guardians/ parents reminded the adolescents to take medication. It also showed some of the factors that negatively affected adherence to ART were forgetfulness, complex dosage, being isolated by family members and not being given adequate health education about how medications should be taken. There is a need for planners and implementers of ART separate HIV/AIDS services from other public services and put them in private spaces. More research on reducing drug dosage complexity by manufacturers is needed. Health care providers need to improve counselling at the initiation of ART and during follow-up at the hospital and home visits, where counselling should emphasize the nature of HIV disease, characteristics of ART, advantages of taking medication as prescribed, and consequences of poor adherence to ART. Extensive health education about taking ART and its effects related to poor adherence should be strengthened. Health care professionals should recognize the need for encouraging adolescents to visit health care facilities if they have problems. Strategic interventions such as toll-free telephone numbers should be distributed, and health care providers should be readily prepared to address the needs of adolescents.

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Conflict of interest: None

Authors' contributions
EH contributed to the original study, data collection, analysis and manuscript writing, S N, I N & JM contributed to the proposal development and draft of the manuscript, G K, A N, and MM contributed to the research proposal development, data analysis, discussion and writing of the manuscript.

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