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A Cross-Sectional Analysis on Correlates of Adherence to Antiretroviral Therapy Among Adolescents Living with HIV in Machakos County, Kenya

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ABSTRACT

Background: Adolescents have unique characteristics and needs which affects their adherence to antiretroviral therapy. In Kenya, the level of adherence among adolescents is poor. With the rapid growth of adolescents living with HIV, there is a need to establish the factors that influence their adherence. Thus, this study aimed at determining the correlates of adherence to antiretroviral therapy among adolescents in Machakos county

Methodology: This retrospective cross-sectional study abstracted data from electronic medical records of 1766 adolescents. All adolescents living with HIV in Machakos County and accessing HIV care and treatment services in 66 comprehensive care clinics were included in the study. Adolescents with a viral load of <200 copies/ml were considered adherent while those with a viral load ≥ 200-999 copies/ml (low level viremia) and >1000 were considered non-adherent. Data analysis was done using SPSS version 26. Chi square test was used to test significance.

Results: Only 1366 (77.4%) of the adolescents were adherent to their treatment. Living with a parent and having full disclosure of their HIV status significantly improved adherence at 90.9% (*P*<.001) and 85.1% (*P*<.001) respectively. Adolescents' adherence to first line regimens 81.7% (*P*<.001) and non-lopinavir based regimens 85.7% (*P*<.001) was significantly better than other regimens. Among the health systems related factors, being active in care 78.1% (P<.001), satisfaction with services 82.6% (*P*<.001) and close proximity to the health facility 82.5% (*P*<.001) had significant positive influence on adherence among the adolescents.

Conclusion: Adherence was influenced by parental presence, disclosure status, drug regimen, satisfaction and proximity to services. Adherence to treatment among ALHIV is important and thus need to create adolescent friendly environments at home and in the health care facilities.

BACKGROUND

Adolescents represent a growing share of people living with the Human Immunodeficiency Virus (HIV). Globally, an estimated 1.75 million adolescents aged 10-19 years are living with HIV[1]. They also represent up to 11% of new HIV infections[1]. Approximately 89% of adolescents living with HIV (ALHIV) live in Sub-Saharan Africa[1,2]. Kenya has approximately 74,000 ALHIV currently enrolled in care and under anti- retroviral therapy (ART).[3,4]

The use of anti- retroviral therapy (ART) has been shown to suppress replication of the HIV virus leading to immune reconstitution resulting in increased CD4 count, slowed disease progression and reduced HIV transmission.[5–8] However, suppression requires high levels of adherence to medication and, any sub-optimal levels of suppression points towards poor adherence to ART. [9]

Since the main aim of ART is to achieve viral suppression, a measure of viral load (VL) is considered the best proxy indicator for adherence and effectiveness of ART.[10] Adherence is thus majorly determined through periodic viral load monitoring, usually every six months.[11] Viral load suppression is achieved when the load is below the Lower Detection Level (LDL) or below 50 copies per milliliter of any assay.[10] Conversely, patients with a detectable VL are either classified as low-level viremia for VL above 50 but below 1000 copies per milliliter and high viremia for patients with over 1000 copies per milliliter.[10–13] Persistent viremia indicates either non-adherence or treatment failure in that order.[12]

Distinguishing non-adherence from treatment failure is not automatic. It requires a root cause analysis. The Kenyan ART guidelines of 2022 recommended a close follow up with adherence counseling to rule out any issues and address them for any patient with detectable copies.[11] The aim being to appreciate adherence to ART as a broader concept than just

taking the antiretroviral drugs as prescribed, but it involves coordinated interventions that are responsive to patients' needs. This is especially with adolescents.

Adolescence is a period of rapid physiological and psychological growth and development that poses unique challenges.[14,15] While these challenges are not exclusive, they pose additional task to ALHIV navigating through the chronic infection and daily medication.[14–16] They thus push the ALHIV to greater risk of not adhering to their medication as well as being lost-to-follow-up

The challenges to adherence among ALHIV are broadly classified as either medication, patient or health system related factors.[2,17–20] Medication related factors relate to the drug formulation/ pill burden, expected side effects and transition between regimens.[19–21] Patient factors are the socio-demographic characteristics, economic factors and psychosocial support.[3,19–22] The health system factors are usually intervening relating to access (distance/ transport cost), time spent in the facility, attitude of the health care worker, frequency of clinic appointments and nutritional support.[2,17–21] These challenges, either singly or intertwined, affect adherence to medication amongst the ALHIV.

However, there is still paucity of information on ALHIV adherence to ART in Kenya since most existing studies are restricted to specific settings and may not adequately capture the country's diverse socioeconomic, cultural and healthcare contexts. Given the contextual nature of health care delivery and adherence behaviors, findings from these studies cannot be presumed to represent the wider ALHIV population in the country. Machakos county has approximately 1,766 ALHIV with routine data estimates showing a suppression rate of 72% against the 95% target.[11] This study aimed at determining the correlates of adherence to antiretroviral therapy among adolescents in Machakos county. This will validate existing adherence correlates and support more informed interventions to address any barriers and improve comprehensive care services among ALHIV.

METHODS

Study Design

This was a retrospective cross-sectional study which abstracted data from electronic medical records assessing the correlates of adherence to antiretroviral therapy in a cohort of 1,766 seropositive adolescents in Machakos County.

Study Setting

Sixty-six (66) public comprehensive care sites which are tier 2, 3, 4 and 5 in Machakos county, Kenya offering adolescents' HIV care and treatment services.

Study Population

The study population was all adolescents living with HIV (ALHIV) in Machakos County and accessing HIV care and treatment services in the 66 comprehensive care clinics in Machakos County.

Sampling Method and Size Determination

A census of all the ALHIV aged between 10 and 19 years who met the inclusion criteria during the study period were included in the analysis. The inclusion criteria were all adolescents receiving comprehensive HIV care and treatment services aged between 10 and 19 years in Machakos county in the 66 comprehensive HIV care and treatment sites. Incomplete records were excluded from analysis to avoid selection bias. A minimum sample size was estimated using Cochran's formula for cross-sectional studies assuming a 50% prevalence of non-adherence, 95% confidence interval and 5% margin of error. The minimum required sample size was 384 participants and therefore the inclusion of all 1,766 participants was sufficient to provide statistical power for the analyses performed to detect meaningful associations between variables.

Data Collection and Analysis

Data was abstracted from a pediatric mapping tool using a structured data abstraction tool developed in MS excel. The tool was reviewed by the research team and HIV experts to ensure content validity and alignment with the study objectives. Prior to full-scale data abstraction, the tool was pretested on 5% of the records and minor refinements were made. Secondary data was extracted from routine primary patient medical records such as antiretroviral register, appointment diary, defaulter tracing register, the green card, Operation Tripple Zero (OTZ) module and adherence counseling forms all embedded in the Kenya Electronic Medical Records (EMR). Data collection and collation was done by trained health records and information officers and clinicians following orientation on study procedures and use of the data abstraction tool.

The variables collected included the adolescents' individual characteristics; such as age, education level, type of school (day or boarding), HIV disclosure status and enrolment in any support group. The medication related variables included were current ART regimen, history of regimen switch and reported side effects, and, health system related variables included distance to the nearest health facility. To enhance data quality, conditional formatting and data validation rules were embedded in the data abstraction tool to minimize errors and ensure accuracy. The data was exported to IBM SPSS Statistics version 26 for cleaning and subsequent analysis. Descriptive statistics, including counts, percentages, mean with standard deviations, median with interquartile ranges were calculated where appropriate. In bivariate analysis, Chi square was used to test for significant associations.

Ethical Considerations

Approval to conduct the study was obtained from Kenyatta National Hospital - University of Nairobi Ethics and Research Committee (KNH-UoN ERC) approval number UP502/06/2022. The ALHIV data obtained was de-identified and unique study identification codes were used in place of personal identifiers. The soft copy of the data was stored in an encrypted folder in a password protected sheet and computer under the custody of the author.

RESULTS

A total of 1766 entries were extracted and used for data analysis.

Social Demographic Characteristics

Table 1 shows the social demographic characteristics of the participating adolescents. There were slightly more female adolescents 892 (50.5%) than males (49.5%). There were 998 (56.5%) adolescents aged 15-19 years while 768 were in the 10-14 age category. Most of the adolescents, 1542 (87.3%), were in day school, 166 (9.4%) were in boarding schools while 50 (2.8%) were not in school. Majority of the adolescents, 1093 (61.9%) lived with other relatives and 673 (38.1%) lived with their biological parents. Full disclosure was done for 1334 (75.5%) of the adolescents, 422 (23.9%) had received partial disclosure while 10 (0.6%) had not started the disclosure process.

Medicine Related Characteristics

As shown in table 1, the majority of the adolescents 1368 (77.5%) were still on the first line regimen, 397 (22.5%) were on the second line regimen while 1 (0.1%) was on the third line regimen. Only 220 (12.5%) were on LPV based regimen, all the other 1546 (87.5%) were on non-LPV based regimens. Majority of the adolescents 1090 (61.7%) had been on therapy for more than 10 years, 558 (31.6%) had been on therapy for 6-10 years while 118 (6.7%) had been on therapy for 0-5 years. Majority of the adolescents 1674 (94.8%) have had at least one transition while 92 (5.2%) have not experienced any transition in regimen.

TABLE 1: Social Demographic Characteristics

Variable /Characteristic	Frequency n= 1766	Percentage (%)
Sex		
Male	874	49.5
Female	892	50.5
Age		
10 - 14 years	768	43.5
15 - 19 years	998 5	6.5
Type of schooling		
Day school	1,542	87.3
Boarding school	166	9.4
Not in school	50	2.8
Tertiary/College	8	0.5
Type of home setup or caregiver type		
Living with biological parents	673	38.1
Living with other relatives	1093	61.9
Disclosure of HIV status		
Partial disclosure	422	23.9
Full disclosure	1334	75.5
Not started	10	0.6
Medicine Related Characteristics		
Regimen line		
First line	1368	77.5
Second line	397	22.5
Third line	1	0.1
Palatability of the drugs		
LPVr based regimen	220	12.5
All other regimens	1546	87.5
Duration of therapy		
0 - 5 years	118	6.7
6 - 10 years	558	31.6
Over 10 years	1090	61.7
Frequency of transition		
Transition present	1674	94.8
Transition absent	92	5.2
Health system related characteristics		
Current status		
Active in care	1665	94.3
Dead	12	0.7
Lost to Follow Up	40	2.3
Transfer out	49	2.8
ART service assessment		
Satisfactory	1206	68.3
Unsatisfactory	140	7.9
Not sure	420	23.8
Support system		
OVC		
Yes	1132	64.1
No	381	21.6
N/A	253	14.3
OTZ		
Yes	1484	84.0
No	115	6.5
N/A	167	9.5
PAMA		
Yes	1019	57.7
No	68	3.9
N/A	679	38.4
Distance to facility		
<1 km	492	27.9
1-5 km	788	44.6
6-10 km	294	16.5
11-15 km	161	9.1
>15 km	31	1.8

Health System Related Characteristics

Table 2 shows distribution of adolescents by the health system related characteristics. Most of the adolescents, 1665(94.3%), had an active status in the facility registers, 49 (2.8%) were shown to have transferred out of Machakos county, 40 (2.3%) had been lost to follow up while 12 (0.7%) were reported to have died. Majority, 1206 (68.3%), rated the ART service as satisfactory, 140 (7.9%) felt the services were unsatisfactory while 420 (23.8%) were not sure of how to rate the services. Of the eligible 1513 adolescents for Orphans and Vulnerable Children (OVC) program, only 1132 (74.8%) were active in the program. Similarly, 1484 (92.8%) of the eligible 1599 adolescents were actively participating in the Operation Triple Zero (OTZ) support program. Moreover, of the 1087 adolescents eligible for the Papa and Mama (PAMA) program, 1019 (93.7%) were actively participating in the program.

Most adolescents, 788 (44.6%), traveled a distance of 1-5 kilometers to the nearest care and treatment site, 492 (27.9%) traveled for less than a kilometer, 294 (16.7%)

covered 6-10 kilometers while 192 (10.8%) had to travel more than 10 kilometers to the nearest health facility.

Level of Adherence

From the data abstracted, 1366 (77.4%) of the adolescents had a viral load of <200 +LDL, 163 (9.2%) had viral load copies between 200-999 while 237 (13.4%) had 1000 or more viral load copies (Table 2). Following the guidelines[11], those with viral load copies of < 200 +LDL were considered virally suppressed. Therefore 1366 (77.4%) of the adolescents were suppressed (and presumed to have acceptable level of adherence) while 400 were considered unsuppressed and thus presumed non-adherent to their treatment.

TABLE 2: Distribution of Adolescents By Their Last Viral Load Copies

Viral load copies	Frequency	Percentage (%)
< 200 + LDL	1,366	77.4
200 – 999	163	9.2
1,000 and above	237	13.4
Total	1766	100.0

Association between Suppression (LDL&<200) with Predictor Variables

Analysis was carried between suppression (LDL &<200) and potential predictor variables. As shown in Table 3, from the social demographic characteristics, those living with their biological parents had significantly high adherence levels than those living with other relatives (*P< .001*). Similarly, those who were fully disclosed of their status had significantly better adherence compared to those with partial or non- disclosure (*P<.001*). However, adolescents' sex, age and type of schooling did not significantly influence adherence.

Among the medicine related characteristics, those on the first line regiment had significantly higher levels of adherence compared to those in second and third- line regimens (*P<.001).* Similarly, those on more palatable non- LPVr based regimens, had significantly better adherence than those on LPVr based regimens (*P< .001).* Therapy duration or transition to/from a regimen did not significantly influence adherence.

Those with active status in the health care system were more likely to have adhered to their medication than those who had moved between facilities, lost to follow-up or had died. This relationship was significant *(P<.001).* In parallel, those who rated ART services at their respective facility as satisfactory had significantly better adherence than those who were unsatisfied or unsure of their ART service rating (*P<.001).* Moreover, those who covered shorter distances to the provider facility were significantly more likely to adhere to medication than those who covered longer distances (*P<.001).* However, enrollment into any of the support systems offered within the health system setup like the PAMA, OVC or OTZ did not significantly influence adherence.

TABLE 3: Association Between Suppression (LDL& <200) with Predictor Variables

Variables	Adhered to ART therapy		Total	Chi-square	
	Yes [N = 1366]	No [N = 400]		statistic X2	p value (95% CI)
Sex					
Male	667	207	874	1.056	.304
Female	699	193	892		
Age					
10 - 14 years	609	159	768	2.940	.086
15 - 19 years	757	241	998		
Schooling type					
Day	1192	350	1542	1.775	.620
Boarding	132	34	166		
Not in school	37	13	50		
Tertiary/College	5	3	8		
Home setup					
Living with biological parents	612	61	673	3.701	<.001*
Living with other relatives	754	339	1093		
Disclosure status					
Partial disclosure	228	194	422	0.316	<.001*
Full disclosure	1035	299	1334		
Not started	3	7	10		

Continue

TABLE 3: Continued

Variables	Adhered to ART therapy Yes [N = 1366]	No [N = 400]	Total	Chi-square statistic X2	p value (95% CI)
Regimen line					
First line	1117	251	1368	64.927	<.001*
Second line	248	149	397		
Third line	1	0	1		
Palatability of the drugs					
LPVr based regimen	41	179	220	21.088	<.001*
All other regimens	1325	221	1546		
Therapy duration					
1 - 5 years	87	31	118	0.946	.623
6 - 10 years	433	125	558		
Over 10 years	846	244	1090		
Transition					
Transition present	1207	384	1591	1.143	.806
Transition absent	159	16	175		
Current status					
Active	1301	364	1665	1.085	<.001*
Dead	4	8	12		
Lost to Follow Up	22	18	40		
Transfer out	39	10	49		
ART service assessment					
Not sure	328	92	420	198.172	<.001*
Satisfactory	996	210	1206		
Unsatisfactory	42	98	140		
Enrolled in OVC					
Yes	892	240	1132	1.996	.158
No	287	94	381		
Enrolled in OTZ					
Yes	1150	334	1484	0.207	.649
No	87	28	115		
Enrolled in PAMA					
Yes	571	147	718	0.022	.882
No	18	5	23		
Distance to facility					
≤ 5 km	1056	224	1280	97.085	<.001*
6 - 15 km	283	172	455		
>15 km	27	4	31		

Key * indicates significance
ART- Antiretroviral Therapy
LPVr- Lopinavir
PAMA- Papa and Mama
OTZ- Operation Triple Zero
OVC- Orphans and Vulnerable Children
Full disclosure – Explicitly informing an ALHIV of their HIV positive status, need for lifelong ART and importance of adherence to their treatment.
Palatability – How acceptable a medication is to consume based on taste, texture, smell and size
Transition – Change in ART regimens

DISCUSSION

This study set out to determine correlates of adherence to antiretroviral therapy among adolescents in Machakos county. This study found the level of suppression, and used it as a proxy measure of adherence to treatment thereby presuming adherence to be 77.4%. Among the adolescents in the current study, those living with their biological parents and having been fully disclosed of their status had a significantly better adherence. Those on first line regimens as well as those on non- LPVr based regimens were found to have significantly better adherence. Similarly, being active in the health care system, getting satisfactory ART services as well as living in close proximity to the provider facility significantly improved ALHIV adherence to medication. The census sampling approach included all the ALHIV enrolled in care across the county which strengthened the representativeness of the study population. The findings are therefore likely

to be generalizable within the county reflecting the programmatic and clinical realities. However, the findings should be interpreted with considerations that some ALHIV may have persistent viremia despite adhering to treatment due to some clinical factors such treatment failure, drug to drug interactions and co-infections.

The level of adherence among ALHIV in the current study was 77.4%. This was considered to be relatively favorable within the Kenyan adolescent HIV care context during the study period. Previous studies conducted among ALHIV in Kenya reported lower suppression levels, with national estimates ranging between approximately 63% and 70% in routine care settings. Mwangi et al. reported viral suppression levels of 63% among adolescents aged 10–19 years in Homa Bay County[23] while Njuguna et al. reported that nearly one-third of adolescents and young adults on ART in Kenya were not virally suppressed.[24] Compared with these findings, the suppression level observed in this study suggests comparatively better treatment outcomes. The findings are similar with other studies done globally and in low- and middle-income countries that reported low levels of adherence.[17–20] Despite this relatively better outcome, the suppression rate in this study remains below the UNAIDS 95-95-95 target indicating persistent challenges in achieving optimal adherence and sustained viral suppression among ALHIV both nationally and in the global spheres.

One of the greatest challenges of adherence to ART is the constituent of the ALHIV social fabric. This study consistent with other studies [14,25–27] found ALHIV living with their biological parents had significantly higher adherence levels than those living in other family setups. The results indicate that biological parents may provide more consistent clinical and treatment supervision, psychological and emotional support, and, general communication regarding their HIV care all which are important for sustaining adherence. Contrary, adolescents living with relatives and in other family setups may struggle with acceptance, disclosure, psychosocial support and consistent treatment monitoring.[20,22,28,29] Past studies have revealed that HIV-related stigma may negatively influence ART adherence among ALHIV by contributing to fear of disclosure, missed medication doses and disengagement from care. [3,20,28,30] While stigma was not covered in the scope of the current study, findings from other settings show that ALHIV living with relatives other than their biological parents may be more vulnerable to stigma which was found to negatively impact adherence to ART.[22,27,30–32] This underscores the critical role of a supportive social environment to the ALHIV in promoting adherence. It further highlights the need for the healthcare system to offer strong support systems to ramify any home related inadequacies such as psychosocial support. [17,33,34]

The healthcare system should thus be well structured to support the psychosocial interventions including facilitating a timely and age-appropriate disclosure process. This is not a one-time caregiver event but a healthcare process that should address the needs of the ALHIV without causing any delays.[22,35] Studies have shown delayed disclosure is as result of most parents fearing to disclose because they felt guilty about the transmission, feared the adolescents reaction, feared stigma, family conflicts, never felt adequately prepared and did not know how to start the disclosure conversations. [22,36] However, when the healthcare system supported in the disclosure process there were increased rates of HIV disclosure, clinical outcomes were not negatively affected, positive attitude towards HIV care, improved communication with caregivers and improved adherence.[22,36,37] This stems from better awareness among the ALHIV, increased self-efficacy in their own management and ability to link to available support systems.[14,38] Parents and guardians to ALHIV should therefore be continually supported by the health care system to disclose early as this has been shown to yield better clinical outcomes.[38,39] Inversely, delay in HIV status disclosure has been shown to have negative influence on ALHIV such as treatment refusal, missed clinical visits, psychological distress and distrust towards the caregiver which leads to disengagement from HIV care.[2,22,35] While full disclosure in the current study (75.5%) exceeded that reported by Edun *et al.* of 63.1% among ALHIV in South Africa and Ngeno *et al*. at 36.6% in Kenya, all findings indicate suboptimal adherence levels relative to the World Health Organization recommendation of 100% by the age 12 years.[40] The disparity could be a result of ART adherence, suppression and retention interventional programs in the study area in the intervening period of the two studies and the current study.[41,42] The programs PAMA, OVC and OTZ, were shown not to significantly influence adherence in isolation.

Another influencer of adherence is medication related challenges. Difficulties in tolerating the ART regimen such as pill burden, taste, size of medication, daily dosing and their side effects has been shown to affect adherence.[2,18,19,21,26] WHO recommends that the first line ART regimen should be simplified and offered in a once-daily fixed dose combination (FDC) regimen[10] which Kenya has adopted.[11] Conversely, the second and third-line regimens are more complex as they are majorly not a single tablet, may require a separate boosting agent or with additional tablets that require to be taken twice a day[10,11]. In the current study, ALHIV on first line regimen had significantly higher level of adherence compared to those on second and third- line regimens. Moreover, those on more palatable drugs compared to LPVr based regimens, had significantly better adherence. LPVr oral solution and pellets are bitter, difficult to swallow and are poorly tolerated which affects adherence.[43–45]These findings mirror those of other studies where many drugs and/or big size for age as well as poor taste were found to be associated with poor adherence.[2,19,21]This implies that the pill burden either by number, size or taste impacts on adherence. Treatment modalities and programs should thus design and initiate measures to ensure ALHIV remain on first line regimens. Research should also be enhanced towards having more tolerable medication and reducing all forms of pill burden.

Other barriers opined to affect retention are long waiting periods, inconvenient clinic appointments, fixed clinic hours, poor accessibility of the hospital, lack of youth friendly services and health care worker related factors.[2,18–21] Only a third of the ALHIV in this study, felt the services offered were unsatisfactory. While, more than a quarter of the ALHIV had to travel long distances to the

care facility. These indicators should be major concerns since satisfaction with services as well as distance to health care facility were shown to significantly influence retention. This is also compounded by the adolescents' sensitivity to everything happening around them due to changes and transitions they would be experiencing during this period of their lives.[2,21,46] They require therefore hospital environments that are friendly and healthcare workers who are responsive to their individual needs, show empathy and can maintain confidentiality.[2,20,21] Healthcare system should also improve access through creating more treatment sites to eliminate the access gap.

Since ART is lifelong, successful outcomes, including suppression through adherence, are based on consistency, and can only be achieved by remaining active in care. The high number of ALHIV active in care from the study is thus encouraging. The results further indicated that those who were currently active in the healthcare system were more likely to have adhered to their medication than those who had moved between facilities, lost to follow-up or had died. These findings are similar to those of other studies.[18,20,37,41,42] The high number in care in the current study could be attributed to the healthcare system meeting the needs of the ALHIV such as clinical appointments scheduled during school holidays, shorter waiting periods, and presence of psychosocial support groups. There is still need though to address other real or perceived barriers by ALHIV so as to progress towards 100% retention.

Future studies should consider comparative approach with different implementation models so as to evaluate the support structures considering their importance in providing psychosocial support to the adolescents, offer time to share personal experiences with peers, setting life goals from the sessions covered and also empower them on how to deal with HIV, as well as life with all the changing dynamics.

Limitations

The current study had some inherent limitations anticipated secondary to retrospective data review. There were missing variables since they are not routinely collected within the program. These includes several known correlates of adherence such as mental health status, stigma, side effects and care giver support were not analyzed. The researcher also had no control over the validity of the secondary data used. To overcome this the researcher did data cleaning; duplicate entries were removed, any errors and outliers were removed and only complete data was used in the analysis. The original data sets were programmatic and therefore contained additional data not aligned to the objectives of the study. The researcher developed a data abstraction form to ensure only relevant data was considered and analyzed. The study was also cross sectional and thus inadvertently unable to assess incidence and make a causal inference. In the current study, the use of cross-sectional design was justified since suppression as a proxy to adherence measures an outcome assessed at a particular time.

CONCLUSION

The study demonstrates the viral suppression among ALHIV in Machakos county was relatively better at 77.4%. To realize the UNAIDS target of 95-95-95 and WHO target of ending HIV/AIDS as a public health concern by 2030, this needs to be addressed. The social demographic characteristics such as living with biological parent and disclosure of HIV status were significantly associated with adherence while age, sex and schooling type were not. Regimen line and palatability of drugs were significant predictors of adherence among medicine related characteristics while duration of therapy and number of transitions between regimens were not significant predictors. Among the health system related characteristics, current enrollment status, ART service delivery satisfaction and distance to health facility significantly affected adherence while enrolment to any of the support systems did not significantly affect adherence among the ALHIV.

These findings suggest that optimal HIV outcomes among ALHIV require more than just access to antiretroviral therapy but rather more informed interventions addressing the multifaceted barriers. Successful adherence to treatment is dependent on comprehensive adolescent-centered approaches that address patient, medication and health system related factors simultaneously. There is a need to have studies examining combination interventions targeting both clinical and home-based care in diverse settings. Further, identifying scalable and sustainable interventions that can enhance adherence to treatment, improving viral suppression and reducing progress to treatment failure. The government on the other hand, should consider providing drug formulations that are friendly to the ALHIV and integrating this into national guidelines while expanding differentiated service delivery models that respond to the needs of the adolescents. The health system should establish robust tracking systems including digital systems that have machine learning to promptly identify none adherent adolescents and offer enhanced adherence support interventions.

The findings were shared with the County Health Management Team, health facility teams, implementing partner and other stakeholders through a dissemination meeting to facilitate service improvement. The engagement was meant to support translation of the evidence to strengthen adolescents HIV programming, inform targeted quality improvement initiatives and change policy in an effort to close the existing gaps and, contribute to the global goal of ending the HIV epidemic as a public health threat.

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