Adherence and retention studies of HIV-positive adolescents in Southeastern Nigeria and factors responsible for their outcomes: a quantitative and qualitative study

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Abstract

Adolescents living with HIV have an increasing burden of AIDS-related illnesses and death. Studies in other countries showed poor adherence to antiretroviral therapy (ART) and retention-in-care among this group. Limited studies exist in Nigeria on this subject. This cross-sectional study therefore assessed the level of adherence to ART and retention-in-care by HIV-positive adolescents in South-East Nigeria and the factors responsible for their outcomes, using a mixed methods approach. The study states and the interview participants were selected using convenient and purposive techniques, respectively. A multistage sampling technique was used for the selection of the study hospitals. The data for the quantitative study were from eligible patients' folders. For the qualitative studies, face-to-face in-depth interviews and key informant interviews were conducted on purposively selected HIV-positive adolescents and healthcare staff, respectively. Quantitative and qualitative data were analysed descriptively and thematically, respectively. The result showed that only 34.7% of the 147 HIV-positive adolescents assessed achieved ≥ 95% adherence to ART, and 72.2% were retained-in-care in 2016. The adherence level was not affected by the demographic variables and was not statistically different in the study states. Poverty was the major constraint, and improved working conditions were a major facilitator to the study outcome measures identified. HIV-positive adolescents in South-East Nigeria had poor adherence to ART (34.7) %, and a somewhat poor retention-in-care (72.2) %. The findings are worse than the reported poor global level of 62% adherence to ART and 85% retention-in-care. Service delivery interventions using the identified factors will improve these outcomes.

Keywords: HIV adolescents, adherence, retention-in-care, constraints; facilitators, Nigeria

Introduction

Over 1.6 million adolescents aged 10-19 years are currently living with Human immunodeficiency virus (HIV) worldwide (UNICEF, 2019). Between the year 2000 and 2015, the number of acquired immune

deficiency syndrome (AIDS) related deaths in adolescents tripled (Avert, 2019). HIV is the second leading cause of death among adolescents worldwide and the second leading cause of death among adolescents in Africa with about 89% of the infected adolescents living in sub-Saharan Africa (UNICEF, 2019).

Nigeria has the second-largest HIV epidemic in the world and one of the highest rates of new infection in sub-Saharan Africa (UNAIDS, 2017). A recent study by Badru et al in 2019 recorded an HIV prevalence of approximately 3.5% in Nigerian adolescents which is the highest among countries in West and Central Africa (Badru et al., 2020). HIV adolescents in Nigeria make up a greater number of the population at risk, which accounts for over 32% of new HIV infections (Avert, 2018). These adolescents have limited access and poor linkages to health facilities, attributed mainly to their psychological changes and low health-seeking behaviour (Ekwunife, Anetoh, Kalu, Ele, & Eleje, 2018). Also, the retention-in-care and adherence to antiretroviral therapy (ART) of those linked to care are of concern because improvements in these outcomes will result in viral suppression and increased immunological response. Suboptimal adherence to ART could lead to treatment failure, and the emergence and transmission of HIV drug-resistant strains (Anghel, Farcas, & Oprean, 2019). HIV Positive adolescents' adherence to ART and retention-in-care in most parts of the world have been assessed (Kim, Gerver, Fidler, & Ward, 2014). However, there is a paucity of data on HIV positive adolescents' adherence to ART and retention-in-care in Nigeria. Such data could increase awareness of the problem and stimulate discussions to provide possible solutions. Establishing the factors responsible for improving HIV adolescents' adherence to ART and retention-in-care will help the design of service delivery interventions to improve these outcomes. This study, therefore, aimed to ascertain the level of adherence to ART and retention-in-care by adolescents living with HIV/AIDs (ALHIV) in southeastern Nigeria as well as the factors responsible for the outcomes.

Methods

Study location

The study was carried out in three randomly selected States out of the five States in South-East Nigeria, namely, Anambra, Enugu, and Imo State. The HIV treatment hospitals selected were from those approved by the National Agency for the Control of AIDS (NACA). One tertiary hospital, a rural and an urban secondary hospital were selected from each of the chosen states. The hospitals purposively chosen for the study were; Anambra State; Nnamdi Azikiwe University Teaching Hospital(NAUTH) Nnewi, General Hospital Onitsha, St Joseph Hospital Adazi-Nnukwu. Imo state; Federal Medical Centre Owerri (FMC Owerri), General Hospital Awomama, General Hospital Umuguma, while Enugu State; University of Nigeria Teaching Hospital Ituku Ozalla (UNTH), Oji General Hospital, and Our Saviour Medical Centre, Ngwo

Study design and data collection

A mixed methods design was employed to provide a contextual qualitative understanding of some identified quantitative findings. The quantitative study was a cross-sectional review of the clinical and demographic data of the ALHIV in the nine, selected HIV treatment hospitals. The major outcome data was the level of adherence to ART, measured either through pill count or patient self-report. Their adherence to clinic appointments was also assessed. These data were collected using a predesigned data collection form. In-depth interviews (IDIs) were conducted with purposely selected non-adherent ALHIV or with the caregivers of the under-aged ALHIV. Similarly, Key

Informant Interview (KII) was conducted on purposely selected healthcare professionals. IDIs and KIIs assessed the factors contributing to non-adherence to ART and non-retention-in-HIV care and the possible interventions to ameliorate them from patients and healthcare professional's perspectives respectively. This study was conducted between October 2017 and March 2018.

Study instruments

IDI and KII instruments were developed according to the Karen Brouneus and Krishna Kumar's guidelines respectively (Brounéus, 2011; Kumar, 1989). The instruments (Appendix 1 and 2) were face validated by four experts in HIV care (two doctors, a nurse and a pharmacist). All IDIs and KIIs sessions were conducted in English in a confidential setting and audio-taped to allow for accurate transcription. Notes were taken by the research assistant during the interviews.

Sample size and sampling technique

A multistage sampling technique was used to select the states and the HIV treatment hospitals (https://www.randomizer.org/). A total of fifty interviewees (18 ALHIV or caregivers and 32 Healthcare workers including 11 doctors, nine pharmacists, nine nurses and three adherence counsellors) were purposely selected from the study hospitals for qualitative data collection. Due to paucity of records of HIV positive adolescents in the facilities, all available eligible folders were used for the quantitative data in the selected hospitals.

Eligibility criteria

The quantitative assessment included adolescents between 10-19 years who are HIV positive, accessing ART, and HIV care in any of the selected HIV treatment hospitals at least 6 months before the study period (2014 - 2016). Eligibility for the IDI included ALHIV that were aware of their HIV status, those receiving HIV care at the selected HIV treatment hospitals, and those non-adherent to ART and care, who gave a written informed consent. Eligibility for the KII involved healthcare professionals working in the selected HIV treatment hospitals, who gave a written consent to participate. All the participants were introduced to us by the adherence counsellors in the various hospitals.

Data analysis

Quantitative data were analyzed using SPSS version 20 (Chicago, IL). Patients' demography was analysed using descriptive statistics and presented in frequencies and percentages while the relationship between the major demographic characteristics and adherence were analyzed using Chi-square. The level of adherence was rated as optimal adherence if adherence level was ≥ 95% and suboptimal adherence if adherence level was < 95% (Swann, 2018). Health Resources and Services Administration (HRSA) method was used to assess retention-in-care in the year 2016 and involved at least one outpatient ambulatory health services visit by September 1 of the measurement year, with a second visit at least 90 days after (Mj et al., 2012). Statistical significance was determined at a *p*-value of 0.05. A thematic content approach was utilized for qualitative data (Vaismoradi & Snelgrove, 2019). Responses from IDIs and KIIs were systematically read to identify the meaning units (Vaismoradi & Snelgrove, 2019). The meaning units were coded using a describing cue related to the content of the meaning unit. Codes concerning the same subject were grouped into categories. The interview guides were used as a point of departure for grouping information, deductively. Information obtained during the IDIs and KIIs were analyzed and merged according to the codes, and themes. Original data was reassessed to detect any

concepts or information that may have been missed.

Outcome measures

The outcomes measured were adherence level of the ALHIV to ART, their level of retention-in-care and the factors affecting the adherence and retention status of the HIV-positive adolescents in the study area.

Ethical considerations

This research was conducted according to the Helsinki declarations on ethical principles from medical research involving human subjects (Skierka & Michels, 2018). Written informed consent was obtained from all the respondents of KII, ALHIV aged 18 years and older, and caregivers of ALHIV less than 18 years after obtaining assent from the adolescents. Full ethical approvals (**NAUTH/CS/66/VOL.10/70/2017/029 and NHREC/05/01/2008B-FWA00002458-1 RB00002323)**) were obtained from the Ethical Committee of Nnamdi Azikiwe University Teaching Hospital, Nnewi in October 2017 and University of Nigeria Teaching Hospital Ethics Committee Ituku Ozara Enugu on 21 September 2017.

Results

The ALHIV studied (147) were fairly distributed in three states in southeastern Nigeria. About one-half of them were males and a greater percentage (56.4%) were within the ages of 10-15 years. Further demographic variables of the study participants are shown in Table 1. Of the 52 participants selected for the qualitative interviews, ten healthcare workers and four ALHIV declined participation, mainly due to time leaving 10 ALHIV, 4 caregivers and 22 healthcare workers (nine physicians, five pharmacists, five nurses and 3 adherence counsellors).

Table 1: Demographic Characteristics of the ALHIV for the Baseline Adherence Studies

(n = 147)

Demographic Characteristics		**Frequency (Percentage)**
Age in years		
	10 – 15	83 (56.4)
	16 – 19	64 (43.5)
Sex		
	Male	70 (47.6)
	Female	77 (52.4)
Clinical Stage on Entry		
	Stage 1	52 (35.4)
	Stage 2	58 (39.5)
	Stage 3	32 (21.7)
	Stage 4	5 (3.4)
Route of Transmission		
	Vertical	56 (38.1)
	Sexual	43 (29.3)
	Others	48 (32.6)
Antiretroviral in use		
	ALT	3 (2.0)
	ZLN	42 (28.6)
	ZLE	32 (21.8)
	TLE	59 (40.1)

	ZLN_p	11 (7.5)
State		
	Anambra	49 (33.3)
	Enugu	52 (35.4)
	Imo	46 (31.3)

ALHIV Adolescents Living with HIV
ALT – Abacavir, Lamivudine, Tenofovir
TLE – Tenofovir, Lamivudine, Efavirenz
ZLE – Zidovudine, Lamivudine, Efavirenz
ZLN - Zidovudine, Lamivudine, Nevirapine
ZLN_P –Zidovudine, Lamivudine, Nevirapine with protease inhibitor

As shown in Figure 1, only 34.7 % of the 147 ALHIV assessed achieved optimal adherence to ART and almost three-quarters (72.2%) were retained-in-care in the study period. There was no statistically significant difference in adherence to ART among the ALHIV based on the routes of HIV transmission (p = 0.138). The level of adherence to ART was neither affected by sex, state nor by age (p = 0.094, p=0.064, p= 0.325 respectively). Further sub-group differences in adherence to ART are shown in Table 2.

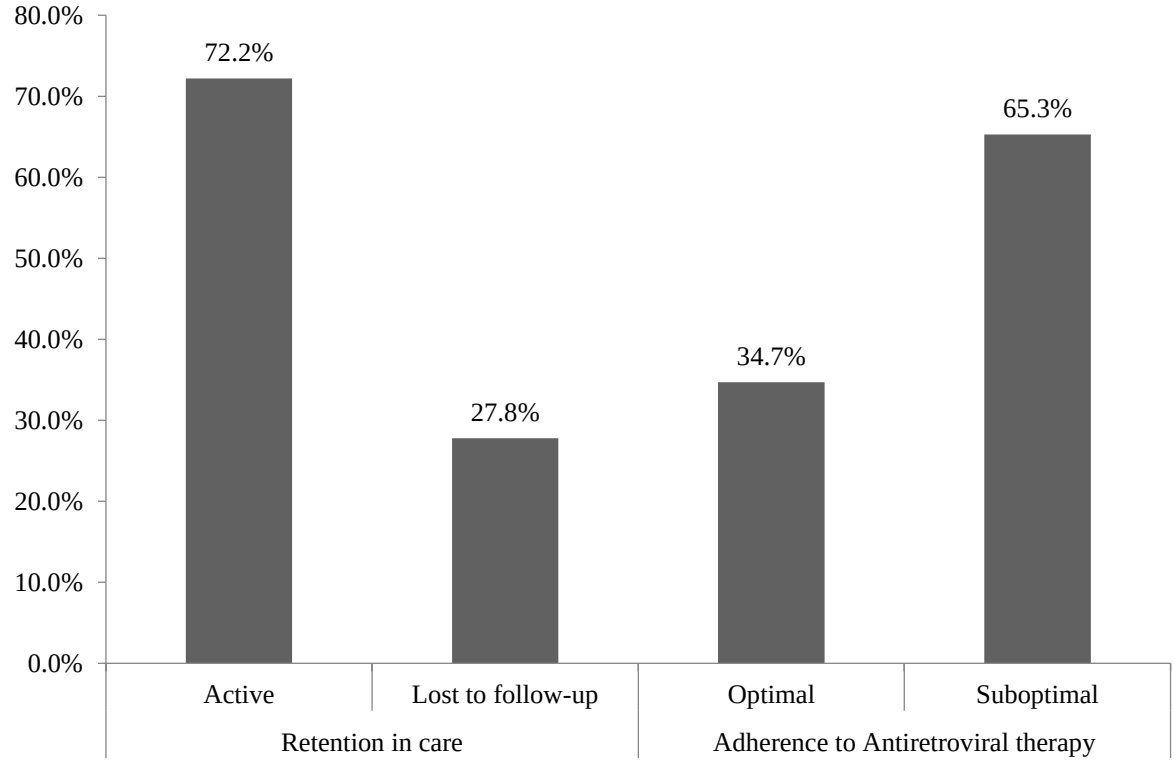

Figure 1: HIV positive adolescent's level of retention-in-care and adherence to antiretroviral therapy (n = 147)

Table 2: Adherence to ART of the ALHIV against various demographic variables (n =147)

Variable	Adherence (%)			*P*-value
	Suboptimal	Optimal	Total	
Route of Transmission				
Vertical	39 (40.6)	17 (33.3)	56(38.1)	
Sexual	31 (32.3)	12 (23.5)	43(29.3)	0.138
Others	26(27.1)	22(43.1)	48 (32.6)	
Total	96(100.0)	51(99.9)	147(100)	
Sex				
Male	50(52.1)	20(39.2)	70 (47.6)	0.094
Female	46(47.9)	31 (60.8)	77 (52.4)	
Total	96(100)	51(100.0)	147(100.0)	
States				
Imo	31 (32.3)	15(29.4)	46(31.3)	
Anambra	26 (27.1)	23(45.1)	49(33.3)	0.064
Enugu	39 (40.6)	13(25.5)	52(35.4)	
Total	96 (100.0)	51 (100.0)	147 (100.0)	
Age				
Paediatric adolescents	56 (58.3)	27(52.9)	83(56.5)	0.325
Adult adolescents	40 (41.7)	24 (47.0)	64 (43.5)	
Total	96 (100.0)	51 (100.0)	147 (100.0)	

ALHIV : Adolescents Living with HIV

The result of the interview sections (IDI and KII) was grouped into eight (8) themes with forty-four (44) sub-themes (see Table 3). These themes represent the major factors which facilitate or prevent adherence to ART and retention-in-care of the HIV-positive adolescents from the healthcare providers and the HIV-positive adolescents' perspectives. The major themes identified were: Poverty, stigmatization, caregivers' influence, excess workload, factors related to drugs, support groups, improved working conditions, and living with HIV positive parents/guardians.

Table 3: Shows the factors (themes and the various sub-themes) affecting the adherence to ART and retention-in-care of the HIV-positive adolescents that emanated from the interview session

SN	*Themes*	*Sub-Themes*	*Number of persons who reported it*
1	Poverty	• No regular visit on clinic days because of transport money and money for other payments • Malnutrition • Does not carry out necessary tests	30 (22 Health workers, 8 ALHIV)
2	Fear of stigmatization	• Hides to take drugs or don't even take the drugs • Does not attend clinics • Travels very far to a clinic in other not to be recognized • Depression	14 (8 healthcare workers, 6 ALHIV/Caregiver)
3	Caregivers Influence	• Forgetfulness • The poor state of health • Late presentation to clinics • Poverty • Fear of stigmatization • Fear of abandonment • Ignorance • Busy Schedule	14 (12 healthcare workers and 2 Caregivers)
4	Excess workload/ shortage of staff	• Lack of proper counselling • Unconducive environment • A longer stay in hospital • The unfriendly attitude of health workers	10 (7 healthcare workers and 3 ALHIV, 2 Caregivers)
5	Factors related to drugs	• Taking drugs with parents • Directly Observed Therapy (DOT) • Call or send a reminder for check-ups / take ART • Use of alarm in the phone to remind self when to take drugs • Giving drugs by proxy • Improved drug supply chain • Home delivery of drugs • Adverse drug reactions	20 (14 healthcare workers and 6 ALHIV)

		• Increased pill burden	
6	Support groups	• Provision for essential food materials • Incentives to encourage those that have remained adherent	10 (7 Healthcare workers, and 3 Caregivers)
7	Political will	• Government active participation through provision of; • improved infrastructure • Recruitment of more staff • Involvement in drug research and supply • Provision of job opportunities for ALHIV • Training of the healthcare staff • Financial assistance to help with transport costs • Waving of folder fee/ fee for service • Empower them with sustainable job opportunities	23 (14 healthcare workers and 7 ALHIV and 2 Caregivers)
8	Living with HIV positive parents/guardians	• Directly observed therapy (DOT) • Psychological Protection • Financial support	6 (4 healthcare workers, 2 ALHIV)

Some excerpts from the statements made by the various interviewees representing the various themes are:

A. *Poverty*: More than half of the interviewees made statements relating to how poor financial status affects the retention-in-care and adherence to ART of the ALHIV. Some of the statements as made by the interviewees include:

'The infection is more common among the low and middle-income earners. Majority of them lack money for transport, to pay for the folder fee, service charge and money to run other recommended tests not covered by the program' (Nurse).

'My parents are dead and my grand mum does not have money to be paying for transport fare and folder fee, even now that I come, it is my aunty, just a nurse that likes me that has been giving me money for my transport fares and folder fees' (ALHIV,19-year-old female).

B. *Stigmatization*: About eight healthcare workers and six ALHIV made specific statements to show how complex due to stigmatization have affected the regular clinic visits of the adolescents and their adherence to ART. Some of the statements as made by the interviewees are;

I am an orphan and the only child. Since my grandmother that I was living with died,

I find it difficult to tell my uncle or my aunt about my condition because I do not want them to abandon me. I hide to take my drugs and only come to the clinic when I have some money. I also do not tell anybody when I am coming to the clinic. "It is not easy on me" (ALHIV, 19-year-old female).

Another ALHIV stated how depressed she feels about her condition to the extent that she puts her drugs in another container so as not to allow others to know the drugs she takes. She stated;

'I always feel so bad about my condition. I got it from birth and I am the last born and the only one infected with HIV out of the three children. My brothers do not know about my condition but my father knows. I am living with my grandmother. My mum is late now and my father has married another wife. "Whenever I visit them, I put my drugs in drug envelop and hide to take them". I do not stay long with them' (An 18-year-old ALHIV).

A caregiver who though negative expressed how she has to be travelling to a far HIV treatment hospital so as not to be seen as being HIV positive. She stated,

'We live in Delta State and travel to Enugu for a checkup because I don't want to be seen as being HIV positive because I am not. It is because of my late sister's son and this is very expensive and the whole day is wasted' (A caregiver).

Some patients also go to the extent of providing fictitious addresses and phone numbers so as not to be recognized. Some KIs stated,

'Majority of the clients give wrong phone numbers and names for fear of being recognized and this makes it difficult to track them' (An adherence counsellor).

A certain NGO brought support materials and needed twenty HIV positive people accessing care in the clinic to give the materials, out of the twenty numbers called, only three identified with their numbers while others were either switched off or were wrong numbers, and those three were given the foodstuff and other materials. When some of them later came for a checkup, we asked them why the number they gave us was not going and explained to them why we were calling. They felt so bad and then gave their correct numbers (Adherence counsellor).

C. *Caregivers Influence*: Some caregivers perhaps due to their level of education or commitment cause serious setbacks on the health outcomes of the ALHIV in their care. Here are some of the statements on caregiver's attitude as made by the interviewees;

Majority of the cases we see here are already bad before the presentation. Their caregivers out of ignorance and say poverty often take them to prayer/healing homes and when it is glaring that the condition of the ALHIV has worsened, they come to the hospital for you to perform 'the magic. "The truth is that they even spend more money at the prayer/healing homes" (Nurse).

Also, a caregiver who is not aware of the risks associated with non-adherence to ART stated the following:

I sell vegetables (Ora) at the park and leave home as early as 5.00 am to meet up with the long-distance travellers, so most of the time I forget to give him (The ALHIV) his drugs before going out in the morning, but I try to give him the ones in the night except when I am so tired and slept off. (Caregiver).

Some caregivers are equally great facilitators in ensuring adherence to ART. For example, an ALHIV reported the following:

'I now take my drugs with my mum at the same time every day so I don't miss my drugs again except when our drugs finished and we have not gone to the hospital' (ALHIV, 13-year-old).

D. *Excess Workload / Shortage of Staff*: This theme was reported as a barrier to adequate care of the ALHIV. The excess workload is as a result of a shortfall in the number of HIV staff and also HIV patient's possible preference for the tertiary hospitals. One KI stated that:

The client surge is so high and pharmacy is usually the last port of call. This in addition to the shortage of staff does not allow us enough time to check their pills and talk with them or say motivate them as should be done. We, therefore, rely more on clients self-report on adherence to ARVs (Pharmacist).

A caregiver also narrated how this client's surge coupled with the shortage of staff has always made her spend more time than she anticipated. She stated that,
'Almost a whole day is gone anytime we come for a check-up as so much time is wasted before seeing the doctor and collecting our drugs' (Caregiver).

E. *Factors related to drugs*: Most of the interviewees mentioned peculiar factors related to drugs which in one way or the other have facilitated adherence to ART and retention-in-HIV care of the ALHIV. Some of the factors constantly mentioned were; taking drugs with parents who are also HIV positive, the practice of directly observed therapy (DOT), a phone call from a friend or healthcare provider or short message service (SMS) reminder to take drugs and go for checkups, individual, setting alarm to remind self when to take drugs, giving drugs by proxy, home delivery of drugs and improved drug supply chain. Among the factors related to drugs which hinder adherence to ART as mentioned by the interviewees were pill burden and adverse drug reactions. Here are some of the statements;

'I now have a phone that I have set the alarm to remind me when to take my drugs and equally have a power bank so that my phone never runs out and it has been helping me' (an 18- year -old ALHIV).

'The ARV drugs supply chain is highly effective now and there is a relatively constant supply of the needed ARVs except if you did not make your request on time' (A Pharmacist).

An ALHIV who reported the uncomfortable feelings experienced with a certain ARV (name not known) as a hindrance to adherence to ART stated that:
'There was a time that I was given one drug which used to make me weak after taking it so I stopped taking it until I came for checkup and complained and it was changed. The one I am taking now does not do me anything and I take it regularly' (A 19-year-old ALHIV).

F. *Support Groups*: Belonging to support groups has been useful in encouraging regular clinic visits by the HIV adolescents and in the adherence to their HAART regimen. A key informant stated;

"Support group is very important and has worked in the past with the previous funders. Through it, financial, health talk and material assistance were extended to the ALHIV. I suggest that the present funders should still use support groups. i.e. Fhi 360 or the federal government" (Nurse).

Caregivers are also of the opinion that support groups have a great impact on alleviating their poverty level and making them have better control of their condition. A caregiver stated this;

'A few years ago, we used to meet in the hospital every first Saturday of the month

and there, they shared a lot of things; clothes, foodstuffs and money and gave the ALHIV talk on how to still be healthy even with HIV, but this has not been the case lately. They equally used to organize sessions for the caregivers where we were taught the best way to take care of the ALHIV' (Caregiver).

G. *Improved working condition*: Active participation by the government in improving the working condition of the staff and in implementing service delivery interventions according to many of the interviewees will help in no small measures to improve the outcomes of the ALHIV. A KI stated;

'A lot of interventions are possible but most will require the government active participation in assisting the donor agencies in drug research and supply, providing enough workforces to meet the teeming population, providing adequate infrastructure and financial assistance to the clients' (A doctor).

Some caregivers also mentioned that if the government should provide the necessary machines for the analysis of their samples, they will be able to notice on time when their health indices start varying and make every effort to correct them. A caregiver stated that,

'Government should provide good working machines for tests because most of the time, they will say to us that the machine is faulty. They should also help us with good jobs because feeding money is difficult to talk less of transport money and money for service charge' (Caregiver).

H. *Living with HIV positive parents/guardian and DOT*: Some of our interviewees reported that adolescents who live with their parents especially those who are also HIV positive or who are 'adopted' to families who are also HIV positive are better adherers to ART because their parents give them the maximum protection they need and ensure they take the drugs as and at when due, in most cases through directly observed therapy DOT.
Some of the KIs stated;

'From experience, ALHIV who are living with their parents who are also HIV positive adhere better to ART and are retained-in-care longer because they take their drugs with their parents and visit the clinic as well with them' (A doctor).

'*About three to four orphaned adolescents have been "adopted" into the families of some capable HIV positive couples' homes in this facility and they are doing well' with their medications and clinic visitation'* (Nurse).
A key informant also stated how they encourage non-adherent ALHIV to visit the clinic on daily basis to ensure the actual intake of their prescribed ART through DOT and how such practice has helped many of them to get better and imbibe the habit of daily drug consumption. He said,
'We have handled many difficult cases of non-adherent ALHIV and one is right here waiting for me, apart from motivationally interviewing them, we insist that they take their drugs daily under directly observed therapy (DOT) except on Saturdays and Sundays for some weeks until remarkable improvement is seen in their attitude to drug use. It involves a lot of sacrifices like time and money but the outcome is encouraging' (A Doctor).

From the qualitative assessment, the financial constraint was constantly cited by the interviewees. Majority of the parents and caregivers lack steady jobs and this affected not only their food supply but also their clinic visits. They lack money to pay for transportation, consultation fees and to carry out other tests not covered by the HIV program. Poverty, stigmatization, and excess workload/ shortage of staff were consistently identified by the interviewees as constraints to adherence to ART and

retention-in-care while living with HIV positive parents/guardians, and support groups were constantly cited as facilitators of adherence to ART and retention-in-care. Caregivers' attitude, factors related to the ARTs and improved working condition influenced these outcomes positively and negatively.

Discussion

A very poor level of adherence to ART (34.7%) and retention-in-care (72.2%) requiring an improvement was observed in this study. This poor level of adherence to ART is worrisome and lower than the established global poor level of adherence to ART and retention-in-care as reported in systematic reviews by Kim *et al*. (2014) and Murray *et al.* (2017) respectively. Our findings were contrary to the findings in a similar study in Uganda by Nabukeera-Barungi *et al*. (2015), where an adherence level of ≥ 95% was observed in the ART cards of 1588 (90.4 %) HIV positive adolescents out of the 1824 adolescents assessed. Again, of the 156 ALHIV who were newly started on ART, 90 % were still active in care at one year assessment. However, factors affecting adherence to ART and retention-in-care observed in the study were similar to our findings. Similar trends in adherence based on the various demographic characteristics and study states were observed in our study. Therefore interventions applicable in one state may work perfectly in other states in the South-East Nigeria all other things being equal.

The major constraints to the study outcomes (adherence to ART and retention-in-care) identified were poverty, stigmatization, and, excess workload, while facilitators to these outcomes were support groups, living with HIV positive parents/ guardians, improved drug supply chain and government active participation in HIV program. Caregivers' attitude had both positive and negative influences**.** There is an urgent need to implement interventions exploring these identified constraints and facilitators to reverse the downward trend in the health indices of these vulnerable HIV positive adolescents. This will also help to actualize the UNAIDS goal to end the HIV epidemic in 2030 (Casale *et al.*, 2019).

Poverty resulted in many cases of missed appointments to the extent that one of the ALHIV reported splitting her drugs to ensure her daily use until she had transport money to go for a checkup. Poor adherence resulting from financial constraints affects greatly the health outcomes of ALHIV patients (Swann, 2018). Counselling geared towards understanding the importance of rational use of the ART and encouraging behavioural change towards making health needs a priority is necessary for the HIV positive adolescent group.

The findings of this study showed that high client to health personnel ratio could result in a poor quality of care. Expanding the HIV care centres in line with the WHO decentralization agenda, employing more healthcare personnel as well as improving infrastructure in line with the National guideline on HIV/AIDS management will help improve their retention-in-care, and ART adherence because of the proximity of services to the clients (FMOH, 2005; Kolawole et al., 2017; Manley, 2013; Mukora, Charalambous, Dahab, Hamilton, & Karstaedt, 2011). Interestingly, a study conducted in southeastern Nigeria found that local health facilities such as community pharmacies are willing to participate in HIV care. (Ajagu, Anetoh, & Nduka, 2017)

The practice of DOT has been effectively used in the past to increase medication compliance in Tuberculosis (TB) management (Karumbi and Garner, 2015). A parent who is HIV positive knows the importance of adherence to ART and therefore ensures improved well-being of

the ALHIV in his care by ensuring regular ART use by the ALHIV through direct observation of the drug consumption and possibly taking their ART at the same time with the ALHIV, as was reported by a caregiver in the IDI. For the caregivers who are HIV negative, caregivers' support groups could allow their education in HIV care and improve proper monitoring of their wards.

The study showed that improving working conditions of healthcare professionals working in the HIV treatment hospitals such as providing enough work space, adequate staff, functional machines and appliances is a major facilitator to adherence to ART and retention-in-HIV care of the ALHIV. The staff will have a sizeable number of clients to attend to and thus have enough time to interact with the clients in a conducive environment.

Active participation by the government is a major facilitator in ensuring adherence to ART and retention-in-HIV care. The government has the responsibility to improve the working conditions of the healthcare staff, provide functional equipment, possibly employ the ALHIV to support in care (e.g. as adherence counsellors, role models, etc.), and provide financial support. Most of the identified barriers can be addressed through government intervention. In Vietnam when the global funding for HIV care was withdrawn because the country had reached the middle-income status, the government of the country ensured regular ARTs supply, and access to care by ensuring active enrolment of HIV patients in insurance scheme and providing transitional funding through Social Health Insurance Scheme (Nguyen *et al.*, 2017). This act is worth emulating especially now that the continuous availability of funders in HIV care is not ascertained.

One major limitation of this study was the small proportion of HIV treatment hospitals included in the study. This was caused by hitches presented by some of the hospital management in granting approval within the limited time designated for the study, which caused a reduction in the number of hospitals enrolled in the study per state and clear paucity of data of HIV positive adolescents in the hospitals. The study, however, involved both rural and urban centres as well as tertiary and secondary hospitals and therefore provides a representative sample of the ALHIV population. The spread of the study and the addition of qualitative assessment gave a deep insight into the problems causing adolescents' non-retention-in-HIV care and poor adherence to ART. We intended to assess the clinical outcomes through the records of the viral loads and CD_4 counts but could not due to paucity of the records in all the study sites. One site was dropped in Enugu State because of scanty and inconsistent data. Our study may also have overestimated the extent of ART adherence because adherence to ART was based on either self-report or pharmacists' pill counts which were prone to bias (Anghel et al., 2019). To define lost-to-follow-up, we lumped up those who intentionally dropped from care, those on transfer and those that died. Despite these limitations, this was the first study that assessed the HIV positive adolescents' level of adherence to ART, their retention-in-care and the factors responsible for the outcomes in Southeastern Nigeria.

In conclusion, ALHIV in Southeast Nigeria have a huge challenge with adherence to ART. Level of retention-in-care could be improved upon further. Service delivery interventions using identified factors are urgently needed to improve these health outcomes and enhance their wellbeing. This will help to achieve the UNAIDS fast-track strategy of ending the AIDS epidemic by 2030.

References

Ajagu, N., Anetoh, M. U., & Nduka, S. O. (2017). Expanding HIV/AIDS care service sites: A cross sectional survey of community pharmacists' views in South-East, Nigeria. *Journal of Pharmaceutical Policy and Practice*, *10*(1), 1–12. https://doi.org/10.1186/s40545-017-0122-x

Anghel, L. A., Farcas, A. M., & Oprean, R. N. (2019). An overview of the common methods used to measure treatment adherence. *Medicine and Pharmacy Reports*, *92*(2), 117–122. https://doi.org/10.15386/mpr-1201

Avert. (2018). HIV and AIDS in Nigeria, AVERT. *HIV and AIDS in Nigeria*, pp. 1–18.

Avert. (2019). Young people, HIV and AIDS. *Global Information and Education on HIV and AIDS*, 1–21.

Badru, T., Mwaisaka, J., Khamofu, H., Agbakwuru, C., Adedokun, O., Pandey, S. R., … Torpey, K. (2020). HIV comprehensive knowledge and prevalence among young adolescents in Nigeria: Evidence from Akwa Ibom AIDS indicator survey, 2017. *BMC Public Health*, *20*(1), 1–10. https://doi.org/10.1186/s12889-019-7890-y

Brounéus, K. (2011). In-depth Interviewing : The process , skill and ethics of interviews in peace research. In K.Hoglund & M.Oberg (Eds.), *Understanding Peace Research methods amd challenges* (pp. 130–145). London: London Newyork Routledge.

Casale, M., Carlqvist, A., & Cluver, L. (2019). Recent Interventions to Improve Retention in HIV Care and Adherence to Antiretroviral Treatment among Adolescents and Youth: A Systematic Review. *AIDS Patient Care and STDs*, *33*(6), 237–252. https://doi.org/10.1089/apc.2018.0320

Ekwunife, O. I., Anetoh, M. U., Kalu, S. O., Ele, P. U., & Eleje, G. U. (2018). Conditional economic incentives and motivational interviewing to improve adolescents' retention in HIV care and adherence to antiretroviral therapy in Southeast Nigeria: Study protocol for a cluster randomised trial. *Trials*, *19*(1), 1–9. https://doi.org/10.1186/s13063-018-3095-4

FMOH. (2005). Guidelines for the Use of Antiretroviral Agents in Pediatric HIV Infection, January 7, 2000. *HIV Clinical Trials*, *1*(3), 58–99. https://doi.org/10.1310/ec1d-a9jn-j0hb-24py

Kim, S. H., Gerver, S. M., Fidler, S., & Ward, H. (2014). Adherence to antiretroviral therapy in adolescents living with HIV: Systematic review and meta-analysis. *Aids*, *28*(13), 1945–1956. https://doi.org/10.1097/QAD.0000000000000316

Kolawole, G. O., Gilbert, H. N., Dadem, N. Y., Genberg, B. L., Agaba, P. A., Okonkwo, P., … Ware, N. C. (2017). Patient Experiences of Decentralized HIV Treatment and Care in Plateau State, North Central Nigeria: A Qualitative Study. *AIDS Research and Treatment*, *2017*. https://doi.org/10.1155/2017/2838059

Kumar, K. (1989). Conducting key informant interviews in developing countries. *A.I.D Program Design and Evaluation Methodology Report*, *13*, 1–40.

Manley, G. (2013). *Public Access NIH Public Access*. *71*(2), 233–236. https://doi.org/10.1038/mp.2011.182.doi

Mj, M., Ao, W., Zinski, A., Davila, J., Ml, D., Li, G., … Marks, G. (2012). Measuring retention in HIV care : the elusive gold standard . PubMed Commons. *J Acquir Immune Defic Syndr*, *61*(5), 574–580. https://doi.org/10.1097/QAI.0b013e318273762f.Measuring

Mukora, R., Charalambous, S., Dahab, M., Hamilton, R., & Karstaedt, A. (2011). A study of patient attitudes towards decentralisation of HIV care in an urban clinic in South Africa. *BMC Health Services Research*, *11*(1), 205. https://doi.org/10.1186/1472-6963-11-205

Nguyen, Q. L. T., Van Phan, T., Tran, B. X., Nguyen, L. H., Ngo, C., Phan, H. T. T., & Latkin, C. A. (2017). Health insurance for patients with HIV/AIDS in Vietnam: Coverage and barriers. *BMC Health Services Research*, *17*(1), 1–10. https://doi.org/10.1186/s12913-017-2464-0

Sedgwick, P. (2015). Multistage sampling. *BMJ (Online)*, Vol. 351. https://doi.org/10.1136/bmj.h4155

Skierka, A. S., & Michels, K. B. (2018). Ethical principles and placebo-controlled trials - Interpretation and implementation of the Declaration of Helsinki's placebo paragraph in medical research. *BMC Medical Ethics*, *19*(1), 1–12. https://doi.org/10.1186/s12910-018-0262-9

Swann, M. (2018). Economic strengthening for retention in HIV care and adherence to antiretroviral therapy: a review of the evidence. *AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV*, *30*, 99–125. https://doi.org/10.1080/09540121.2018.1479030

UNAIDS. (2017). HIV and AIDS in Nigeria, AVERT. *HIV and AIDS in Nigeria, AVERT*, 4.

UNICEF. (2019). HIV and AIDS in adolescents. *Adolescent Medicine Clinics*, p. 5. https://doi.org/10.1016/j.admecli.2004.02.009

Vaismoradi, M., & Snelgrove, S. (2019). Theme in qualitative content analysis and thematic analysis. *Forum Qualitative Sozialforschung*, *20*(3), 1–18. https://doi.org/10.17169/fqs-20.3.3376

Appendices

Appendix I

Interview guide questions for in-depth interview (IDI)

1. How do you feel about your HIV status?
2. What are the things that you do to make sure that you achieve and maintain reduced amount of HIV virus in your body?
3. Can you tell us the problems that you often encounter that make it difficult for you to keep your appointment days and take your drugs regularly?
4. Please describe your experience with the HIV clinic's services where you receive care.
5. If you have been coming to HIV clinic with your parents and/or caregiver and now come alone, can you give us any added knowledge which you have acquired? (Optional for those above 18 years)
6. Kindly give us information you learnt on the consequences of

missing, delaying, under dosing or opting out from HIV care
7. Do you belong to any of the peer support groups? If yes,
8. What activities are conducted in the peer support groups?
9. What problems do you encounter with your drugs?
10. In your own thinking, what can be done to improve on the care being given to the adolescents accessing HIV care?

Appendix II

Interview guide questions for key informant interview (KII)

A. Adherence to ART and retention-in-HIV care by adolescents

1. Give us a brief insight on HIV infection among adolescents
2. What factors affect the adherence to ART and retention-in-care of ALHIV?
3. Do you encounter any peculiar challenges in providing HIV treatment and care to ALHIV?

B. Effects of interventions already on ground to improve the adherence characteristics of ALHIV

1. What interventions have already been put in place to improve the adherence characteristics of ALHIV to ART and care as is seen in children and pregnant women?
2. Elaborate on the outcome of such interventions
3. Kindly give evidence of effects or changes observed in the interventions listed
4. What were the reasons for the success in the interventions or lack of success?
5. Can you give us information on the negative effects observed in the intervention(s) earlier mentioned?

C. General

1. How can you assess the long-term sustainability of adherence to HIV treatment, and retention-in-care for ALHIV?
2. Kindly make suggestions on possible ways to improve and sustain adherence to ART and retention-in-HIV care for the HIV positive adolescents