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ARTICLE

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Full Length Research Paper

Medication belief, locus of control, and adherence among patients on highly active anti retro viral therapy in Lagos, Nigeria

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Anti-retro viral therapy (ART) is a lifelong treatment and its effectiveness depends critically both on the efficacy of the antiretroviral drugs against the virus and achieving a very high level of adherence (> 95%) to the medications. This study evaluated the relationship between medication beliefs, locus of control and adherence to ART among people living with HIV/AIDS (PLWHA) in Lagos. A cross-sectional descriptive study was conducted on 302 HIV/AIDS clients receiving Highly Active Anti-Retroviral Therapy in the outpatient ART clinics of the 3 selected public health facilities in Lagos State. Only respondents confirmed and diagnosed to be HIV positive and had met the eligibility criteria for initiating ART, and were 18 years and above on Highly Active Anti-Retroviral Therapy (HAART) for not less than a year. A total of 302 HIV positive persons on HAART completed the study. They were mostly females (n=202; 66.9%) with a mean age of 39 ± 10 years. About a third (30%; n=90) of respondents were adjudged non-adherent. Those who were adjudged adherent were significantly younger than the non-adherents (P=0.001). However, there was no significant difference in the mean score for medication beliefs (Concern or Necessity) and locus of control (Internal, Powerful Others or Chance) between those who were adjudged adherent or non-adherent. There was no direct relationship observed between the locus of control, medication beliefs and adherence to medication among patients on HAART in Lagos, Nigeria. Interventions targeting these socio-cognitive parameters may not yield a further increase in adherence.

Key words: Locus of control, medication belief, adherence, highly active anti-retroviral therapy (HAART), HIV/AIDS.

INTRODUCTION

The introduction of Highly Active Anti Retroviral Therapy (HAART) has transformed the treatment of HIV infection by improving the clinical course of the disease and substantially reducing HIV/AIDS associated morbidity.

Early optimism concerning the benefits of these medications has been tempered, however, by evidence that even modest or occasional non-adherence can greatly diminish the benefits of treatment and lead to

serious personal and public health consequences. Research has demonstrated that suboptimal adherence (that is, taking less than 90 to 95% of prescribed doses) is associated with increased risk of adverse virologic and clinical outcomes, including increased viral replication and the development of drug-resistant HIV strains as well as a host of clinically significant health-related setbacks (Barclay et al., 2007). Medication non-adherence, however, continues to be a major challenge to and set-back for the success of retro-viral therapy (Chesney, 2000).

Non-adherence, especially in HIV pharmacotherapy, may result in unnecessary health costs, investigations, and changes in treatment, morbidity and mortality (World Health Organization, 2003). Patients' beliefs about treatment influence treatment engagement and adherence in most clinical treatment settings including during HIV pharmacotherapy (Adefolalu et al., 2014). This is driven mainly by personal beliefs about medications and mediated through the Necessity-Concerns Framework. This framework postulates that medication adherence is influenced by implicit judgments of personal need for the treatment (necessity beliefs) and concerns about the potential adverse consequences of taking it (Horne et al., 2014). The Necessity-Concerns Framework identified individual's beliefs about their medication as playing a key role in adherence, and UK Clinical Adherence Guidelines recommend eliciting and incorporating individual's perceptions of their medication within the consultation (Thorneloe et al., 2017).

Locus of control (LOC) is a personality construct that can influence health behavior including modulating perception of necessity of and concerns about medications. Locus of control influences behavior by dictating the reaction to events and circumstances based on the social cognition of the individual. Rotter (1954) identified an inclination towards internal or external loci of control among persons. Internal locus suggests a perception of outcomes of events and actions being dependent on personal choices, whereas external locus of control suggests a perception that the outcome of events are as a result of external influence beyond their personal control. Locus of control is, however, on a continuum on which people are either internally or externally focused (Rotter, 1960). Locus of control further describes the degree to which individuals perceive that outcomes result from their own behaviors, or from forces that are external to themselves. This produces a continuum with external control at one end and internal control at the other; people who develop an internal locus of control believe that they are responsible for their own success. Those with an external locus of control believe that external forces, like luck, determine their outcomes (Darshani, 2014).

Individuals with an internal LOC believe their reinforcements are contingent on their own behavior, capacities, and attributes. External LOC individuals believe their reinforcements are under the control of powerful others, luck, or fate (Darshani, 2014). Externally-oriented individuals believe that illness is caused by something or someone elsewhere, while internally-oriented individuals believe that illness is caused by their own unhealthy attitudes and actions (Omeje and Nebo, 2011).

Very few studies, globally, have examined the relationship between locus of control and treatment adherence among patients living with HIV. Dearth of such data has also been observed in Nigeria. Yet, available evidence suggests that socio-cognitive factors such as medication beliefs and locus of control can influence adherence to medication use (Obadiora, 2016). In the context of HAART therapy, non-adherence has grave implications for personal health and quality of life as well as broader public health. Therefore, this study evaluated the relationship between medication beliefs, locus of control and adherence to ART among people living with HIV/AIDS (PLWHA) in Lagos.

METHODS

Setting

This study was conducted in Lagos State, located in South-Western Nigeria. As at December 2015, there were 40 ART treatment sites in the state (33 Public and 7 Privates) with an estimated number of PLWHIV in the state put at 217,569 by UNAID.

Participants

A cross sectional descriptive study was conducted on a sample of 302 HIV/AIDS clients receiving Highly Active Anti-Retroviral Therapy in the outpatient ART clinics of the 3 selected public-health facilities in the state. Only respondents confirmed and diagnosed to be HIV positive and had met the eligibility criteria for initiating ART, and were 18 years and above on HAART for not less than a year by December 2014, and had consented to participate in the study were included. Clients with history of psychiatric disorders and those who have missed or stopped ART on medical ground were excluded from the study.

Sampling

A multi-stage sampling method was adopted for the selection of respondents. One rural and one urban Local Government Areas(LGA) were selected by balloting from the 20 official LGAs in the state, and then 3 facilities were selected from the 6 facilities in the selected LGAs by balloting and finally the selection of clients which was conducted using systematic sampling technique.

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Measurements

Adherence

Methods used to measure adherence include subjective ones such as provider and patient reports of adherence, use of standardized patient-administered questionnaires (General and Specific), while objective methods include counting of remaining dosage units, electronic monitoring device (Medication Event Monitoring System, MEMS) and the use of pharmacy prescription records (WHO, 2015). No single method is considered optimal and feasible combinations are expected to provide more accurate information about adherence (WHO, 2015). Nigeria, pharmacy records may be inaccurate and misleading as patients patronize several pharmacies, MEMS would be financially unfeasible and so standardized patient-administered questionnaires are considered the most appropriate in these circumstances.

The primary outcome measure of adherence to HAART was determined in this study using a modified version of the six items, self-reported Morisky Medication Adherence Report Scale with Yes/No responses. Each positive response attracted one point while negative responses attracted zero. A total score less than 75% (4.5/6) was regarded as being non-adherent (Charurat et al., 2010; Najjar et al., 2015). The Morisky scale has been used across many chronic diseases, including HIV/AIDS, as a self-reported measure of adherence to medications and has demonstrated good reliability and predictive validity (Barclay et al., 2007; World Health Organization, 2003; Horne et al., 2013).

Medication beliefs

Medication beliefs were assessed using the nine items of greatest relevance to HAART medication adapted from the beliefs about medicines questionnaire (Cronbach alpha: necessity = 0.74, concerns = 0.80) (Thorneloe et al., 2017). Three of the questions were from the 'necessity' of using HAART medications domain (patients belief about the importance of using a medicine) and five were from the 'concerns' about medications domain (worries about side-effects, interference with normal life, etc). In computing the medication belief scores, positive responses were scored 'one' while negative responses were scored zero. The higher the score in each domain, the higher the belief of respondents in respects of necessity for the medication or concerns about the medications.

Locus of control

Perception of locus of control of participants was measured using the Levenson's Multiple Dimension Locus of Control (LMDLC) Scale (Levenson, 1981). The LMDLC can be used to approximate an individual's generalized expectations of locus of control over everyday life situations. It has scales which can assess both Internal and External locus of control. The external locus of control scales are further divided into Chance and Powerful Others subscales. The Levenson's scale and its adaptations continue to show evidence of good reliability and validity in general populations (Kourmousi et al., 2015).

Ethical considerations

Ethical clearance to conduct the study was granted by the State AIDS Control Agency and the Lagos State University College of Medicine. Written informed consent was taken from all the participating respondents.

Data analysis

Data analysis was performed using Epi Info Software (2008 version 3.4.1) Descriptive statistics in terms of frequencies and means were used to describe socio-demographic variables, medication beliefs, and medication adherence. Fisher's exact test or Pearson's Chi Square (χ^2) test of statistical significance were conducted to assess statistical significant association between socio-demographic variables, medication adherence and belief, as well as locus of control. Furthermore, correlation studies were used to further test for associations between general locus of control and medication beliefs/adherence. Level of significance for all tests was set at p-value <0.05.

RESULTS

A total of 302 HIV positive persons on HAART completed the study. They were mostly females (n=202; 66.9%) with a mean age of 39 ± 10 years. The majority of the respondents had at least secondary school education (80.4%), while about 22% of them had tertiary education. Other aspects of the socio-demographic characteristics are shown in Table 1. Regarding adherence to medication, about a third (30%; n=90) of respondents were adjudged non-adherent (Table 2). Table 2 further shows that the most common nature of non-adherence reported is forgetting to take medication (28.2%; n=85) followed by deliberate alteration of dose (20.9%; n=63). Other common nature of non-adherence to HAART among respondents is shown in Table 2. On medication beliefs, the majority (85.8%; n=259) felt that they would still become very sick despite taking their HIV medications while 80.5% (n=243) of respondents had concerns about the cost of the HAART medications (Table 3). However, 88.1% (n=266) go on to report that taking HIV medications can improve their health and prolong their lives. Other forms of medication beliefs are as shown in Table 3.

Except for the observation that the mean age of those who were adjudged adherent was significantly younger than the non-adherents (P=0.001), there was no significant difference in the mean score for medication beliefs (Concern or Necessity) as well as locus of control scales (Chance, Powerful Others, or Internal) between those who were adjudged adherent or non-adherent (Table 4).

DISCUSSION

The present study shows that about 70% of respondents reported adherence to medication. This is very much higher than what has been reported in similar studies conducted in Nigeria. For instance, in a systematic review by Monjok et al. (2010) most of the studies from Nigeria which used self-reports (as used in the present study) to assess medication adherence reported rates that ranged from 44 to 65% among attendees of general HIV clinics in Nigeria. Since most of the studies included in the

Table 1. Socio-demographic characteristics of respondents.

Variable		Frequency (%)
Sex	Male	100 (33.11)
	Female	202 (66.89)
	Single	93(30.79)
	Married	167 (55.30)
Marital status	Separated	12 (3.97)
	Divorced	5 (1.66)
	Widow	25 (8.28)
	Mean ± SD	39.05 ± 10.42
	<20	2 (0.66)
Age	20-50	255 (84.44)
	>50	45 (14.90)
	Professionals	17 (5.63)
	Highly skilled	50 (16.56)
Occupation*	Semi-skilled	80 (26.49)
	Manual	107 (35.43)
	Unskilled	48 (15.89)
	Primary	44 (14.57)
	Secondary	178 (58.94)
Education	Tertiary	65 (21.52)
	Informal	6 (1.99)
	None	9 (2.98)

Table 2. Adherence to HAART among respondents.

Adherence status		302 (100%)
	I forget to take my ARVs	85 (28.15)
	I altered the dose of my ARVs	63 (20.86)
Drug adherent	I stop taking my ARVs for a while	60 (19.87)
	I decided to miss out a dose	55 (18.21)
	I take less than dose prescribed	53 (17.55)
	Did you take your drug yesterday	46 (15.23)
Overall adherence	Adherent	212 (70.0)
	Non-Adherent	90 (30.0)

systematic review were mostly conducted about a decade ago, passage of time may have improved medication adherence among HIV patients. Most of the factors which have been reported as militating against medication adherence among HIV patients in Nigeria are modifiable and may have improved over time. These factors include cost of therapy, medication side effects, non-availability of ARV drugs, and the stigma of taking the drug (Kourmousi et al., 2015). Improved drug formulation, increased access to drugs, and stigma reduction strategies may have yielded desired impact on medication adherence. A more recent study conducted same catchment area with the present study has also recorded self-reported adherence rate as high as 78% (Kasumu and Balogun, 2014).

Forgetting to take the medications and skipping a dose (ostensibly to avoid side effects) is the leading form of non-adherence in the present study which is consistent with results from other parts of Africa (Kasumu and Balogun, 2014; Byakika-Tusiime et al., 2005). Although a

Table 3. Medication belief of respondents.

Medication belief	No (%)	Yes (%)
Necessity		
Taking HIV medications as prescribed can improve my health and prolong my life	36 (11.9)	266 (88.1)
Taking HIV medications exactly as prescribed decreases the chances of my illness getting worse	130 (43.0)	172 (57.0)
Taking my HIV medications is worth the hassle	180 (59.6)	122 (40.4)
HIV medications will work more effectively if I take them only when I am feeling bad	71 (23.5)	231 (76.5)
Concerns		
If I take my HIV medications as prescribed, I will still become very sick	43 (14.2)	259 (85.8)
Dealing with the side effects of HIV medications is stressful	158 (52.3)	144 (47.7)
Taking HIV medications interferes a great deal with my normal activities	170 (56.3)	132 (43.7)
It is difficult to follow doctors' instructions on HIV medications	103 (34.1)	199 (65.9)
The HIV medications that I'm taking are too expensive for me	59 (19.5)	243 (80.5)

Table 4. Medication belief, locus of control and adherence to HAART among respondents.

Parameter	Total	Adherence		Statistics (t)	P value
		Non-Adherent	Adherent		
Medication belief [specific]					
Concern (Mean ± SD)	2.4 ± 1.1	2.5 ± 1.1	2.3 ± 1.1	1.1	0.292
Necessity (Mean ± SD)	3.5 ± 1.2	3.6 ± 1.1	3.4 ± 1.3	1.5	0.145
Locus of control					
Internal (Mean ±SD)	35.6 ± 8.6	35.4 ± 8.5	35.6 ± 8.7	0.2	0.825
Powerful Others (Mean ±SD)	22.1 ± 13.7	21.9 ± 12.5	22.2 ± 14.2	0.2	0.857
Chance (Mean ±SD)	26.6 ± 9.6	27.4 ± 9.2	26.2 ± 9.7	1.0	0.337

significant proportion of respondents hold a few erroneous beliefs about the medications, something that has been reported in other studies in parts of Africa (Mthembu and Van Wyk, 2014), the overall mean score on medication beliefs among respondents was largely positive. Overall, however, the mean score on medication belief was not significantly associated with medication adherence. The implication is that, even when they may hold certain negative beliefs about the medications, respondents were still as adherent as those who held more positive beliefs. This finding is counter-intuitive as one would have expected that holding a negative notion about medication should translate to poor adherence. Furthermore, literature has not shown consistent relationship between medication beliefs and HIV medication adherence, and where it does, the effect size has been small or medium at best (Langebeek et al., 2014). Being younger was significantly associated with better adherence in the present study. This may have to do with younger persons being better motivated.

Consistent with similar research among HIV-positive patients receiving anti-retroviral drugs (Lynam et al., 2009), the present study found no association or correlation between locus of control and anti-retroviral medication adherence. There has not been robust evidence to suggest that locus of control (general or specific) influences adherence to medication significantly. Granted that internal locus of control has been shown to be associated with medication adherence in some chronic medical conditions such as hypertension (Hong et al., 2006) and depression (Voils et al., 2005), the evidence has not been in any way consistent (McDonald-Miszczak et al., 2000). However, other socio-cognitive or motivational factors, which are similar to the locus-of-control construct, have been found to influence medication adherence. For instance, Williams et al. (2004) showed that autonomous self-regulation, a similar but more volition-mediating concept than locus of control, is a good predictor of adherence to medication among diabetic patients. Similarly, Lynam et al. (2009) reported that self-efficacy, another closely related concept, was a better predictor of medication adherence among patients living with HIV than locus of control. In fact, at least one recent systematic review reported self-efficacy as the single most important predictor of medication adherence among patients on combination anti-retroviral therapy

(Langebeek et al., 2014). The current thinking, therefore, is that while locus of control may not have a direct influence on medication adherence, it may nonetheless influence other closely related constructs such as self-regulation and self-efficacy, which in turn influence medication adherence (Lynam et al., 2009). This theory is however yet to be fully explored.

A key limitation of the present study is that adherence was measured using self-reports. So there is a possibility of false reports by patients, purposefully or accidentally. Also, we juxtaposed the locus of control of respondents towards HIV from their self-reported general locus of control. General locus of control assesses the general world view and attitude to life among respondents and not their specific locus of control in relation to HIV. A HIV-specific locus of control (if there had been any such instrument) or a health-related locus of control may have yielded a more specific and different result.

There is no direct relationship between the locus of control, medication beliefs and adherence to medication among patients on HAART in Lagos, Nigeria. Other than other general interventions to improve adherence, especially among older persons, interventions focusing on medication beliefs may not lead to further improvement in medication adherence among this particular population.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Treatment outcomes among adolescents on antiretroviral therapy in Machakos, Kenya

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It is estimated that in 2017 there were about 1.5 million people living with Human immunodeficiency virus (HIV) in Kenya, of which 105,000 (7%) were adolescents. Adolescents have poorer antiretroviral therapy (ART) outcomes compared to adults. This study aimed to determine the treatment outcomes of adolescents on ART in Machakos County, Kenya. Adolescents on ART for at least two years from nine facilities were randomly selected in this retrospective cohort study. Data on their clinical and laboratory information at baseline and follow-up were abstracted from patient files. Descriptive analyses were used for central tendency while univariate and multivariate analysis was performed using SPSS version 16.0. A total of 182 adolescents consisting of 102 (56%) females and 80 (44%) males participated in the study. There were 54 (29.7%) young adolescents aged 12-15 years and 128 (70.3%) older adolescents (over 15 years). A total of 119 (65.4%) adolescents were retained after a mean follow-up period of 34.5 months. Almost all [180 (98.9%)] the adolescent had their weight and height documented, 143 (78.6%) had at least one viral load test, 140 (76.9%) at least one CD4 test and 164 (90.1%) had TB screening at the last visit. At first viral load test, 73% of adolescents were virally suppressed while 4.9% died in the course of follow-up. Additionally, 16.5% of adolescents were lost-to follow-up; 10.4% were transferred out, 20.3% had a treatment interruption and 6.6% were switched to second line treatment. Older adolescents had worse treatment outcomes compared to younger adolescents. They had lower retention rates; 60.2% compared to 77.8%; lower viral suppression: 70.4% compared to 75.6% and higher mortality: 6.3% compared to 1.9%. Suboptimal treatment outcomes were found despite good clinical follow-up, which were worse in the older adolescents. There is an opportunity to improve adolescent HIV treatment to meet national and global goals.

Key words: Treatment outcomes, antiretroviral therapy, adolescents, human immunodeficiency virus (HIV), Machakos, viral suppression, Kenya.

INTRODUCTION

Human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV/AIDS) continues to be a major public health concern in Kenya with a national prevalence of 5.6% among 16-64 year-olds (Ministry of Health [MoH], National AIDS and STI Control Program (NASCOP, 2014).

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The Kenya 2018 HIV Estimates Report showed that in 2017 there were about 1.5 million people living with HIV (PLHIV), of which 105,000 (7%) were adolescents. There were 52,800 new infections including 8,200 adolescents and 28,200 deaths including 2,100 adolescents (National AIDS Control Council [NACC], 2018). There has been rapid scale-up of ART in Kenya from about 216,000 in 2008 to 579,000 in 2012 and 1,121,948 in 2018 (Maina et al., 2014; NACC, 2018). There has also been a shift towards more durable and less toxic regimens with introduction of Tenofovir disoproxil fumarate (TDF) in first-line regimen in 2011, which replaced Stavudine (D4T) that had several drug toxicities (NASCOP, 2011). Laboratory infrastructure has also expanded to support the ART scale-up with almost universal access to viral load testing through a robust laboratory referral network (Lecher et al., 2015). The purpose of ART is to ensure viral suppression and immune recovery to prevent opportunistic infections (OIs) leading to less morbidity and mortality, improved quality of life and prevention of further transmission (Cohen et al., 2011, pp. 493-505). Achieving good treatment outcomes depends on the provision of standardized clinical follow-up based on available guidelines. In Kenya, the package of treatment is outlined in national guidelines that recommend the clinical and laboratory monitoring as well as drug regimen for various patient populations based on World Health Organization (WHO) guidelines (MoH, 2016; WHO, 2006). It is thus important to follow-up and document ART outcomes in different patient categories. Studying ART outcomes among adolescent will help in understanding how well they are doing and what gaps exists in improving their treatment.

Evidence shows that adolescents have poorer ART outcomes compared to other patient categories: A study in South Africa comparing 154 adolescents living with HIV/AIDS (ALHIV) to 7,622 PLHIV found that ALHIV had lower rates of adherence, lower viral suppression and poorer immune recovery (Nachega et al., 2009). Another study in Cape Town with 65 ALHIV and 818 young adults (20-24 years) found lower viral suppression rates and higher treatment failure in the ALHIV compared to the young adults (Nglazi et al., 2012). Evans et al. (2013, pp. 892-900) reviewed data from seven clinics in South Africa for 652 ALHIV and 1,599 young adults and found that adolescents had lower viral suppression, higher virological failure and higher loss to follow-up (LTFU) rates compared to young adults. In Kenya, a program review for 8,016 ART patients found increasing rates of LTFU among adolescents and young adults at 12 and 24 months after ART initiation (Koech et al., 2014).

According to the 2009 Kenya population census, adolescents constitute about 24% of the country's total population (Kenya National Bureau of Statistics [KNBS], 2009). In Kenya, as in other parts of Sub-Saharan Africa, adolescents face severe challenges to their lives and general well-being. They are vulnerable to early and unintended pregnancy, unsafe abortion, female genital mutilation (FGM), child marriages, sexual violence, malnutrition and reproductive tract infections including sexually transmitted infections (STIs) as well as HIV and AIDS (MOH, 2015, p4). For ALHIVs, they have to deal with these inherent challenges on top of issues related to management of their HIV infection.

Machakos County in Kenya is one of the high burden counties with about 32,611 PLHIV, a HIV prevalence of about 4.5%, about 1,872 new infections and 885 deaths annually and an ART coverage of 68% (MOH, 2016). It neighbors the capital city of Nairobi and has an estimated population of 1,179,215 of which 59.2% are below 24 years of age. Machakos County HIV/AIDS Strategic Plan 2015/2016-2018/2019 targeted adolescents as one of the priority populations for achieving two key strategic objectives: Reduction of new HIV infections by 75% and AIDS mortality by 25% (NACC, 2016). Due to minimal availability of adolescent specific data from routine program settings, this study was carried out to determine the treatment outcomes of adolescents on ART in selected facilities in Machakos County who had been on treatment for at least two years.

MATERIALS AND METHODS

Study design

This was a retrospective cohort study in which data were abstracted from patient files between 25th June 2018 and 20th August 2018. Adolescents enrolled in care between 1st January 2014 and 30th April 2016 were targeted. Children who turned ten years in the course of that year were eligible for inclusion. The records were reviewed up to April 2018. Those whose records could not be traced or had visited the clinic less than three times were excluded. Treatment outcomes were documented along the follow-up period. The primary outcomes were retention, viral suppression (viral load count of less than 1,000 viral copies/ml) and all-cause mortality. Secondary outcomes were treatment interruption, treatment failure (after initial treatment response), transfer-out and LTFU (non-attendance of the clinic for a period of over 12 weeks).

Study setting and population

The study was conducted in nine health facilities within Machakos County, which is located 70 km south-east of Nairobi. The county was selected because of the high HIV burden and availability of high volume facilities with high adolescent numbers. Nine facilities were conveniently selected based on the number of adolescents enrolled. This included one County referral hospital, six sub-County hospitals and two health centers. These facilities were in different administrative units (sub-counties) and thus provided a good geographical mix.

The study population was adolescents on ART and accessing their care in Machakos County at the time of the study. The WHO definition was used to categorize younger adolescent being 10-14 years and older adolescents being 15-19 years.

Sample size determination and sampling

To calculate the sample size retention was considered as the key primary outcome was considered. Previous studies have shown a 24 and 36-months' retention of 76% and 74.6%, respectively (Arrive et al., 2012; Koech et al., 2014). Thus, an average of 75% (0.75)

was used. The following formula was used (Charan and Biswas, 2013, pp. 121-126):

$$n = \frac{z^2 p(1-p)}{c^2}$$

n=Sample size; z= Z-value (1.96 for 95% confidence level); p= Proportion of interest (retention)-75 % (0.75). c = Precision (margin error) (0.05).

The above formula gives a sample size of 288. However, program data had estimated adolescent population of 600 among the selected facilities; this was thus corrected for finite (known) population using the following formula:

$$new\ n = \frac{N}{1 + \dfrac{N-1}{n}}$$

Where: N = population; Thus new N=194. Adjusting for 10% for missing data gives a sample of 213.

For case selection from the records, simple random sampling was performed in the high volume facilities while consecutive sampling was performed in the smaller facilities until the desired sample size for each facility was reached.

Data collection

Data abstraction from hard copy patients' files or electronic medical records (EMR) was carried out using a standard tool. The tool was piloted in a similar facility as the study sites and modified for ease of use. The tool captured routinely available data such as age, gender, viral load counts, CD4 counts, height, weight and body mass index (BMI), treatment regimen, reported adherence, ARV side effects, occurrence of opportunistic infections and treatment outcomes at six monthly intervals or as was documented. Adherence was captured as "good", "fair" or "poor" based on patient self-report and pill count. Good adherence was equivalent to 95% and above; fair, 85-94% while poor was equivalent to less than 85%.

Data analysis

Data was cleaned, processed and analyzed using Statistical Package for Social Sciences (SPSS) version 16.0. Descriptive analysis and measures of central tendency were performed for baseline demographic factors to compute mean and median. Univariate, bivariate and multivariate analysis were performed for various factors. Different factors were analyzed through disaggregation of the younger and older adolescents.

Ethical considerations

For each of the nine participating facilities, permission was obtained from facility administration to allow the study to proceed. The HIV clinic in-charge was informed about the study and provided permission for data collection. This study was reviewed and approved by Kenyatta National Hospital/University of Nairobi Ethics and Research Committee.

RESULTS

Overall participation

Of the total 223 adolescents whose case records were

reviewed, 182 (81.6%) were eligible for the study and were included in the data abstraction. Forty-one participants were excluded because their records were missing, they had visited the clinic less than 3 times or their age was out of the eligibility bounds (Figure 1). Manual records were available for 167 (91.8%) while 15 (8.2%) was from EMR.

Baseline sociodemographic characteristics

Of 182 study participants, 102 (56%) were females while 80 (44%) were males. The mean age of all participants was 16.9 (95% CI: 14.2-19.7) years. There were 54 (29.7%) young adolescents with a mean age of 13.2 (95% CI: 12.4-13.9) years and 128 (70.3%) older adolescents with a mean age of 18.8 (95% CI: 16.6-20.6) years. Of the 178 whose marital status was recorded 162 (91.1%) were single while 16 (8.9%) were married. Education level was recorded for 123 of who 38 (30.9%) were in primary level, 28 (22.8%) were in secondary, four (3.3%) in tertiary while 51 (41.5%) were not specified. Only two (1.6%) lacked formal education. The majority [163 (89.6%)] of the adolescents resided in Machakos County (Table 1).

Baseline biological characteristics

The majority of the participants were in WHO stage 1 (42.0%) followed by 31.3% in stage 2, 23.9% in stage 3 while only 2.8% were in stage 4. The median baseline BMI was 16.5 (range: 5.5-29.2) while the median CD4 was 317 cells/ml (range: 2-1550 cells/ml). Only 13 (7.1%) of the adolescents had developed TB prior to or at enrollment and 14 (7.7%) had an OI prior to or at enrollment.

Treatment regimen

Baseline regimen was defined as the first regimen documented in the file for initiation at the facility or the initial regimen at the previous facility for the 21 patients who transferred in. Seven baseline treatment regimens were recorded with three contributing 82%. Tenofovir (TDF)/Lamivudine (3TC)/Efavirenz (EFV) contributed the largest proportion at 76 (42.9%, 95% CI: 35.6 - 50.3) followed by Zidovudine (AZT)/3TC/Nevirapine (NVP) at 35 (19.8%, 95% CI: 13.8 - 25.7) and Abacavir (ABC)/3TC/EFV at 34 (19.2% 95% CI: 13.3 - 25.1). Other non-standard fist-line regimens included ABC/3TC/NVP (7.3%), AZT/3TC/EFV (6.8%), TDF/3TC/NVP (2.8%) and ABC/3TC/Lopinavir/ritonavir (LPV/r) (1.1%) (Table 2).

Clinical follow-up and monitoring

Almost all, 180 (98.9%) of the adolescent had their
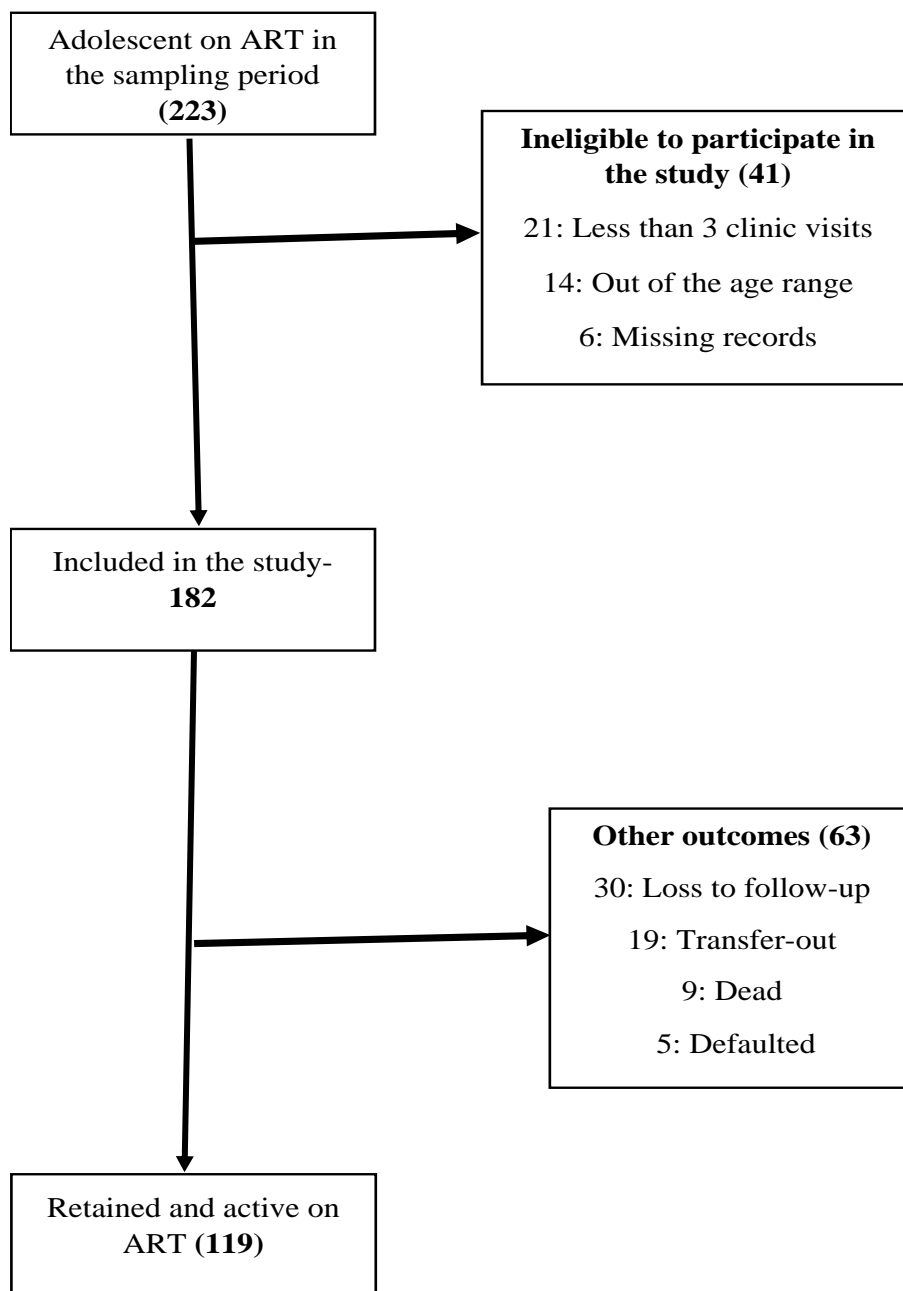
Figure 1. Flow chart and enrollment of participants into the adolescents ART study in selected health facilities in Machakos County, Kenya, 2018.

weight and height monitored and documented. For viral load, 143 (78.6%) adolescents had at least one test, 110 (60.4%) had two while 60 (33%) had three tests. For CD4, 140 (76.9%), 34 (18.7% and 12 (6.6%) adolescents had one, two and three tests respectively. At the last visit, 164 (90.1%) and 116 (63.7%) had TB and STI screening documented. A total of 181 (99.5%) and 136 (74.7%) were on Cotrimoxazole and Isoniazid prophylaxis respectively. Only 84 (46.2%) of the adolescents had been screened for depression of which two (2.4%) had

been identified as depressed while 78 (42.9%) had been screened for alcohol and substance abuse of which none had been identified.

Primary treatment outcomes

During a mean follow-up period of 34.5 (95% CI: 32.5-36.5) months, 119 (65.4%, 95% CI: 58.4 - 72.4) adolescents were retained. Only nine (4.9%, 95% CI: 1.8

Table 1. Sociodemographic characteristics of adolescents on ART in selected health facilities in Machakos County, Kenya, 2018.

Characteristic	Age						P-value
	12-15 years		>15 years		Total		
	n	col % (95% CI)	n	col % (95% CI)	N	Col % (95% CI)	
Sex							0.085
Female	25	46.3 (32.9 - 59.7)	77	60.2 (51.6 - 68.7)	102	56 (48.8 - 63.3)	
Male	29	53.7 (40.3 - 67.1)	51	39.8 (31.3 - 48.4)	80	44 (36.7 - 51.2)	
Total	**54**	**100 (-)**	**128**	**100 (-)**	**182**	**100 (-)**	
Marital status							0.022
Married monogamous	0	-	12	9.7 (4.4 - 14.9)	12	6.7 (3 - 10.5)	
Married polygamous	0	-	4	3.2 (0.1 - 6.4)	4	2.2 (0 - 4.4)	
Single never married	54	100 (100 - 100)	108	87.1 (81.1 - 93.1)	162	91 (86.8 - 95.3)	
Total	**54**	**100 (-)**	**124**	**100 (-)**	**178**	**100 (-)**	
Education level							0.125
None	0	**-**	2	2.3 (0 - 5.6)	2	1.6 (0 - 3.9)	
Other	16	43.2 (27.1 - 59.4)	35	40.7 (30.2 - 51.2)	51	41.5 (32.6 - 50.3)	
Primary school	16	43.2 (27.1 - 59.4)	22	25.6 (16.2 - 34.9)	38	30.9 (22.6 - 39.2)	
Secondary school	5	13.5 (2.3 - 24.7)	23	26.7 (17.3 - 36.2)	28	22.8 (15.2 - 30.3)	
Tertiary	0	-	4	4.7 (0.1 - 9.2)	4	3.3 (0.1 - 6.4)	
Total	**37**	**100 (-)**	**86**	**100 (-)**	**123**	**100 (-)**	
County							0.074
Machakos	45	83.3 (73.3 - 93.4)	118	92.2 (87.5 - 96.9)	163	89.6 (85.1 - 94)	
Other	9	16.7 (6.6 - 26.7)	10	7.8 (3.1 - 12.5)	19	10.4 (6 - 14.9)	
Total	**54**	**100 (-)**	**128**	**100 (-)**	**182**	**100 (-)**	
Mean age	54	13.2 (12.4 - 13.9)	128	18.8 (16.6 - 20.6)	1	16.9 (14.2 - 19.7)	<.001

- 8.1) adolescents died after a mean follow-up period of 26.2 (95% CI: 13.6-38.8) months. The calculated mortality rate was 2.1 per 100 patient years. Viral suppression after a mean follow-up period of 15 months from ART initiation was 105 of 144 (73%, 95% CI: 64.6 - 79.5). This decreased to 71% (77 out of 109) at second test after 25 months, 56% (34 out of 61) at third test after 30 months and to 52% (13 out of 25) at fourth test after 38 months of follow-up respectively. Viral suppression was higher among those with a support group than those without 74% vs 70.1%. Viral suppression was also associated with adherence. Overall 95 of 137 (69.3%) had good adherence in all documented adherence sessions; 15 (10.9%) and 27 (19.7%) had fair and poor adherence in at least two sessions, respectively. Viral suppression was highest in those with good adherence at 80 of 95 (84.2%) followed by those with fair adherence at nine of 15 (60%) and was lowest in those with poor adherence at 13 of 27 (48.1%). Those with poor adherence were almost five times likely to be non-suppressed (Odds Ratio 4.78, 95% CI: 1.9-11.9; P=0.0008) while those with fair adherence were almost

three times to be non-suppressed (Odds Ratio 2.96, 95% CI: 0.93-9.38, P=0.064).

Secondary treatment outcomes

A total of 30 (16.5%, 95% CI: 11.0 - 21.9) adolescents were LTFU; 19 (10.4%, 95% CI: 6.0 - 14.9) were transferred out; nine (4.9%, 95% CI: 1.8 - 8.1) were dead and five (2.7%, 95% CI: 0.3 - 5.1) were defaulters. Only 37 (20.3% 95% CI: 14.4 - 26.2) had a treatment interruption and 12 (6.6%) had been switched to second line due to treatment failure (Table 3).

Comparison of outcomes between younger and older adolescents

Older adolescents had poorer outcomes compared to younger adolescents. They had lower retention rates: 60.2% (95% CI: 51.6 - 68.7) compared to 77.8% (95% CI: 66.6 - 89.0); lower viral suppression: 70.4% (95% CI: 61.3 - 79.6) compared to 75.6% (95% CI: 62.8 - 88.3)

Table 2. Proportions of treatment regimens among adolescents on ART in selected health facilities in Machakos County, Kenya, 2018.

Characteristic	Age						P-value
	12-15 years		>15 years		Total		
	n	col % (95% CI)	n	col % (95% CI)	N	Col % (95% CI)	
Regimen at initiation							
ABC_3TC_EFV	23	43.4 (29.9 - 56.9)	11	8.9 (3.8 - 13.9)	34	19.2 (13.3 - 25.1)	
ABC_3TC_LPV/r	1	1.9 (0 - 5.6)	1	0.8 (0 - 2.4)	2	1.1 (0 - 2.7)	
ABC_3TC_NVP	8	15.1 (5.4 - 24.8)	5	4 (0.5 - 7.5)	13	7.3 (3.5 - 11.2)	
AZT_3TC_EFV	5	9.4 (1.5 - 17.4)	7	5.6 (1.5 - 9.7)	12	6.8 (3 - 10.5)	<0.001
AZT_3TC_NVP	12	22.6 (11.3 - 34)	23	18.5 (11.6 - 25.5)	35	19.8 (13.8 - 25.7)	
TDF_3TC_EFV	4	7.5 (0.4 - 14.7)	72	58.1 (49.3 - 66.8)	76	42.9 (35.6 - 50.3)	
TDF_3TC_NVP	0	-	5	4 (0.5 - 7.5)	5	2.8 (0.4 - 5.3)	
Total	**53**	**100 (-)**	**124**	**100 (-)**	**177**	**100 (-)**	

and higher mortality: 6.3% (95% CI: 2.0 - 10.5) compared to 1.9% (95% CI: 0.0 - 5.5). The same trend was observed for loss to follow-up and transfer out (Table 3).

DISCUSSION

Adolescents in this region were found to have good baseline characteristics: Almost three quarters were in WHO clinical stage I and II and had a higher median baseline CD4 (317 cells/ml). The baseline WHO clinical stage in our study contrasts with that documented by Shroufi et al. (2013) in which over three quarters had advanced disease (WHO stage 3 and 4) and that by Arrive et al. (2012) that showed 48% in WHO stage 3 and 4. The median baseline CD4 was higher than that documented by Nachega et al. (2009) of 144 cells/ml and Bygrave et al. (2012) of 102 cells/ml and Nglazi et al. (2012) of 133 cells/ml. Lower rate of TB (less than one in ten) was found compared to 20.6% documented by Van Rie et al. (2011) and 11% documented by Gunda et al. (2018). Overall, good clinical follow-up as recommended by Kenya treatment guidelines was noted: Almost all the adolescents had a weight and height measurement; almost four out of five had a viral load and CD4 test documented; nine out of ten had been screened for TB and two thirds screened for STI at their last visit. These findings demonstrated progress in provision of quality HIV care as per the Kenya standard. However, there were some gaps: Less than half were screened for depression and alcohol or substance abuse with missed opportunities to diagnose these conditions. One in four ALHIV was on a non-standard baseline ARV regimen including Abacavir and Lopinavir-containing regimens that were prescribed as per the treatment guidelines while they were children, but were not switched as they grew up which was likely due to evolving treatment guidelines over time (NASCOP, 2011, 2014; MoH, 2016).

Despite the good baseline characteristics and good

clinical follow-up, it was found that retention and viral suppression rates were poorer compared to other studies. After a median review follow-up time of 34 months, it was found that only two in three adolescents were retained. This retention rate was lower than the 36-months retention rate of 72.3% documented by Fox and Rosen (2010) and 74.6% documented by Arrive et al. (2012) in West Africa. The study found older adolescents had a lower retention rate of 60% compared to 78% in the younger which was consistent with another Kenyan study that documented a 24-months retention rate of 70% and 82% among the older and younger adolescents respectively (Koech et al., 2014). It is important to explore the reasons for non-retention of the older adolescents. This may include transitions in schools and caregivers and leaving from parental care.

For ALHIV who had a viral load test, the viral suppression rate decreased with time from a mean of 73% after one year on ART to 71% in two years and 56% in three years. This is lower than that documented by Chhim et al. (2018) of 76.8% after 8.6 years of follow-up and the 24 and 36-months suppression rate of 87 and 61-63%, respectively documented by Ferrand et al. (2016). Findings show a much lower suppression rate than the global goal of 90% set for the year 2020 (Sidibé et al., 2016). The suppression rate in our study was poorer in the older compared to the younger adolescents and was directly proportional to adherence: it was highest in those with good adherence and lowest in those with poor adherence. This finding is consistent with studies that show lower viral suppression with lower adherence rates (Behrens et al., 2014; Wilkins et al., 2016]). Both of these studies showed a marked drop in viral suppression when the adherence fell below 90% to 95%. Since viral suppression is the single most important outcome and is predictive of both mortality and morbidity, measures need to be implemented to enhance adherence in the adolescents' age group including availability of adolescent-specific psychosocial support groups. The

Table 3. Treatment outcomes of adolescents on ART in selected health facilities in Machakos County, Kenya, 2018.

Characteristic	12-15 years			>15 years			Total		
	Unweighted N	Weighted %	95 % CI	Unweighted N	Weighted %	95 % CI	Unweighted N	Weighted %	95 % CI
Status of the ART patient									
Alive and retained on ART	42	77.8	(66.6 - 89.0)	77	60.2	(51.6 - 68.7)	119	65.4	(58.4 - 72.4)
Dead	1	1.9	(0.0 - 5.5)	8	6.3	(2.0 - 10.5)	9	4.9	(1.8 - 8.1)
Defaulter	1	1.9	(0.0 - 5.5)	4	3.1	(0.1 - 6.2)	5	2.7	(0.3 - 5.1)
Loss-to-follow up	5	9.3	(1.5 - 17.1)	25	19.5	(12.6 - 26.5)	30	16.5	(11.0 - 21.9)
Transfer out	5	9.3	(1.5 - 17.1)	14	10.9	(5.5 - 16.4)	19	10.4	(6.0 - 14.9)
Total	**54**	**100**	**(-)**	**128**	**100**	**(-)**	**182**	**100**	**(-)**
Viral load (copies/mL)									
< 1000	34	75.6	(62.8 - 88.3)	69	70.4	(61.3 - 79.6)	103	72	(64.6 - 79.5)
>=1000	11	24.4	(11.7 - 37.2)	29	29.6	(20.4 - 38.7)	40	28	(20.5 - 35.4)
Total	**45**	**100**	**(-)**	**98**	**100**	**(-)**	**143**	**100**	**(-)**
ARV drugs ever been stopped OR interrupted									
No	44	81.5	(71.0 - 91.9)	101	78.9	(71.8 - 86.0)	145	79.7	(73.8 - 85.6)
Yes	10	18.5	(8.1 - 29.0)	27	21.1	(14.0 - 28.2)	37	20.3	(14.4 - 26.2)
Total	**54**	**100**	**(-)**	**128**	**100**	**(-)**	**182**	**100**	**(-)**

finding that the older adolescents had poorer outcomes could be due to psychosocial and other challenges that come along with adolescence. This is the age where some of the adolescents leave parental support and get independent. Others join boarding schools where close personal support may not be available. They may also be grappling with issues of dealing with disclosure and self-esteem.

A mortality rate of 2.1 per 100 patient-years was found which was higher than that documented by Nglazi et al. (2012) of 1.2 per 100 person-years for adolescents in South Africa but lower than 6.4 per 100 person-years documented by Shroufi et al. (2013) in Zimbabwe. Though the mortality rate documented could have been slightly lower than the true value due to unreported deaths among those LTFU, it nevertheless a good indication that the closer clinical follow-up had good results.

This study had a number of limitations: Documentation was sub-optimal with missing or incomplete records in some instances. Inconsistencies were also found in the intervals that CD4 and viral load tests were performed. Whereas guidelines recommend specific intervals (every six months for CD4 and six months and 12 months after ART initiation then annually thereafter for viral load), this was not always the case. This is because part of the follow-up period was during a time when access to viral load testing was not universally available. It was also found that screening for depression, alcohol and substance abuse was suboptimal; it was thus difficult to examine how these factors may have affected adherence, viral suppression and other outcomes. The mortality rate may also have been underestimated since this was based on what was reported to the hospital in the case of the adolescents that died at home. Despite these limitations, adequate data were gotten for analysis and useful conclusions were made.

Conclusion

This study demonstrates that a big gap remains in achieving good treatment outcomes among adolescents. Of critical importance is viral suppression, which was found to be much lower in this age group, against the target of 90% in the90:90:90 UNAIDS global goals to be achieved by the year 2020 (Sidibe et al., 2016).

To achieve these ambitious targets among adolescents, it is critical to overcome the factors associated with this poorer outcome. Since viral suppression appears to be especially poorer in the older adolescents, handling the transition and adolescence challenges can help to improve outcomes. To address the lower retention and viral suppression rates, tailored interventions need to be implemented including psychosocial support through adolescent specific support groups. The National Adolescents and Reproductive Health Policy recommendations including provision of adolescent-friendly services should be implemented (MoH, 2015). Good practices such as early treatment initiation while ALHIV are still stable, closer clinical monitoring, provision of Cotrimoxazole and Isoniazid prophylaxis and screening of TB and STIs should be enhanced. Simplified and standardized treatment regimen, should be used and timely switch or substitution done during transition from childhood to adolescence. Screening for depression, alcohol, and substance abuse should become routine since adolescence is a vulnerable age for alcohol and substance use both of which can affect adherence to treatment. Cross-sectoral measures from the health sector through the community to the education sector may be the missing link that can address the continuum of care among ALHIV and address the poor retention and adherence issues. This multi-sectoral approach will lead to achievements of local, national and global treatment goals in adolescents' age group that is currently lagging behind.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Mode of transmission of HIV infection among orphans and vulnerable children in some selected States in Nigeria

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Nigeria has high rate of pediatric HIV but there is a dearth of empirical data on the mode of HIV transmission. Association for Reproductive and Family Health (ARFH), with the support of USAID, is implementing a project to mitigate the impact of HIV on Orphans and Vulnerable Children (OVC) affected/infected with HIV/AIDS in Akwa-Ibom, Lagos, and Rivers states, Nigeria. The mode of HIV transmission among their OVC was examined. A retrospective study of enrolled OVC was done in the three states. HIV OVC whose mothers are HIV positive were classified under those who got HIV through vertical transmission, otherwise horizontal. The data was summarized using descriptive statistics. Significance of association between qualitative variables and mode of transmission was determined using Chi-square test. Among the 387 OVC HIV positives who enrolled, there was a slight preponderance of males (50.6%); and about 42% were aged 10 - 17 years and 26% <5 years. Vertical mode of HIV transmission was higher (77%) in children <10 years. Horizontal transmission was highest among Akwa-ibom adolescents. In addition, age and State were significantly associated with transmission mode. A high proportion of children <10 years were infected through vertical transmission; while majority of adolescents are infected through horizontal transmission. Hence, a Swift scale-up of prevention of mother-to-child HIV transmission (PMTCT) services is recommended. Pregnant women infected with HIV need close monitoring to receive counseling as well as to get ARV prophylaxis. Also, condom demonstration should be introduced into the OVC project

Key words: Orphans and vulnerable children (OVC), HIV, prevention of mother-to-child HIV transmission (PMTCT), vertical, horizontal, transmission.

INTRODUCTION

One of the major challenges of the HIV/AIDS pandemic in developing countries is the dearth of empirical data on its mode of transmission among the pediatrics. About 90% of pediatric HIV infections were said to occur in Africa (NASCP, FMOH, NACA, UNICEF, WHO and UNAIDS, 2014). Report by the Nigerian National Agency for the

Control of AIDS (NACA) showed that nearly 1.8 million women and girls were living with HIV and AIDS in 2009; with women between 25 and 29 yearshaving the highest prevalence rate (5.6%) (NACA, 2010). Also, Nigeria is ranked second amongst countries with high rate of newly infected persons with HIV in 2012; with110,000 new HIV

infections among women aged between 15 and 49 years (UNAIDS, 2013). The mother- to-child transmission (MTCT) of HIV and the high rate of infection among women of reproductive age remains a problem in Nigeria (Anoje et al, 2012, Nkwo, 2012). Globally, almost 400,000 children were infected with HIV in 2009 and virtually all of these infections occurred through mother-to-child transmission (MTCT).

In spite of all efforts intensified by the Federal government of Nigeria, since the official flag off of the PMTCT in 2001, Nigeria still account for about 65% of pregnant women who were tested for HIV as at 2016 (UNAIDS, 2017; NBS and UNICEF, 2017).

Women who are HIV positive, who gave birth and contributed to the pool of mother to child transmission increased to about 26% in 2016 (UNAIDS, 2018). Despite purported enhanced efforts devoted to the prevention of mother-to-child HIV transmission (PMTCT), the nationwide coverage of the Nigerian PMTCT program is poor.

The major susceptible groups to HIV in Nigeria include children between 0-17 years, particularly orphans and vulnerable children (OVC) and youths, especially young women (UNAIDS, 2018). The United Nations Children Emergency Fund (UNICEF) defined 'an orphan' as a child less than 18 years of age who has 'lost one or both parents'. About 11 million of 13.4million childrenworldwide who had lost one or both parents to AIDS are from sub-Saharan Africa (UNAIDS, 2011, 2018). Also, PEPFAR defined an OVC as someone between 0-17 years who became orphaned by being infected or affected by HIV/AIDS (PEPFAR, 2012).

In 2008, an estimated 2.5 million Nigerian children aged 0-17 years were orphaned as a result of HIV/AIDS out of the 17.5 million orphans. The number of OVC dropped to 2 million in 2017 (UNAIDS, 2018). However a total of 220,000 children are living with HIV and AIDS in Nigeria (UNAIDS, 2018). Thus, the the impact of the current socio-economic problems in Nigeria on OVC cannot be overestimated (PEPFAR 2017).

Vertical transmission (mother to child) is defined as the passing on of HIV-infection from an infected mother to the infant at one or more of the following phases: In the uterus during pregnancy (Trans-placental), during the course of labor and delivery (Peri-natal), and during breastfeeding (Post-natal) (Navabakhsh et al, 2011). The baby of an HIV- infected pregnant woman has between 15% to 45% risk of being infected during pregnancy, delivery, and breastfeeding in the absence of any intervention (WHO, 2018). In developing countries, suchas Nigeria, intrauterine infection account for about 25 to 40% while peri-partum infections account for 60 to 75% of vertical infection when infants are not breastfed.

However, breastfeeding account for 8 to 25% of vertical transmission risk (Mor et al, 2006).

The sole mode of transmission that account for 90% of all HIV infections in adults includes: Unprotected sex with an infected person, infected blood and blood products transmission, as well as contaminated instruments and all other transmissions that occur between two individuals who live separately is called Horizontal transmission. In spite of recent massive investments to provide PMTCT services in Nigeria, the burden of pediatric HIV remains a serious challenge particularly among vulnerable population. A big gap is the dearth of information on the mode of HIV transmission among orphans and vulnerable children (OVC) 0-17 years. Hence, this study examined the mode of transmission of HIV among OVC positive to HIV in selected LGAs in 3 states of Nigeria.

METHODS

In 2014, USAID supported the Association for Reproductive and Family Health (ARFH) to implement a 5 year (2014-2019) project called Local Partners for Orphans and Vulnerable Children in selected Local government areas (LGAs) in Akwa-Ibom, Lagos, and Rivers States of Nigeria. The main goal is to mitigate the debilitating impact of HIV/AIDS among orphans and vulnerable children and their families in an accelerated and sustainable manner. The selection of the States and subsequent LGAs were from the PEPFAR priority LGAs based on the highest rate of HIV prevalence in Nigeria. The project is being implemented through Community Based Organizations who recruited Community Volunteers across 14 PEPFAR priority Local Government Areas in Lagos (Agege, Surulere, Ajeromi, Apapa, Badagry, Ojo and Kosofe), Akwa-Ibom (Ikot-Ekpene, Uyo, Okobo, Oron and Uruan) and Rivers (Port-Harcourt, Eleme and Obio/Akpor) states. People living with HIV (PLHIV) were identified and enrolled through the community HIV testing of all members of the households infected or affected by HIV in the LGAs. The community volunteers accompany those referred for HIV Testing Services (HTS) to health facilities, results are collected and those positive are counselled and referred to treatment same day.

All OVC who are HIV positive with mothers that are HIV positive were classified to have vertical transmission of HIV in this study; whereas, all OVC that are HIV positive but their mothers were negative were assumed to have HIV through horizontal transmission.

This study is a secondary analysis of data gotten from the HIV positive OVC on the LOPIN 1 project collected in the 3 implementing states (Akwa-Ibom, Lagos and Rivers states). The database contained information on 387 consecutively enrolled OVC aged between 0-19 years. The data included the child's age, sex, State/LGA of residence, mother's HIV status, and caregiver's HIV status.

Descriptive statistics such as means and proportions were used to summarize the age and sex of the OVC, the transmission mode (vertical or horizontal transmission); while Chi-square statistics was used to determine the significance of the association between the variables of interest using the SPSS version 20.

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Table 1. The distribution of HIV positive OVC enrolled on the LOPIN 1 project by selected variables and mode of transmission in Nigeria, 2018.

Variable		Mode of transmission			Chi-square	P-value
		Horizontal (%)	Vertical (%)	Total (%)		
Age of OVC (in years)	0-4	17 (17.2)	82 (82.8)	99 (25.6)	15.2	<0.05
	5-9	24 (19.2)	101 (80.8)	125 (32.3)		
	10-14	26 (23.6)	84 (76.4)	110 (28.4)		
	15-17	23 (43.4)	30 (56.6)	53 (13.7)		
Sex of OVC	Female	51 (26.7)	140 (73.3)	191 (49.4)	2.51	0.11
	Male	39 (19.9)	157 (80.1)	196 (50.6)		
State	Akwa-Ibom	38 (44.2)	48 (55.8)	86 (22.2)	35.08	<0.05
	Lagos	25 (12.4)	176 (87.6)	201 (51.9)		
	Rivers	27 (27.0)	73 (73.0)	100 (25.8)		
	Total	**90 (23.3)**	**297 (76.7)**	**387**		

RESULTS

Table 1 showed the age, sex and state distributions of OVC enrolled in the LOPIN 1 project as at 2018 by their mode of HIV transmission. A quarter of the OVC were less than 5 years of age, while almost a third were between 5 and 10 years with only 14% in the age group 15 to 17 years. About 77% of the OVC were infected by their mothers, while the remaining were through horizontal transmission of HIV, with a higher proportion (82%) in this category among children less than 10 years of age. There was a statistically significant association between the age of OVC and mode of HIV transmission P<005. Adolescents, 15 to 17 years, were more likely to be infected through horizontal transmission.

OVC males who are HIV positive had a slight preponderance (50.6%) than the females. Although a higher proportion of male OVC (80%) than females OVC (73%) could be said to be a victim of HIV transmission from mother to child, this was not statistically significant, P>0.1.

The highest proportion of the positive OVC (52%) were enrolled in Lagos state followed by Rivers state (26%) and 22% from Akwa-Ibom state. In addition, a greater proportion of OVC acquiring HIV through mother to child transmission were from Lagos state, while HIV positive OVC from Akwa-Ibom state was more of horizontal transmission compared to other states. The mode of HIV transmission and State of the OVC was statistically significant P<0.05.

Table 2 shows the result of the logistic regression analysis to identify independent predictors of Mode of HIV transmission after adjusting for another confounding variable (sex). OVC less than 10 years were more than four times likely to acquire HIV through their mothers compared to those aged 15 years and above, who had the highest proportion of HIV positive. The OVC from horizontal transmission was P<0.05. The logistic regression analysis also showed only 2 variables (age and state) to be independent predictors of the mode HIV transmission to OVC. While OVC from Lagos state are almost 3 times likely to acquire HIV from their mothers compared to those from Rivers state, the reverse was observed in Akwa-Ibom where OVC were 61% less likely to acquire HIV through mother to child transmission and this were statistically significant (p <0.05)

DISCUSSION

The finding of a high proportion of vertical transmission of HIV among the OVC sample in this study deserves some comments. Although, the places of delivery of OVC are not known, one can attribute the high number of vertical transmission to poor utilization of PMTCT services. The HIV status of a woman can be determined during pregnancy at health facilities (antenatal care (ANC), where the PMTCT can be achieved. Unfortunately, most women usually give birth at home or with the help of traditional birth attendants. Most women in this study might not have had supervised care during pregnancy at hospitals or clinics, where HIV testing is regularly done in Nigeria. This has been a renowned dilemma in Nigeria, where almost 1.8 million women and girls are living with HIV. Despite efforts by the Nigerian Ministry of Health, the prevalence of the HIV infection continues to amplify. Only 32% of women who tested positive during pregnancy received ARVs in 2011 (NACA, 2011). To achieve the UNAIDS 90-90-90 goal (By 2020, 90% of all people living with HIV will know their HIV status, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy, 90% of all people receiving antiretroviral therapy will have viral suppression), it is crucial to recognize the socio-cultural aspect that aid or deter PMTCT service uptake in Nigeria.

The fear of stigma and prejudice are the main deterrent

Table 2. The logistic regression statistics for the predictors of mode of transmission of HIV among OVC in selected states in Nigeria, 2018.

Variable	Vertical (%)	OR (95% CI)	
		Unadjusted	Adjusted
Age group			
0-4	99 (82.8)	4.31 (1.91-9.76)*	4.62 (2.05-10.42)*
5-9	125 (80.8)	4.31 (1.99-9.32)*	4.56(2.12-9.81)*
10-14	110 (76.4)	2.54 (1.20-5.37)*	2.57 (1.22-5.43)*
15-17	53 (56.6)	1.00	1.00
Sex			
Female	191 (73.3)	0.68 (0.40-1.14)	-
Male	196 (80.1)	1.00	-
State			
Akwa-Ibom	86 (55.8)	0.39 (0.20-0.74)*	0.40 (0.21-0.76)*
Lagos	201 (87.6)	2.73 (1.46-5.15)*	2.76 (1.47-5.17)*
Rivers	100 (73.0)	1.00	1.00
Total		**387 (76.7)**	

to voluntary counseling and testing for HIV, which often influence decisions and actions towards PMTCT service uptake. The negative effects of HIVstigma and discrimination have been highlighted in studies conducted in other African countries (Airhihenbuwa et al, 2009). Non-adherence to ARV's among pregnant women with HIV seems to be another issue of MTCT (Enwereji and Enwereji, 2010). Regular contribution to HIV tests for all pregnant women and their partners, incorporating HIV test with other prenatal tests as well as other services irrespective of socio-economic status should be the major aim. Data from the NDHS 2008 (NDHS 2008) showed that low socioeconomic status is the most imperative factor for low utilization of antenatal and other maternal care services. The relative high cost of health service for the poor general public is another issue of concern in Nigeria, and the OVC are greatly disadvantaged. Therefore, devising inexpensive inventive techniques to get in touch with this group of women is a major task that should be accomplished in order to reduce MTCT. Nonetheless, financial support should be associated with the aim of Federal government to augment access to comprehensive gender-sensitive prevention, care, management and support services for the populace alongside the national strategic structure.

Another option is to develop family-oriented, sustainable community-based programs that proffer PMTCT services as well as voluntary counseling and testing services, clear of the regular clinic settings to all, including Orphans and Vulnerable Children households. It was found that the sex distribution of HIV-positive OVC in this study is slightly in favor of males but this was not statistically significant and may not have anything to do with the mode of transmission as found in this study. This is in conformity with previous reports where no sex difference

was observed (Brahmbhatt et al, 2009). Another major finding in this study is the significant association of age and location of OVC with mode of transmission. The fact that children less than 10 years were more likely to receive HIV transmission from their mothers and a high proportion of adolescents from horizontal transmission has implications for the OVC project. The HIV counseling aspect of the project focused more on abstinence. This study shows that some of these adolescents must have been sexually active to have contracted HIV through horizontal transmission; the implication is that it is now imperative to include condom demonstration and other HIV preventive measures during HIV counseling and testing of the adolescents.

Furthermore, the fact that 24% of the OVC in this study must have acquired their HIV through horizontal transmission could be attributed to their poverty state, negative peer influence, poor sex education and poor gender mainstreaming.

In an attempt to make ends meet financially, some of these children might have been engaged with hawking and child trafficking, which makes them more susceptible to gender based violence including sexual abuse. Children in this age group are also usually sexually active, independent, and are involved in recreational and developmental activities that could lead to sexual abuse. Another finding in this studyis that young children contracted HIV through horizontal transmission were more from Akwa-Ibom State, which corroborate the current finding from the National AIDS indicator and impact study (NAIIS) (NAIIS, 2019). This survey indicated Akwa-Ibom to have the highest prevalence of HIV, including pediatrics. These might be because the state is peaceful and many foreigners who could induce some of these young girls into sexual abuse live in these states.

Conclusion

There is an imperative need for a swift scale-up of the PMTCT services in Nigeria to reach many women in communities where there are no access currently. For PMTCT programme to successfully avert vertical transmission of HIV between mother and baby, pregnant women must effectively follow the PMTCT course, starting with receipt of HIV counseling and testing to getting ARV prophylaxis and ensuring safe infant feeding practices. Every healthcare provider concerned with caring for pregnant women should be very familiar with the PMTCT interventions in order to achieve this goal. Furthermore, extensive accessibility of amenities for HIV tests and timely diagnosis or early exclusion of HIV infection in the at-risk infants are required for apt initiation of treatment of infected infants. This is in addition to purposeful assessment of the PMTCT program. It is recommended that HCT centres should be user-friendly and youth-friendly. Media advocacy on HIV knowledge, stigmatization and discrimination should be embarked on, policies to tackle programmatic challenges of extended turnaround time, effectual referrals and connection to care is crucial. OVC programs should include all HIV prevention and control measures used for adults and also ensure the formation of HIV prevention groups in secondary schools.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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