Relationship between Patient Factors and Adherence to Antiretroviral Therapy by Adults Living with HIV and AIDS in Kisumu County, Kenya

Maurine Ng'oda[1], Lucas Othuon[2] and Harrysone Atieli[1]
[1]School of Public Health and Community Development, Maseno University, P. O. Box 333, Maseno, KENYA.
[2]Department of Educational Psychology, Maseno University, P. O. Box 333, Maseno, KENYA.

ABSTRACT

Adherence to Antiretroviral Therapy (ART) is an important survival factor for people living with HIV/AIDS (PLWHAs). However, patients on ART in Kenya still miss routine check-ups, and get lost to follow up. Research on the factors influencing ART adherence among different populations in Kenya have yielded inconsistent results. The objective of this study was to determine the relationship between patient factors and adherence to ART by adults living with HIV/AIDS in Kisumu County, Kenya. Facility based cross-sectional survey was carried out on patients receiving ART from all the seven Sub-Counties in the County. Systematic random sampling was used to recruit a sample of 386 patients. Data collection tools were pre-tested and piloted to ensure validity and reliability. Chi-square statistic was used to analyze the data at $\alpha=.05$. Findings indicated that the relationship between age and ART adherence was statistically significant ($\chi^2= 8.064$, $df= 2$, $p = 0.034$). Similarly, the relationship between alcohol use and ART adherence was statistically significant ($\chi^2 = 5.331$, $df = 1$, $p = 0.009$). Knowledge of ART also had a statistically significant relationship with ART adherence ($\chi^2 = 7.799$, $df = 1$, $p = 0.0028$). However, marital status, level of education, employment status, stigma, and psychosocial support did not exhibit statistically significant relationships with ART adherence. The study concludes that patient age, use of alcohol and knowledge of ART are patient factors related to ART. It is recommended that these factors should be considered in the treatment of PLWHAs to ensure ART adherence.

INTRODUCTION

Adherence to Antiretroviral Therapy (ART) is a powerful predictor of survival for People Living With HIV/AIDS (PLWHAs) (WHO, 2015). In order to achieve the viral suppression effect of ART, optimum adherence level of 95% is recommended by the World Health Organization (WHO, 2015; Paterson et al., 2000).

Adherence to ART has been shown to be a strong predictor of increase in CD4 count after initiation of ART even in persons starting treatment at low CD4 levels (Wood et al., 2004). In addition, adherence to ART and hence, the success of treatment, have other public health benefits such as lowering community viral load and reducing sexual, perinatal and injection-related transmission of HIV (Cohen et al., 2011). Understanding the prevalence of and reasons for non-adherence to ART among HIV-infected persons are important clinical and public health goals in reversing the HIV epidemic worldwide (WHO, 2016).

In a meta-analysis, Ghidei et al. (2013) observed that older individuals over the age of 50 on ART regimens have a reduced risk of non-adherence when compared to younger individuals. Contrary to this, Hadland et al. (2012) noted that younger Injection Drug Users (IDU) remain less likely to adhere to ART, resulting in inferior viral load suppression. They suggested that interventions should carefully address the unique needs of young HIV positive IDU. Hegazi et al. (2010) showed that compared to younger subjects (40 years), older subjects (>40 years) were less likely to be non-adherent ($p<0.01$) and had shorter non-adherent periods ($p< 0.0001$).

Hegazi et al. (2010) investigated the relationship between patients' literacy and education to ART adherence in an urban treatment centre in The Gambia. They compared information on education and literacy collected before ART initiation against selected adherence outcomes. Their findings indicate that formally educated patients were significantly more likely to achieve virological suppression. The study suggests that literacy and formal education may impact favourably on adherence to ART.

Negash and Ehlers (2013) identified personal (patient-related) factors influencing ART adherence in Addis Ababa, Ethiopia. They used a quantitative, descriptive design with 355 HIV-infected patients on ART. The findings revealed that stigma, and alcohol use negatively affected patients' ART adherence levels. However, patients' knowledge levels had no influence on their ART adherence levels, contrary to other researchers' reports. They recommended that addressing stigma at community levels might enhance patients' abilities to take their medications in the presence of others.

ILO (2013) found no evidence of statistically significant differentials in the association between employment status and optimal ART adherence. However, it was observed that the impact of unemployment would be less negative in high-income countries than in low- and middle-income countries. In light of the above background indicating mixed results on factors influencing ART adherence, the objective of this study was to determine the relationship between patient

factors and adherence to ART by adult PLWHAs living in Kisumu County, Kenya.

METHODOLOGY

Research Design

A facility based descriptive cross-sectional survey was used to study patients receiving ART from the selected sub county hospitals of Kisumu County. This is a design that is primarily concerned with finding out what, where and how of a phenomenon (Cooper, 2003) and is appropriate for behavioral studies. The intention of adopting this design was to gather data at a particular point in time and use it to describe the existence or non-existence of relationships between selected patient factors and ART adherence within Kisumu County, Kenya.

Study Population

This study targeted 19,943 HIV infected adult patients receiving ART in the seven sampled Sub-County Hospitals of Kisumu County by the end of 2016. One hospital was selected per Sub-County on the basis of the highest registered number of sero-positive adult clients receiving ART. Three health care providers, specifically, a clinician, a nurse and an adherence counsellor in each facility were purposively sampled for interviews giving a total of 21 key informants. The total target population was therefore 19,964 persons.

Inclusion Criteria

i. Patients above 19 years old, living in Kisumu County who have been enrolled for ARV treatment for at least three months. In this study, adults were defined as anyone above 19 years, borrowed from the age categorization by the World Health Organization, 2016 in the Consolidated Guidelines on the use of Antiretroviral drugs for treating and preventing HIV infection.

ii. Patient enrolled in care and receiving ARV treatment in the respective health facilities selected for the study.

Exclusion Criteria

i. Patients suffering from illnesses like neurologic disorder such as epilepsy and cerebral palsy or too ill during the data collection period were excluded because of their inability to consent independently and respond to the interview questions.

ii. HIV positive patients who had been enrolled at the facility for a period less than three months and those of age 19 years and below were also exempted

Sample Size Determination

This study was handling a finite target population of known size (19,943 PLWHAs). Therefore, to determine the true proportion at 95% confidence level, a statistical formula for sample size determination by Yamane (1967: 886) was used to compute the sample size as below:

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

where:

n = Desired sample size.

N = Target population size with characteristics being measured (19,943 PLWHAs)

e = Degree of precision usually set at 0.05.

Therefore,

$$n = \frac{19943}{1+19943(0.05*0.05)}$$

$$= \frac{19943}{50.8575}$$

n = 393 Participants

Sampling Procedure

Multistage stratified sampling technique was used in this study. First, the county was stratified into the seven existing Sub-Counties.

Sampling frame for facilities included all government sponsored health facilities providing ART. One facility with the highest enrolled number of PLWHAs on ART was purposively selected to represent each Sub-County giving a total of seven facilities. Sample population from each of the seven facilities was determined proportionately (Table 1) using the formula: $s = \frac{n*x}{N}$ where s = facility sample size, n = total sample size = 393, N = the total number of PLWHAs receiving ART from the seven sampled facilities = 19,943, x = total number of PLWHAs on ART in the target facility).

Table 1. Sample size in each target facility

Sub-County	Sampled Hospital	PLWHAS (>19yrs) on ART by Dec. 2016	Sample Size: $s = \frac{n*x}{N}$
Seme	Manyuanda	960	19
Kisumu West	Chulaimbo	5762	114
Kisumu West	Gita	3306	65
Nyando	Rabuor	1827	36
Nyakach	Katito	1163	23
Muhoroni	Masogo	1185	23
Kisumu Central	Lumumba	5740	113
Total		**19,943**	**393**

At facility level, systematic random sampling was used to determine the patients to interview. HIV clinic appointment register was used as a sampling frame in every facility. It contained patient clinic numbers in sequential order as well as demographic information. Eligible patients' clinic numbers were first grouped into male and female categories for equal gender representation. Clinic numbers were picked systematically from each group at an interval of "k" until the desired number of patients was obtained for quantitative data collection. The sampling interval k, was determined by k= N/n. This procedure was applied in all the seven facilities. For qualitative data collection, 3 key informants were purposively selected from each facility for in-depth interviews. These comprised of a clinician, a nurse and an adherence counsellor in every facility because they have a better understanding of the patient's behavioral and clinical response towards ART. They were also in a better position to share critical information regarding heath system infrastructural factors influencing ART adherence in their respective areas of operation.

Instruments for Data Collection

A questionnaire was used to measure demographic characteristics and patient related factors that might be related to ART adherence. In addition, the study made use of the CASE adherence tool to measure patients' adherence to ART. CASE measures adherence by examining three major aspects. First, difficulty in taking medication "on time"- no more than two hours before or two hours after the doctor's prescribed time. Secondly, assessing the number of days per week that a patient had missed at least one dose of their medication and lastly, the last time a patient missed at least one dose of their medication. Every possible response to any of the three questions had a score attached to it. Any patient getting an aggregate score of more than ten was considered adherent and a score of less than ten was considered non-adherent.

Procedure for Data Collection

Pre-Testing of Instruments for Data Collection

Before the main data collection process, the research tools were pre-tested at Nyahera Sub-County hospital in Kisumu County. The hospital was purposively selected due to its similarity in characteristics to facilities sampled for the main study and ease of access. A total of 39 PLWHAS were recruited for piloting. Three health care providers were also recruited for piloting as key informants. Ambiguous and difficult questions were identified during the exercise and reviewed. On the average, 30 minutes was enough for each respondent per questionnaire.

Test-retest technique was employed to check for reliability of the tools. The questionnaire was administered to 39 PLWHAS who had come for their clinical check-up and ARV refill. An appointment was made with this group to be seen after a period of two weeks. The tool was administered again to 27 PLWHAS who turned up out of the 39 who were booked. The two sets of responses were used to compute Pearson's correlation coefficient which was used to determine whether the questionnaire produced stable and consistent results. A correlation value of +0.73 was obtained. The tool was therefore considered reliable.

Data Processing and Analysis

Quantitative data collected using the questionnaires was checked for completeness, coded, entered and analyzed using IBM SPSS (Version 20.0). First the questionnaire was converted into a Google sheet form to facilitate the data entry process. Once a filled form was submitted, the entries were automatically saved into a Google spread sheet and imported to SPSS for analysis. Both descriptive and inferential statistics were used. For descriptive statistics, frequencies, percentages, tables, means and charts were used to summarize the findings. For inferential statistics, Pearson's Chi-square test was used to determine the presence of statistically significant association between independent variables and the outcome variable (ART adherence) at the 95% confidence interval. Qualitative data collected from the interviews with key informants was analyzed by organizing it into themes and sub-themes befitting the objectives of the study.

RESULTS

Demographic Characteristics of Participants

A total of 386 PLWHAs out of the planned 393 responded to the questionnaire, giving a non-response rate of only 1.8%. A total of 229 respondents (59.3%) were females compared to 157 (40.7%) males. The mean age of study participants was 37.2 years. The majority of participants numbering 236 (61.1%) were aged between 20 and 39 years compared to 124 (32.1%) who were aged between 40 and 59 years. Those in the elderly age bracket (60 to 79 years) were only 26 (6.8%). The number of participants who were married and living together was 232 (60.1%) with 156 (57.3%) having monogamous families compared to 116 (42.7%) who had polygamous marriages.

The respondents' level of education ranged from those who had never attended school to those who had attained tertiary education. The majority of the respondents numbering 196 (50.8%) had acquired education up to primary level, compared to 113 (29.3%) who had attained secondary level education. Only 65 participants (16.8%) had attained tertiary education and 12 (3.1%) had no education. Those who were employed were 252 (65%) and those who reported that they took alcohol were only 53 (13.7%).

Rate of Adherence

Patients with difficulty in taking medication on time were medication all the time. Those who took medication rarely were 149 (38.6%), with only 20 (5.2%) having reported taking medication most of the time.

The majority of respondents numbering 223 (57.8%) reported missing doses less than once per week. This was followed by 124 respondents (32.1%) who missed doses once per week, 29 (7.5%) who missed 2 to 3 days per week and 10 (2.6%) who missed 4 to 6 days a week.

Overall, out of all the 386 respondents, 126 (32.6%) of them got an index score of less than 10 based on the CASE adherence tool. This outcome translates to non-adherence rate of 32.6% compared to 260 (67.4%) who adhered as shown in Figure 1.
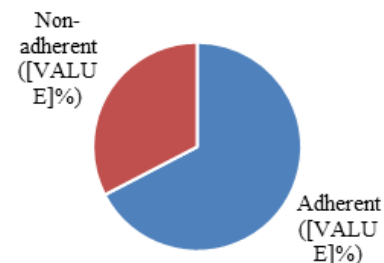

Figure 1. Rate of ART adherence.

Relationship between Patient factors and ART Adherence

In this section, the relationship between patient factors and ART adherence is presented. The patient factors considered are age, marital status, level of education, employment status, alcohol use, psychosocial support, stigma and patients' knowledge on ART.

Age and ART adherence

Table 2 is a cross tabulation for age and ART adherence. There was an association between age and ART adherence ($\chi2= 8.064$, $p = 0.034$). This is consistent with the findings of a meta-analysis by Ghidei et. al. (2013) who observed that older individuals over the age of 50 on ART regimens have a reduced risk of non-adherence when compared to younger individuals.

Table 2. Age and ART adherence.

	Adherent		Non-Adherent		
	N =260		N =126		
Age (Years)	n	(%)	n	(%)	p
20 - 39	173	73.3	63	26.7	0.034
40 - 59	80	64.5	44	35.5	
60 - 79	7	26.9	19	73.1	

These findings call for an increased understanding of age as a factor associated with adherence to ART.

Marital status and ART adherence

Respondents were assessed in five groups: those who were married and living together, married but not living together, separated/divorced, widowed and those who had never married. Out of the 232 participants who were married and living together, 174 were adherent (75%) while 58 were non-adherent (25%). This was followed by a total of 41 participants who were separated/divorced out of whom 22 were adherent (53.7%) while 19 were non-adherent (46.3%). In addition, 40 participants were married but not living together and out of these, 23 participants (57.5%) were adherent while 17 were non adherent (42.5%). In the sample, 39 participants were widowed out of whom 23 were adherent (59%) and 16 were non-adherent (41%). Lastly, out of the 34 participants who had never married before, 18 were adherent (52.9%) while the remaining 16 were non-adherent (47.1%). In summary, adherence was highest among ART patients who were married and living together but lowest among ART patients who had never married before.

However, the association between marital status and ART adherence was not statistically significant (χ^2 = 1.895, df = 4, p = 0.139) as shown in Table 3.

Table 3. Marital status and ART adherence.

	Adherent		Non-Adherent		
	N =260		N =126		
Marital Status	*n*	**(%)**	*n*	**(%)**	*p*
Married and living together	174	75.0	58	25.0	0.139
Separated/Divorced	22	53.7	19	46.3	
Married but not living together	23	57.5	17	42.5	
Widowed	23	59.0	16	41.0	
Never Married	18	52.9	16	47.1	

Education level and ART adherence

Table 4 is a cross-tabulation for respondents' level of education by ART adherence. The respondents' level of education ranged from those who had never attended school to those who had attained tertiary education. A total of 196 respondents had acquired education up to primary level (50.8%). Out of these, 153 (58.8%) were adherent while 43 (34.2%) were not. This was followed by 113 who had attained secondary level education (29.3%) and out of whom 69 (26.5%) were adherent while 44 (34.9%) were non-adherent. In addition, 65 participants (16.8%) had attained tertiary education out of whom 30 (11.6%) were adherent while 35 (27.8%) were non-adherent. The remaining 12 participants (3.1%) had no education at all. Out of the 12, 8 participants (3.1%) were adherent while 4 (3.2%) were non-adherent. Contrary to the results of Peterson *et al.* (2009) which found a positive association between literacy level and ART adherence, this study did not find any significant association between education level and ART adherence (χ^2 = 3.412, df = 3, p = 0.511). This finding is contrary to that of Hegazi *et al.* (2010).

Table 4. Level of Education and ART adherence.

	Adherent		Non-Adherent		
	N =260		N =126		
Level of Education	*n*	**(%)**	*n*	**(%)**	*p*
No Education	8	3.1	4	3.2	0.511
Primary	153	58.8	43	34.1	
Secondary	69	26.5	44	34.9	
Tertiary	30	11.6	35	27.8	

Employment status and ART adherence

Information on employment status and ART adherence is presented in Table 5. A total of 252 participants (65%) had some form of employment compared to the remaining 134 (35%) who were not employed at all. Of those who were employed (i.e. N = 252), 181 (71.8%) were adherent while 71 (28.2%) of the employed participants were non-adherent. For the participants who were not employed, 79 (59%) were adherent to ART while the remaining 55 participants (41%) were non-adherent. However, there was no statistically significant association between employment status and ART adherence (χ^2 = 2.142, df = 1, p = 0.519). This finding is consistent with that of ILO (2013).

Table 5. Employment status and ART adherence.

	Adherent		Non-Adherent		
	N =260		N =126		
Employment Status	*n*	**(%)**	*n*	**(%)**	*p*
Employed	181	69.6	71	56.3	0.519
Not Employed	79	30.4	55	43.7	

Alcohol use and ART adherence

A total of 333 participants reported that they do not take alcohol (86.3%) out of whom 223 were adherent (67%) while 110 were non-adherent (33%). On the other hand, 53 participants reported that they did drink alcohol (13.7%).

Out of those who drank alcohol, 37 participants (69.8%) reported that they had never failed to take their medication as a result of being too drunk while the remaining 16 (30.2%) reported that there are instances when they were too drunk to take their medication. Concurrent with findings by Hendershot, Stoner, Pantalone and Simoni (2010), there was a statistically significant association between alcohol use and ART adherence (χ^2 = 5.331, df = 1, p = 0.009). This finding is also consistent with that of Negash and Ehlers (2013).

Table 6. Alcohol use and ART adherence.

	Adherent		Non-Adherent		
	N =260		N =126		
Alcohol Use	*n*	**(%)**	*n*	**(%)**	*p*
Takes alcohol	37	14.2	16	12.7	0.009
Do not take alcohol	223	85.8	110	87.3	

The above finding was echoed by one adherent counsellor as follows:

"*One of the most challenging groups of patients to deal with are those who drink alcohol because most of the time they do not carry with them the drugs to their drinking places, and once drunk, they do not remember to take their medication. It is also very difficult to find them at home whenever follow up visits are made to those who miss their clinic appointments*".

The counsellor's observation shows how those who drink alcohol find it difficult to cope with ART adherence. These findings are in tandem with Hadland *et al.* (2012) who found that odds of adherence were significantly lower among injection drug users.

Psychosocial support

In this section, the study featured the general family support received by the patient, disclosure status and post disclosure treatment by the closest contacts to the patient. Findings are presented in Table 7. Out of all the study participants, 312 lived together with their families (80.2%) compared to 74 participants who lived alone (19.2%). Even though 377 respondents had disclosed their status (97.7%) to either a spouse/sexual partner, parent/child, friend or a spiritual leader, some 9 participants had not disclosed their HIV status to anybody (2.3%).

Table 7. Psychosocial support.

Characteristic	N = 386	(%)
Family Status		
Lives together with family	312	80.2
Lives alone	74	19.2
Disclosure Status		
Have disclosed their HIV status	377	97.7
Have not disclosed their HIV status	9	2.3
Post-disclosure support (N = 377)		
Talks freely about their HIV status	325	86.3
Do not feel free talking about status	52	13.7
Feels supported		
Receives any kind of support	291	75.4
Do not receive any kind of support	95	24.6

Out of those who had disclosed, 325 reported that they felt free talking to their families or friends about their HIV status (86.3%) while 52 did not feel free talking about this (13.7%). At the same time, while 291 respondents (77.2%) who had disclosed their status reported that they sometimes received support emotionally, financially and even spiritually, 86 (22.8%) barely received any kind of support from the people they disclosed their status to. When asked to rate the support they received (N = 291), 177 respondents who received support from family and friends rated the support as

good (60.8%) compared to 79 who felt it was excellent (27.1%). Additional 22 respondents rated the support as average (7.6%) and the remaining 13 said it was poor (4.5%).

Table 8 shows the findings for the association between psychosocial support and ART. Statistical analysis did not find any significant association between psychosocial support and ART adherence ($\chi^2 = 5.544$, $df = 1$, $p = 0.288$).

Table 8. Association between psychosocial support and ART adherence.

	Adherent N =260		Non-Adherent N =126		
Alcohol Use	*n*	**(%)**	*n*	**(%)**	*p*
Receive support	198	68	93	32	0.288
Do not receive support	62	65.3	33	34.7	

Stigmatization of respondents

When respondents were asked how they felt about taking their ARV medicines, 350 (90.7%) reported that taking ARVs routinely did not worry them. However, 36 (9.3%) reported being worried. The number of participants who did not feel worried about the long term effect of ARVs as long as they remained healthy at present was 351 (90.9%). Whereas 367 participants (95.1%) did not feel avoided (stigmatized in any way) because of their HIV status, 19 (4.9%) did feel that sometimes they are avoided or stigmatized because they were HIV positive In addition, 293 participants (75.9%) reported that they never felt embarrassed taking ARVs in front of people compared to 93 (24.1%) who still felt so. While 348 participants (90.2%) freely attended social events with others irrespective of their HIV status, 38 participants (9.8%) did not feel free attending social events with others. Thus, the majority of study participants did not feel stigmatized or discriminated due to their HIV status. This outcome is summarized in Figure 2.
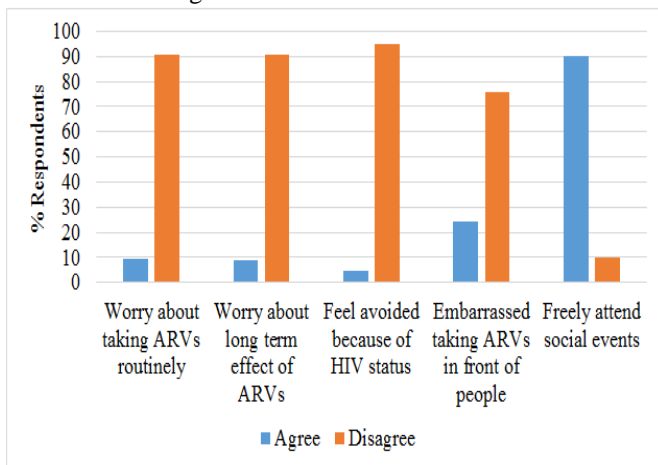
**Figure 2. Stigmatization of respondents.**

Table 9. Association between stigma and ART adherence.

	Adherent N =260		Non-Adherent N =126		
Alcohol Use	*n*	**(%)**	*n*	**(%)**	*p*
Felt stigmatized	12	63.2	7	36.8	0.749
Did not feel stigmatized	248	67.6	119	32.4	

Out of the 367 participants who did not feel avoided or stigmatized in any way because of their HIV status, 248 (67.6%) were adherent while 119 (32.4%) were non-adherent compared to the 19 who felt stigmatized out of whom 12 (63.2%) were adherent while 7 (36.8%) were non-adherent. As presented in Table 9, further analysis did not show any statistically significant association between stigma and adherence to ART ($\chi^2 = 1.2$, $df = 1$, $p = 0.749$). This finding is contrary to that of Negash and Ehlers (2013).

Patient's knowledge of ART

A total of 226 respondents (58.5%) did not know their latest CD4 cell count compared to 160 respondents who were aware (41.5%). In addition, 203 participants (52.6%) did not know what the normal range of CD4 cell count is, compared to 183 (47.4%) who reported that they knew. Whereas 367 respondents (95.1%) were in agreement that missing doses on ART leads to HIV getting worse, 19 (4.9%) disagreed. The meaning of viral load was known to 363 respondents (94.0%) compared to 23 respondents (6.0%) who did not know. When asked whether taking ARVs on schedule can help prolong the life of someone with HIV, 373 respondents (96.6%) agreed while 13 respondents (3.4%) disagreed. Further, 361 respondents (93.5%) confirmed that HIV/AIDS cannot be cured with ARVs while 25 respondents (6.5%) believed that ARVs could cure HIV. An overwhelming 384 participants (99.5%) understood that once a person starts ART, he/she should take their medication every day for the rest of their life, and 355 respondents (92.0%) agreed that they understood how ART works compared to 31 respondents (8.0%) who did not. Figure 3 summarizes patients' knowledge on ART as discussed above.
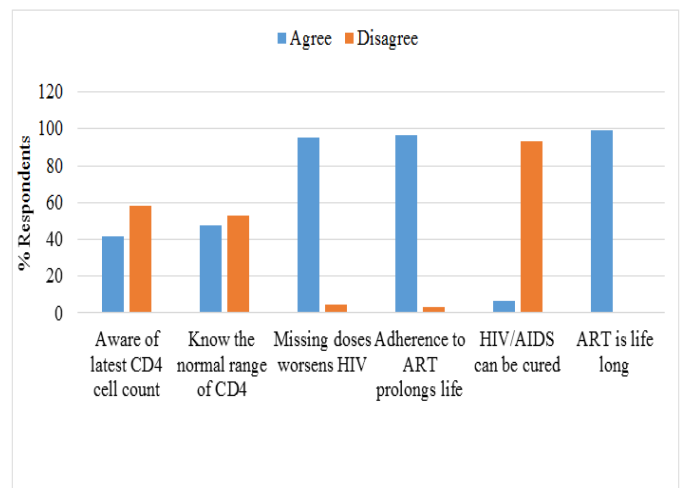
Figure 3. Patient's knowledge of ART.

Table 10. Association between patient's knowledge of ART and ART adherence.

	Adherent N =260		Non-Adherent N =126		
Patient's knowledge on ART	*n*	**(%)**	*n*	**(%)**	*p*
Understands how ART works	253	71.3	102	28.7	0.0028
Does not understand how ART works	7	22.6	24	77.4	

Out of the 355 respondents who understood how ART works, 253 (71.3%) were adherent while 102 (28.7%) were non-adherent. A total of 31 respondents (22.6%) did not understand how ART works out of whom 7 were adherent while 24 were non adherent. There was a significant association ($\chi^2 = 7.799$, $df = 1$, $p = 0.0028$) between patient's knowledge and ART as shown in Table 10. This finding is inconsistent with that of Negash and Ehlers (2013).

Conclusion

Adherence level was found to be at 67.4%. This indicates that there is still need for health service providers to exert more effort to be able to reach the WHO recommended adherence rate of at least 95%.

Variables related to ART adherence among adult HIV patients in Kisumu County were found to be age, patient's knowledge on ART and alcohol use. This study, however, did not find any statistically significant association between ART adherence and marital status, level of education, employment status and psychosocial support.

Recommendations

The following are recommendations based on the study findings:

i. In order to ensure ART adherence among all PLWHAs, ART centers should purpose to handle PLWHAs according to age groups because their adherence rates are different. In addition, health service providers who handle PLWHAs should have high levels of understanding of age as a factor associated with adherence to ART.

ii. Health service providers should make deliberate efforts to improve PLWHAs knowledge on ART as this has a direct bearing on whether they will adhere to ART or not.

iii. All PLWHAs should be told in clear terms that use of alcohol is likely to negatively affect their ART adherence, and that they should keep off from taking alcohol at all costs.

Suggestion for Further Research

While this study focused only on PLWHAs who have been on the therapy for at least 6 months, there is need for a study focusing on the current "test and treat" principle recommended by WHO on the influence it has on adherence to ART. "Test and treat" requires that anyone tested sero-positive should be started on ARVs immediately irrespective of their CD4 cell count.

REFERENCES

Cohen, M. S., Chen, Y. Q., McCauley, M., Gamble, T., Hosseinipour, M. C., Kumarasamy, N. & Fleming, T. R. (2011). Prevention of HIV-1 Infection with Early Antiretroviral Therapy. *New England Journal of Medicine*, 365(6), 493–505. https://doi.org/10.1056/NEJMoa1105243

Cooper, D. R. (2003). *Business Research Methods*. Retrieved from http://trove.nla.gov.au/work/16067972V Patients. *AIDS Care*,12(4),387398.https://doi.org/10.1080/09540120050123783

Ghidei, L., Simone, M., Salow, M., Zimmerman, K., Paquin, A. M., Skarf, L, M., Kostas, T., & Rudolph, J. L. (2013). Aging, Antiretrovirals, and Adherence: A Meta-Analysis of Adherence among Older HIV-Infected Individuals. *Drugs Aging*,30(10),10.1007/s4026601301077.doi: 10.1007/s40266-013-0107-7

Hadland, S. E. Milloy, M.J., Kerr, T., Zhang, R.m Guillemi, S., Hogg, R. S., Montaner, J. S. & Wood, E. (2012). Young Age Predicts Poor Antiretroviral Adherence and Viral Load Suppression Among Injection Drug Users. *AIDS Patient Care STDS, 26*(5), 274–280. doi: 10.1089/apc.2011.0196

Hegazi, A, Bailey, R. L., Ahadzie, B., Alabi, A. & Peterson, K. (2010). Literacy, education and adherence to antiretroviral therapy in The Gambia. *AIDS Care, 22*(11), 1340-1145. doi: 10.1080/09540121003693514.

Hendershot, C. S., Stoner, S. A., Pantalone, D. W., & Simoni, J. M. (2010). Alcohol use and antiretroviral adherence: Review and meta-analysis. *Journal of Acquired Inmune Deficiency Syndrome*, 52 (August 2008), 126.https://doi.org/10.1097/QAI.0b013e3181b18b6e. Alcohol

ILO (2013). *The impact of employment on HIV treatment adherence*. Geneva: International Labour Office.

Negash, T. G. & Ehlers, V. J. (2013). Personal factors influencing patients' adherence to ART in Addis Ababa, Ethiopia. *The Journal of the Association of Nurses in AIDS Care, 24*(6), 530-538.

Paterson, D. L., Swindells, S., Mohr, J., Brester, M., Vergis, E. N., Squier, C. & Singh, N. (2000). Adherence to Protease Inhibitor Therapy and Outcomes in Patients with HIV Infection. *Annals of Internal Medicine*, 133(1), 21–30. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10877736

Sekaran, U. (2013). *Research Methods for Business*. *Research methods for business* (4th Editio, Vol. 65). https://doi.org/10.1017/CBO9781107415324.004

Ware, N. C., Idoko, J., Kaaya, S., Biraro, I. A., Wyatt, M. A., Agbaji, O., Bangsberg, D. R. (2009). Explaining Adherence Success in Sub-Saharan Africa: An Ethnographic Study. *PLoS Medicine*, 6(1), e1000011.https://doi.org/10.1371/journal.pmed.1000011

WHO (2015). Guidelines for Antiretroviral Therapy in Kenya.

WHO (2016). *Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection: recommendations for a public health approach*. https://doi.org/10.1016/j.jped.2014.04.007

Wood, E., Hogg, R. S., Yip, B., Harrigan, P. R., O'Shaughnessy, M. V, & Montaner, J. S. G. (2004). The Impact of Adherence on CD4 Cell Count Responses Among HIV-Infected Patients. *Journal of Acquired Immune Deficiency Syndromes*, 35(3), 261–268. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/15076240