



Predictors of Adherence to Highly Active Antiretroviral Therapy among HIV Patients attending Selected Comprehensive Care Centres in Kericho County, Kenya

Dennis Magu¹, Collins Cheruiyot¹ and Eunice Chelogoi^{2*}

1. Department of Environmental Health and Disease Control, School of Public Health, College of Health Sciences, Jomo Kenyatta University of Agriculture and Technology, P.O Box 62000-00200, Nairobi.
2. Department of Clinical Medicine, School of Medicine, College of Health Sciences, Jomo Kenyatta University of Agriculture and Technology, P.O Box 62000-00200, Nairobi.

***Corresponding author:** Ms. Eunice Chelogoi, Jomo Kenyatta University of Agriculture and Technology, P.O. Box 62000-00200, Nairobi, Kenya. Email: echelogoi@jkuat.ac.ke

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Summary

BACKGROUND

Highly Active Antiretroviral Therapy (HAART) is undoubtedly the only proven remedy known to improve the health outcomes and reduce AIDS-related mortality. However, just like other chronic diseases, HIV presents significant challenges in achieving and maintaining adherence to medication. The effectiveness of HAART solely depends on adherence. For maximum medication benefits, a near-perfect adherence levels of >95% is required yet data from different studies indicate that few, if any patients have achieved perfect adherence. The main objective of the study was to determine predictors of adherence to Highly Active Antiretroviral Therapy among HIV patients attending selected comprehensive care centres in Kericho County.

MATERIALS AND METHODS

A descriptive cross-sectional study was adopted, involving 280 HIV patients (≥ 15 years) on HAART from three selected Comprehensive Care Centres in Kericho County, Kenya. Quantitative and qualitative data were collected using interviewer administered semi-structured questionnaires and key informant interviews, respectively. Purposive sampling was used to select the three health facilities while systematic sampling was used for participant selection. Adherence was measured using viral load. Data was analyzed using SPSS version 25. Logistic regression analysis was used to determine the association between adherence to HAART and various independent variables. Results were considered to be significant at $p < 0.05$.

RESULTS AND CONCLUSION

Seventy six percent (76%) of the respondents had optimal adherence while 24% had sub-optimal adherence. More females than males were on treatment. Use of HAART alternatives was a risk factor for sub-optimal adherence ($p=0.011$).

Having someone/tool to remind of when to take medication and disclosure of HIV positive status to spouse were found to significantly promote adherence to HAART with $p=0.034$ and $p=0.048$, respectively.



RECOMMENDATIONS

Several studies have been done on the socio-demographic and socio-economic factors associated with adherence to HAART. Findings from this study indicate that attitudes and practices towards HAART have significant effects on adherence hence more research should be done on attitudes and practice aspects of adherence.

Keywords: Adherence, Highly Active Antiretroviral Therapy (HAART), Human Immunodeficiency Virus.

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Introduction

Apart from HAART, there are no other proven remedies to combat HIV/AIDS. However, for an individual to benefit fully from HAART medication, a near perfect ($\geq 95\%$) adherence is required. Findings from different studies indicate that few patients manage to achieve the near perfect adherence levels. Jacob *et al.*, (2017) reported that adherence to HAART is still unsatisfactory and it ranges between 27% and 80% across diverse populations and sub-populations in different studies as compared with the stipulated near perfect adherence level of 95%. They further noted that Sub-optimal adherence to antiretroviral therapy is a multi-factorial and dynamic process hence it causes significant challenges for long-term follow-up. The available solutions to this problem are intricate. According to a UNAIDS report (2019), Sub-optimal adherence to HAART is one of the impediments in achieving the 95-95-95 target.

Adherence to HAART is an important concept in the treatment of HIV. Its significance has been emphasized by its incorporation in the “HIV care continuum” a framework that models the dynamic stages of HIV care. The continuum is made up of five stages; HIV Diagnosis, Linkage to care, Retention in care, Adherence to HAART and Viral suppression (Kay *et al.*, 2016).

Global statistics estimate that approximately 36.7 million people are presently living with HIV and Sub Saharan Africa (SSA) contributes 52% of this burden. SSA has had a

remarkable increase in the number of PLHIV on antiretroviral therapy from 758, 000 people in 2005 to 15.4 million in 2017(WHO, 2018).

According to National AIDS and STI Control Programme (NAS COP), Preliminary KENPHIA report (2018), the HIV prevalence in Kenya is 4.9% with 1.3 million people (15-64 years) living with HIV/AIDS. The prevalence of HIV is high among women (6.6%) as compared to men (3.1%). In respect to the joint United Nations Programme on HIV/AIDS (UNAIDS) 95-95-95 targets for ending the AIDS epidemic, Kenya is at 79.5-96-90. From the above, it is evident that only the second 95 in the 95-95-95 target that has been achieved.

When there is a high adherence rate above 95%, there is a resultant viral suppression rate of approximately 78%. However, a reduction in adherence rate to 80% results in an intense drop in the rate of viral suppression and it can drop as low as 20% (Yang *et al.*, 2018). HIV patients who adhere correctly to treatment regimens are reported have approximately similar survival rates as compared to uninfected patients (Bhaskaran *et al.*, 2008; Wing, 2016). However, HAART is a complex regimen and it requires a patient to stick strictly to the prescribed dosing schedules and the numerous medications (Muhammed *et al.*, 2010).

Sub-optimal adherence to HAART has proved to be a major barrier in the treatment and management of HIV/AIDS.



Independent Variables

Attitude and Practices

- Use of other alternatives of HAART
- Patients feeling about their privacy and confidentiality
- Reminder of when to take medication
- Forgetfulness
- Fitting medication into daily routine
- Alcohol consumption
- Spouse awareness of partner's HIV status

Dependent Variables

Optimal Adherence to HAART
Sub-optimal Adherence to HAART

Figure 1: Conceptual Framework - Modified from Joubert & Ehrlich (2007)

Sub-optimal adherence is multifactorial and the causes may be related to treatment regimens, patient or the health system. Majority of patients do not achieve maximum medication benefits as a result of sub-optimal adherence. HIV treatment outcomes are critically dependent on optimal adherence to HAART. Findings from studies have shown that HAART is effective in reducing HIV viral load, minimizing the emergence of drug resistance, improving immune function, improving health outcomes and delaying the advancement of HIV to AIDS.

Materials and Methods

Study site

This study was conducted in three selected Comprehensive Care Centres (CCC) in Kericho County; Kericho Referral Hospital,

Londiani Sub-County Hospital and Litein mission Hospital.

Study design

A descriptive cross-sectional study design was used to establish the predictors of adherence to Highly Active Antiretroviral Therapy among HIV patients attending selected Comprehensive Care Centres in Kericho County.

This study was done between August and September 2019. Interviewer administered questionnaires were used to collect quantitative information from the respondents while Key Informant Interviews were used to collect qualitative information from the healthcare providers.



Table 1: Sample Size for Each Facility

Comprehensive Care Centre	Total population of patients on HAART(≥15 years)	Proportionate number in sample size
Kericho Referral Hospital	5000	5000/6800*280=206
Londiani Sub-County hospital	700	700/ 6800*280=29
Litein mission hospital	1100	1100/ 6800*280=45
Total	6800	280

Table 2: Sampling Interval for Each facility

Comprehensive Care Centre	Average number of patients Served in one month	Average number of patients served in two months	Sampling interval
Kericho Referral Hospital	1200	2400	2400/206= 12
Londiani Sub-County hospital	180	360	360/27=14
Litein mission hospital	240	480	480/45=11
Total	1620	3240	

Population and sampling

The required sample size was determined using Fisher’s method (Fisher *et al*, 1991) with a 95% confidence interval and a 5% sampling error.

$$n = \frac{z_{\alpha}^2 p(1 - p)}{d^2}$$

n=sample size

Z= statistic for a level of confidence at 95% which gives a value of 1.96

P= 24% which is the proportion of HIV patients on HAART not reaching optimal levels of adherence (Amberbir *et al.*, 2008)

D= precision with 95% confidence interval which gives a margin of error of ±0.05

Therefore, the minimum sample size was,

$$n = \frac{1.96^2 \cdot 0.24(1-0.24)}{0.05^2} = 280$$

The target population for this study were HIV patients (≥15 years) on HAART attending comprehensive care centres in Kericho Referral Hospital, Londiani Sub-County Hospital and Litein mission Hospital. The respondents had

been on HAART for at least twelve months, had no history of drug resistance in the preceding 12 months, had at least 2 viral load measurement after starting HAART and consented to participate in the study.

The three facilities were selected purposively basing on their geographical location within the county. The estimated population of PLWHAs (≥15 years of age) was 6800. The number of respondents picked from each facility was determined according to probability proportionate to size as shown in table 1.

Systematic sampling was used to recruit respondents from the selected facilities. Data was collected for a period of two months as per the work plan. The sampling interval for each facility was calculated separately as described in table 2.

Sampling was done in each facility using the intervals shown in the table above. The first respondent to be interviewed was picked randomly between the first and the Kth. If the Kth



respondent did not consent, the next respondent was picked. The second, third to the last respondents were picked after the calculated K^{th} interval for each facility.

Data collection

Quantitative data was collected from the patients using interviewer administered semi-structured questionnaires while qualitative data was collected through key informant interviews with healthcare providers involved in HIV care at the selected facilities. The principal investigator held face to face interviews with the respondents.

Ethical considerations

This study was conducted upon ethical approval by Kenyatta National Hospital-University of Nairobi-Ethical Review Committee (KNH-UON ERC). A research permit was obtained from the National Commission for Science, Technology and Innovation (NACOSTI). Additional approval for data collection was sought from Kericho County Health department. Written informed consent was also obtained from the respondents before collecting the data.

Data entry and analysis

The data collected was sorted, coded and entered Statistical Package for Social Sciences (SPSS) version 25.0. Analysis was done through descriptive and inferential statistics. Descriptive statistics; frequencies and percentages was used to summarize the data set. Logistic regression analysis was used to determine the association between adherence to HAART and various independent variables.

First, Univariate logistic regression analysis was done to explore the various variables associated with adherence to HAART. The P -value was set at 0.05 significance level and any variable whose P -value was less than 0.05 were deemed statistically significant. The

variables that were deemed to be significant at the Univariate level were transferred to the multivariate analysis to control possible confounders. The P -value was set at 0.05. Any variable whose P -value was less than 0.05 were deemed statistically significant.

Results

Majority of the respondents, 75.86% were from Kericho, 14.18% were from Litein and 9.96% from Londiani. Most, 63.22% were Female and 36.78% were male.

More than half of the respondents, 146(53.99%) were worried about the privacy and confidentiality of their HIV status. On disclosure of their HIV status to other people, 199(76.25%) felt that it was not good to disclose while 62(23.75%) had no problem with disclosing their HIV status (Table 3).

Nearly all, 90(34.48%) felt that people will never want to be associated with them in case they know of their HIV status, 82(31.42%) felt that they will be discriminated while a minority, 30(11.49%) felt that they will be supported and encouraged (Table 3).

Majority, 144(55.17%) had someone/tool that reminded them of when to take medication. On fitting medication into daily routine, 172(65.90%) had no difficulty while 89(34.10%) had difficulty fitting medication into daily routine (Table 3). On alcohol consumption, 209(80.08%) had never consumed while 59(22.61%) had consumed alcohol in the last four weeks preceding the survey.

Many, 22 consumed more 10 than bottles per week. Majority, 237(90.80%) had never used any alternatives of HAART while 24(9.20%) had ever used other alternatives in place of HAART. Almost all of the respondents 259(99.23%) carried emergency doses of their HIV medication while away from home (Table 3).



Table 3: Distribution of Respondents According to Attitudes, Practices and Adherence to HAART.

Variable	Frequency	Percent (%)	Optimal Adherence N(%)	Sub-optimal adherence N(%)
Kericho Referral Hospital	198	75.86	148	50
Litein Mission Hospital	37	14.18	28	8
Londiani Sub-County Hospital	26	9.96	21	5
Gender				
Female	166	62.45	111(66.89)	55(33.13)
Male	95	37.55	65(68.42)	30(31.58)
Are you worried about the privacy and confidentiality of your HIV status?				
Yes	146	55.94	93(63.70)	53(36.30)
No	115	44.06	83(72.17)	32(27.83)
Is it good to disclosure of HIV status to other people?				
Yes	62	23.75	50	12
No	199	76.25	126	73
How will people treat you if they know your HIV status?				
They will treat me the same	59	22.61	48(81.36)	11(18.64)
They will discriminate me	82	31.42	60(73.17)	22(26.83)
They will be supportive and encouraging	30	11.49	28(93.33)	2(6.67)
They will never want to be associated with me	90	34.48	62(68.89)	28(31.11)
Do you have someone/tool that reminds you of when to take your medication?				
Yes	144	55.17	89(61.81)	55(38.19)
No	117	44.83	87(74.36)	30(25.57)
Are you worried about the privacy and confidentiality of your HIV status?				
Yes	146	55.94	93(63.70)	53(36.30)
No	115	44.06	83(72.17)	32(27.83)
Do you find it difficult to fit medication to daily routine?				
YES	89	34.10	45(50.56)	44(49.44)
NO	172	65.90	131(76.16)	41(23.84)
Do you carry emergency dose of HIV drugs while away from home?				
YES	259	99.23	190(73.35)	69(26.25)
NO	2	0.77	0(0.00)	2(100.00)
Are you worried about the privacy and confidentiality of your HIV status?				
YES	146	55.94	93(63.70)	53(36.30)
NO	115	44.06	83(72.17)	32(27.83)
Do you think there are better alternatives of HAART?				
NO	237	90.8	155(65.40)	82(34.60)
YES	24	9.2	11(45.83)	13(54.17)
Which alternative medicine do you use				
Herbal/traditional medicine	6	24	2	4
Supplements	3	12.5	3	0
Prayers	15	62.5	6	9
Have you ever consumed alcohol?				
NO	209	80.08	135(64.59)	72(35.41)
YES	52	19.92	30(57.69)	22(42.31)
How much alcohol do you take				
Between 1-3 bottles @week	4		4(100.00)	0(0.00)
Between 4-6 bottles @week	10		8(80.00)	2(20.00)
Between 7-9 bottles @week	16		8(50.00)	8(50.00)
More than 10 bottles @week	22		10(45.45)	12(54.55)

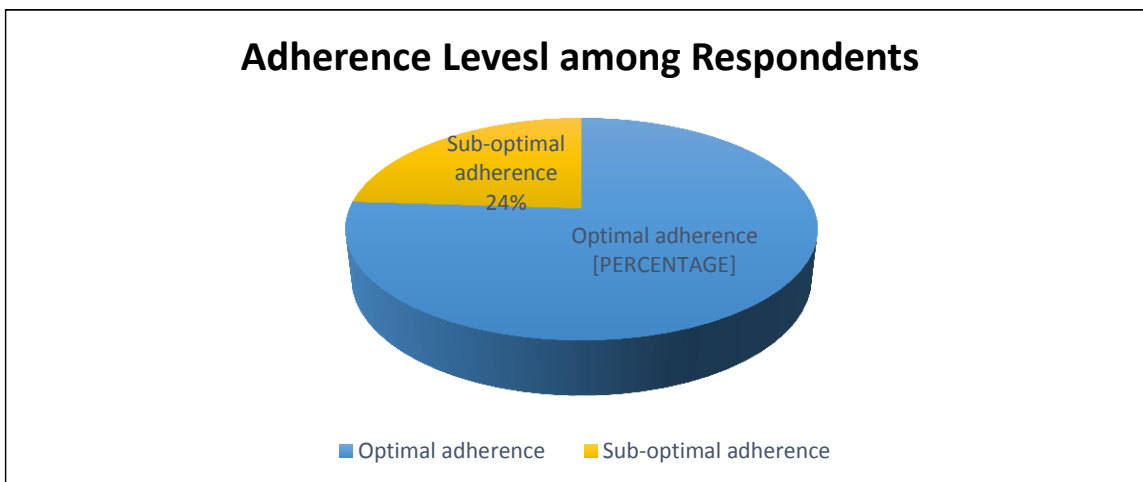


Figure 1: Adherence Status among the Respondents

The level of optimal adherence was 76% of the study participants while 24% had sub-optimal adherence (Figure 1). Use of alternative drugs to HAART were found to be risk factors to suboptimal adherence (Table 4)

Having someone/tool to remind of when to take medication and use of HAART alternatives were significantly associated with adherence (Table 3). However, after adjusting for confounder at the multivariate level $P=0.05$, use of HAART alternatives ($p=0.011$) and having someone/reminder tool ($p=0.034$) had significant association with adherence HAART.

Themes from Key Informant Interviews (KII)

Regarding alcohol consumption, a nurse at Kericho County referral noted:

“In the recent past, we had cases of patients who could not strictly adhere to the medication schedule due to indulgence in alcohol which resulted in them being forgetful. However, after follow-up, adherence monitoring and subsequent counselling, the problems were resolved”.

Table 4: Showing Univariate Association between Attitudes and Practices and Adherence to HAART

Attitude and practice	Odds Ratio	Std. Err.	Z	P>z	[95% Conf.]	Interval]
Use of other alternatives of HAART	0.371	0.161	-2.280	0.022	0.159	0.869
Privacy and confidentiality	0.677	0.183	-1.450	0.148	0.399	1.149
Tool/someone to remind	0.558	0.152	-2.140	0.032	0.327	0.952
Fitting medication to daily routine	0.320	0.089	-4.110	0.000	0.186	0.551
Carrying emergency dose of HIV drugs while away from home	0.223	0.1881	-1.780	0.045	0.043	1.166
Alcohol Consumption	0.745	0.232	-0.950	0.345	0.404	1.373



Table 5: Showing Multivariate Association between Attitudes and Practices and Adherence to HAART

Adherence	Odds Ratio	Std. Err.	Z	P>z	[95% Conf. Interval]
Use of HAART alternatives	0.275	0.140	-2.54	0.011	0.101 0.745
Having someone/tool to remind of when to take medication	0.466	0.168	-2.12	0.034	0.230 0.975

*Statistically significant at level $p < 0.05$

A clinical officer at the Kericho County referral hospital spoke this concerning participants having someone to remind of when to take medication/reminder tool:

“Forgetfulness has been a risk factor for sub-optimal adherence. We have encouraged our patients to have someone/ tool (mobile phone alarm) to remind them of when to take medication. Through reminder tools, we have reduced cases of forgetfulness to take medication to almost nil.”

Discussion

Use of HAART alternatives

Among the respondents, majority (90.8%) believed that there were no better alternatives of HAART. However, 24(9.2%) believed that there were better alternatives to HAART. Findings from this study reveal that a patients’ positive attitude towards HAART as being the only remedy to manage HIV/AIDS is associated with high adherence levels. These findings correspond with findings from studies done by Momany (2017) and Wakibi (2010) which reported that a patients’ belief in the effectiveness of the therapy motivates them to tolerate common adverse drug effects. Sidat *et al.* (2007) reported that patients’ optimism towards ART results to improved clinical, immunological and virological parameters. Heestermans, T. *et al.* (2016) further reported that a patients’ positive perceptions of ART,

such as a strong belief in value of treatment and understanding importance of adherence were associated with adherence, whereas rumours and false beliefs about ART, including that ART can cause harm and is a sexual stimulant, were associated with non-adherence.

In the present study, findings revealed that the use of other alternatives in place of HAART is associated with elevated levels of sub-optimal adherence. Some patients reported to have used herbal medicine while others visited prayer shrines with the hope of being cured of HIV/AIDS. These findings are in agreement with findings from a study done by Bijker R *et al.*, (2017) which reported that the concurrent use of herbal medicines and HAART is a probable impediment to adherence in sub-Saharan Africa. These further correspond to findings from a study by Togarasei (2010) which reported that religious beliefs influences patient’s adherence to ART. Their findings further explained that some Pentecostal Christian churches have negative attitude towards antiretrovirals, their interpretation of life, death and healing are based on traditional explanations hence they consider the use of ARVs to prolong life as competing God who is the sole provider of life and healing. Findings from another study by Mbirimtengerenji *et al.*, (2013) reported that some religious affiliations hold that God has supernatural powers able to



heal HIV and AIDs. Such beliefs have been associated with elevated levels of non-adherence among women in Malawi. Igbende *et al.* (2016) further noted that religious beliefs that HIV/AIDS can be cured spiritually has resulted in reduced adherence. Some patients have been reported to spend much time in prayers, performing rituals, visiting prayer shrines and herbalists for cures.

Alcohol consumption

Majority of the respondents, 209(80.08%) had never consumed alcohol in the last 30days preceding the survey while 52(19.92%) had consumed alcohol. Majority of the respondents, 35(67%) consumed spirits while 17(33%) consumed beer. The weekly consumption was distributed as follows; 4 consumed between 1-3 bottles per week, 10 consumed between 4-6 bottles, 16 consumed between 7-9bottles and 22 consumed more 10 than bottles per week.

Alcohol consumption was reported by the Key Informants as a risk factor for sub-optimal adherence. There was no statistical significant association between alcohol consumption and adherence. However, those who consumed between 7-9 bottles and above per week were more likely to have sub-optimal adherence as compared to those who consumed between 4-6 bottles and below per week.

In the present study, alcohol consumption did not have significant association with adherence to HAART. However, findings from a study by Da Santos *et al.* (2017) reported that alcohol consumption negatively influences an individual's health status and adherence to treatment; it increases the risk of unprotected sex and HIV virus transmission. It directly affects adherence through missing or stopping ARVs. Findings from another study by Petse (2018) further noted that alcohol consumption affects

adherence. Clients who took alcohol failed to take their medications as they feared mixing treatment with alcohol while others claimed that alcohol use made it difficult for them to remember to take medications.

Having someone/ tool to remind of when to take medication

Reminder tools were found to predict high adherence levels. Among the respondents,55.17% reported having someone/tool to remind them of when to take medication while the rest had no reminder tools.

Findings from this study are consistent with a study done by Heestermans *et al.*, (2016), Langebeek *et al.*,(2014) and Hornschuh, (2017) who all reported that patients who use reminders to take medication were more likely to have better adherence than those who did not use any reminders. Langebeek *et al.*,(2014) reported further that Patients who use memory aids were three times more likely to adhere to treatment than those who did not use any memory aids.

Conclusion

There was a fairly low level of adherence to HAART at 76% of the respondents. More females than males were on treatment. Having positive attitudes towards self were found to have a positive influence on adherence to HAART. Use of HAART alternatives such as herbal drugs and fear of discrimination from disclosure of HIV status were a risk factor for sub-optimal adherence ($p=0.011$). Having someone/tool to remind of when to take medication and disclosure of HIV positive status to spouse were found to significantly promote adherence to HAART with $p=0.034$) and $p=0.048$, respectively.

Recommendations

Positive attitudes and practices towards HAART have significant effects on



adherence to HAART. Alleviating stigma, encouragement of positive attitudes and practices may help promote adherence to HAART. Further research should be done to find out ways of promoting positive attitudes and practice of PLWHIV.

Authors' contributions

All authors made substantial contributions to the conception or design of the work including the acquisition, analysis, or interpretation of data; drafted the work and revised it critically for important intellectual content; approved the version to be published; and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

1. **Iacob SA, Iacob DG, Jugulete G.** Improving the Adherence to Antiretroviral Therapy, a Difficult but Essential Task for a Successful HIV Treatment—Clinical Points of View and Practical Considerations. *Front. Pharmacol.* 2017. 8:831. doi: 10.3389/fphar.2017.0083
2. **Kay ES, Batey DS, Mugavero MJ.** The HIV treatment cascade and care continuum: Updates, goals and recommendations for the future. *AIDS Res.* 2016.
3. World Health statistics. Monitoring Health for SDGs, Sustainable Development Goals. Geneva. World Health Organization, 2018.
4. **National AIDS and STI Control Program, NASCOP, Ministry of Health.** *Preliminary KENPHIA 2018 Report.* Nairobi. NASCOP, 2020.
5. **Yang Y, Luo D, Xi, C, Huang Z, Wang M & Shuiyuan X.** Medication adherence to antiretroviral therapy among newly treated people living with HIV. *BMC Public Health.* 2018.
6. **Bhaskaran K, Hamouda O, Sannes M, Boufassa F, Johnson AM, Lambert PC, Porter K.** CASCADE collaboration. Changes in the risk of death after HIV seroconversion compared with mortality in the general population. *JAMA.* 2008;300:51. doi: 10.1001/jama.300.1.51
7. **Muhammed OA, Kayode TI, Adesegun OF, Olayinka O.** Knowledge of and Attitude towards Antiretroviral Therapy among People Living with HIV/AIDS in Nigeria. *TAF preventive medicine Bulletin,* 2010;9(3):201-208 .
8. **Amberbir A, Woldemichael L, Getachew, S., Girma, B., & Deribe, K.** HIV-infected persons: a prospective study in Southwest Ethiopia. *Bio Med. Central journal of Public Health.* 2008, 8, 265.
9. **Momanyi ZK, Karanja S, Mbakaya C.** Factors associated with the Prevalence of Non Adherence to Antiretroviral Therapy among HIV Positive Patients in Kibra Slums, Nairobi, Kenya. *East Africa Medical Journal.* 2016;93(7).
10. **Wakibi SN, Nga'ng'a ZW, Gabriel GM.** (2010). Prevalence and Predictors of Non-adherence, and Incidence of Treatment Failure among Patients on Free Highly Active Antiretroviral Therapy in Nairobi, Kenya.
11. **Sidat M, Fairley C, Grierson J.** Experiences and perceptions of patients with 100% adherence to highly active antiretroviral therapy: a qualitative study. *AIDS Patient Care STDS.* 2007. 21, 509–520. doi: 10.1089/apc.2006.0201.
12. **Heestermans T, Browne JL, Aitken SC, Vervoort SC, Klipstein Grobusch K.** Determinants of adherence to antiretroviral therapy among HIV-positive adults in sub-Saharan Africa: a systematic review. *BMJ Global health.* 2016.1(4):e000125. doi:
13. **Bijker R, Jiamsakul A, Kityo C, Kiartiburanaku S, Siwale M, Phanuphak P, Akanmu S, Chaiwarith R, Wit F, Sim B, Boender TS, Ditango R, De Wit TR, Sohn AH, Hamers RL.** Adherence to



- antiretroviral therapy for HIV in sub-Saharan Africa and Asia: a comparative analysis of two regional cohorts. *Journal of the International AIDS Society*.2017.
14. **Togarasei L.** Christian theology of life, death and healing in an era of antiretroviral therapy: reflections on the responses of some Botswana churches. *Afr J AIDS Res*. 2011;9 (4):429-435.
 15. **Mbirimtengerenji ND, Jere G, Lengu S, Maluwa A.** Factors that influence antiretroviral therapy adherence among women in Lilongwe urban health centres, Malawi. *World J AIDS*. 2013; 3:16-25.
 16. **Igbende, Aumbur D, Mkpelanga, Ogwuche, Chinelo H, Anhange ST & Atsehe PA.** Belief in spiritual Healing, Gender and Adherence to medication among HIV/AIDS patients in Benue state, Nigeria *International journal of Health and Psychology Research*. 2016; 4:22-30.
 17. **Da Santos V, Galvao M, da Cuhna G, de Lima I, Gir E.** Alcohol effect on HIV-positive individuals: treatment and quality of life. *Acta Paul Enferm*. 2017;30(1):94-100
 18. **Petse S, Goon DT, Okafor UB, Yako EM.** Antiretroviral Treatment Adherence Among Patients in Selected Health Facilities in East London, South Africa: A Cross-Sectional Study. *Online J Health Allied Scs*. 2018;17(2):1.
 19. **Langebeek N, Gisolf E H, Reiss P, Vervoort SC, Hafsteinsdóttir TB, Richter C, et al.** Predictors and correlates of adherence to combination antiretroviral therapy (ART) for chronic HIV infection: a meta-analysis. *BMC Med*.2014. 12:142. doi: 10.1186/s12916-014-0142-1
 20. **Hornschuh S, Dietrich JJ, Tshabalala C, Laher F.** Antiretroviral treatment adherence: knowledge and experiences among treatment adherence: knowledge and experiences among adolescents and young adults in Soweto, South Africa. *AIDS Research and Treatment*. 2017,doi.org/10.1155/2017/5192516.