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IN THIS ISSUE

- Fetal Echocardiography Audit
- Diabetes-Related-Stress and Glycaemic Control
- Severity of Anaemia in Haemodialysis Care
- Professional Autonomy in Critical Care Nursing
- Plasma Lipids in Sickle Cell Anaemia
- Medication Adherence in Anti-Retroviral Therapy
- Benign Prostatic Hyperplasia
- Central Obesity in Diabetes mellitus
- Decision-Delivery-Interval in Caesarean Section
- Catatonia in Uraemia and Depression

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ORIGINAL RESEARCH

Medication Adherence, Barriers to Adherence and Treatment Satisfaction with Antiretroviral Therapy Among Adolescents Living with HIV in Lagos, Nigeria

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Abstract

Background: The advent of antiretroviral therapy (ART) in controlling Human Immunodeficiency Virus (HIV) disease has been quite effective in ensuring that infected people can enjoy healthy, long, and productive lives. Medication adherence is an essential part of patient care, especially among patients with HIV, as it greatly determines the effectiveness of treatment. Few studies have explored factors influencing medication adherence and treatment satisfaction among adults, with little focus on adolescents.

Objectives: To assess medication adherence, treatment satisfaction and factors influencing adherence to ART medication among adolescents living with HIV in Lagos, Nigeria.

Methods: This descriptive, cross-sectional study was conducted among diagnosed and registered adolescents aged 10-19 years living with HIV and receiving treatment at eight selected antiretroviral centres in Lagos state, Nigeria. A total of 203 adolescents were recruited in stages, and data were collected using an interviewer-administered semi-structured questionnaire.

Results: There was a low level of adherence as only 59/203 (29.1%) of the respondents adhered to ART. Depression, perceived stigma, being away from home, side effects of drugs, pill burden, and forgetfulness were some factors identified as barriers to adherence. The respondents were most satisfied with the effectiveness of the medication and least satisfied with the side effects.

Conclusions: Medication adherence among adolescents was relatively low; the level of satisfaction with ART medication is an entity that significantly impacts adherence.

Keywords: Adolescents, Barriers to adherence, HIV, Medication adherence, Nigeria, Treatment satisfaction.

Introduction

Human Immunodeficiency Virus (HIV), which causes Acquired Immune Deficiency Syndrome

(AIDS), is one of the world's most serious public health challenges. [1] It is a retrovirus that infects the cells of the immune system and destroys or impairs their functions. [2] Globally, about 8.4 million people are living with HIV/AIDS, two-thirds of whom are in the African region. [3] Adolescents represent an increasing proportion of people living with HIV globally and are the highest-risk population group for treatment attrition and AIDS-related mortality. [4] Although HIV does not have a cure, effective antiretroviral therapy can control the virus and help prevent transmission so that people with the infection and those at substantial risk can enjoy healthy, long, and productive lives. [5] The effectiveness of the therapy is dependent on optimal adherence to the antiretroviral medication, up to 95%. [6] However, a case study has reported that "only approximately one-third of adolescents adhere to their HIV medications. [4]

In Nigeria, the health outcomes for adolescents living with HIV are very poor. [7] The health outcomes include susceptibility to opportunistic infections, increased risk of secondary infections, and mortality from AIDS.[6] Although there have been researches done among adults with HIV/AIDS, only a few studies have examined adherence among adolescents living with HIV/AIDS.[8] Very few studies on adherence showed that access to antiretroviral medications and adherence is lower in adolescents than adults. [9] Not so much research has been done in Nigeria to explore factors responsible for non-adherence among adolescents. [10] Therefore, the increase in adolescent mortality due to HIV/AIDS remains a public health problem, even with the availability of effective ART treatment. [10]

In addition, patient satisfaction is a determinant of treatment uptake, adherence, and retention. [11] Satisfied patients are more likely to follow through with prescribed treatment and advice from healthcare providers, as well as return for subsequent treatment, especially for those on long-term therapy like HIV/AIDS. [12] Adolescents are not an exception, as their satisfaction with treatment affects medication adherence. While patient satisfaction with treatment includes the evaluation of doctor-patient interaction and other concomitant therapies, patient satisfaction with drug therapy is related only to medications. [13] There are peculiarities in adolescence that ordinarily serve as barriers to treatment uptake. These factors are exaggerated with HIV infection. These psychologic peculiarities of adolescence include identity formation, behavioural experimentation, risk-taking, poorly developed life skills, lack of financial autonomy and susceptibility to peer pressure.[9]

This study assessed the medication adherence and treatment satisfaction of adolescents living with HIV and factors influencing adherence to ART medication. The findings of this study may guide the government, policymakers, and other stakeholders in making decisions that will contribute positively to drastically reducing HIV-related mortality among adolescents.

Methods

Study setting

Lagos state, located in southwest Nigeria, has 20 local government areas with an estimated population of about 24.7 million people. [14] There are 26 registered General Hospitals, 256 Public Healthcare centres, 2,886 Private Hospitals, and 160 tradomedical centres. [15] The state has about 135 antiretroviral centres located across the different LGAs. [16]

Study participants and sample size determination

A descriptive, cross-sectional study was conducted among adolescents aged 10-19 years living with HIV who attended the clinic at the eight selected antiretroviral centres in Lagos,

Nigeria. Only respondents diagnosed, whose HIV status had been disclosed to, registered, and had started their antiretroviral therapy at least one year before data collection were included in the study. Adolescents who were terminally or acutely ill at the time of study were excluded. Using Cochran's formula, [17] a minimum sample size of 132 was calculated based on an expected 5% error margin, 95% confidence interval, and a prevalence of 0.905, which represents the proportion of adolescents that were adherent to medication in a similar study in Kano, Nigeria. [18] The calculated sample size was increased by 10% to compensate for improperly completed questionnaires or opt-outs by any respondent. Therefore, 203 adolescents were finally recruited for the study.

Sampling technique

A simple random sampling technique by ballot was used to select eight from the 135 ART centres in Lagos. The selected ART centres included Lagos University Teaching Hospital (LUTH), Ikorodu General Hospital (GH), Isolo GH, Randle GH, Massey Street Children Hospital, Mainland Hospital, Mushin GH, and Somolu GH. The total number of registered adolescents at each of the centres served as the sampling frame for the study. Respondents were proportionately recruited from each centre based on the number of registered HIV-positive adolescents. More respondents were interviewed from antiretroviral centres with a relatively large number of registered adolescents and vice versa. Then, consecutive sampling of respondents that met the inclusion criteria in each ART centre was carried out until the required sample size was attained.

Data collection

Data were collected between November 2019 and June 2020. The questionnaire was pre-tested at one of the centres not selected for the study and far away from the selected study centres. Necessary adjustments were made to the questionnaire after the pre-test. The pre-tested structured interviewer-administered questionnaires were used for data collection. The questionnaire was adapted from validated questionnaires, which included The Simplified Medication Adherence Questionnaire (SMAQ), The Treatment Satisfaction Questionnaire for Medication (TSQM) (version 1.4), and The Adherence Barriers Questionnaire for HIV (ABQ-HIV). [19-21] The questionnaires elicited information on sociodemographic characteristics, medication adherence, treatment satisfaction, and factors affecting adherence to ART. The questionnaire was written in English, and it took an average of 15 minutes to complete. Participants aged 18 years and above were given the written consent forms for signature after providing the research details, while those aged between 10 and 17 years had their consent forms signed by their parents/guardians. Also, oral assent was obtained from each respondent before the questionnaire administration. Participants were given options to decide whether to participate in the study or not and were not coerced. The lead researcher and research assistants administered questionnaires, and confidentiality was ensured.

Data analysis

Data was entered on Microsoft Excel® and analysed electronically using the SPSS version 25 software program. Univariate and bivariate analyses were conducted, and results were presented in frequency tables. The level of significance (p) was set at < 0.05. Medication adherence was assessed using the Simplified Medication Adherence Questionnaire (SMAQ), which consists of six questions. [19] One (1) point was awarded for every correct answer and zero (0) points for every incorrect response or non-response. The maximum score was six (6), while the minimum was zero (0). Respondents with a score less than six were classified as non-adherent to medication. The questionnaire was dichotomic; any answer expressing a lack of

adherence indicated non-adherence. Overall, medication adherence was derived by the sum of the frequency of adherent patients.

The Treatment Satisfaction Questionnaire for Medication (TSQM) (version 1.4) was used to assess the treatment satisfaction of respondents. [20] It consists of 14 questions distributed across four domains: effectiveness (3 items), side effects (5 items), convenience (3 items), and global satisfaction (3 items). The responses were measured through a Likert-type scale of 5 or 7 points and one dichotomous response (item 4). Except for item 4 (presence of side effects; yes or no), all items had 5 or 7 responses, scored from 1 (least satisfied) to 5 or 7 (most satisfied). However, for ease of reporting, 'satisfied', 'very satisfied' and 'extremely satisfied' were grouped as 'satisfied' while 'dissatisfied', 'very dissatisfied' and 'extremely dissatisfied' were grouped as 'dissatisfied'. Therefore, the seven scales were summed up to three; satisfied, somewhat satisfied and dissatisfied. This process was conducted for all other Likert scale variables. Item scores were summed to give four domain scores, which were transformed to a scale of 0 to 100. The maximum obtainable score was 100. The higher the score, the greater the patient satisfaction with medication. The mean score for each domain was calculated.

Factors affecting medication adherence were assessed using the Adherence Barriers Questionnaire for HIV (ABQ-HIV). [21] It is a 17-item questionnaire graded on a 4-point Likert scale ranging from "strongly agree" to "strongly disagree", which were given values from 1 to 4, or 4 to 1, depending on the formulation of each item. Items 1, 2, 3, 4, 7, 14 and 16 were scored from 1 to 4, while items 5, 6, 8, 9, 10, 11, 12, 13, 15 and 17 were scored from 4 to 1. A higher score indicated a higher influence of a certain barrier on patients' perceptions. A patient was defined to be affected by a barrier if the item score was greater than 2. A barrier was identified as affecting adherence if the average score per item was >2. (A copy of the questionnaire is attached in the appendix.)

Ethical considerations

Ethical approval was obtained from the Health Research and Ethics Committee of Lagos University Teaching Hospital (ADM/DCST/HREC/APP/522). Permission to carry out the research was obtained from the Health Service Commission (HSC) of Lagos State and the medical directors of the respective facilities. Assent or informed written consent was obtained from the respondents or the parents where appropriate. The respondents were assured of confidentiality and the right to withdraw from the study at any point in time voluntarily.

Results

Demographic and socio-economic characteristics

Table I shows that the age distribution of the adolescents ranged from 10 to 19, with more than half 109 (53.7%) being between the ages of 14 and 17. The mean age was 16.17±2.25 years. A higher proportion of respondents were males (105; 51.7%), Christians (159; 78.3%) and from the Yoruba tribe (101; 49.8%). Most (127; 62.6%) of the respondents had a secondary level of education. The majority (164; 80.8%) of the respondents were unemployed, and those employed mainly were manually skilled (11; 28.2%). Also, about half (20; 51.3%) of the employed respondents earned less than N5,000 ($6) monthly.

Duration and adherence to Antiretroviral Therapy

Table II shows that a higher proportion of the respondents (171; 84.2%) were diagnosed at least a year ago, and 164 (80.8%) started taking ART medication at least one year before the study, while only 39 (19.2%) had been on treatment for less than a year.

Table I: Sociodemographic characteristics of the respondents (n = 203)

Variables	*Frequency*	*Percentage (%)*
Age (Years)		
10-13	27	13.3
14-17	109	53.7
18-19	67	33.0
Mean ± SD = 16.17±2.25		
Sex		
Male	105	51.7
Female	98	48.3
Religion		
Christianity	159	78.3
Islam	41	20.2
Traditional	1	0.5
None	2	1.0
Tribe		
Yoruba	101	49.8
Igbo	77	37.9
Hausa	9	4.4
Others	16	7.9
Highest level of education		
No formal education	5	2.5
Primary	31	15.3
Secondary	127	62.6
Tertiary	40	19.7
Employment Status		
Employed	39	19.2
Unemployed	164	80.8
Occupation of employed respondents		
(n=39)	2	5.1
Professional	6	15.4
Intermediate	9	23.1
Non-manual skilled	11	28.2
Manual skilled	3	7.7
Partly skilled	8	20.5
Unskilled		
Monthly income of employed respondents		
(Naira)	20	51.3
<5000	15	38.4
5000-<15000	2	5.1
15000-<45000	1	2.6
45000-<50000	1	2.6
≥50000		

More than half of the respondents (117; 57.6%) never forgot to take their medication, while 113 (55.7%) were mindful of their ART medication, and 169 (83.2%) did not stop taking their medications when they felt worse.

As regards how often medication was missed a week before data collection of this study, most of the respondents (121; 59.6%) had not taken their medication about 1-2 times in the previous week, while 163 (80.3%) had not missed their medications over the last weekend, but 134 (66.0%) over the past three months missed taking their medication for < 2 days. About 59 (29.1%) of respondents were adherent, while the majority, 144 (70.9%), were non-adherent to their antiretroviral therapy medication.

Table II: Duration and adherence of respondents to antiretroviral therapy (n = 203)

Variables	*Frequency*	*Percentage (%)*
Time of diagnosis of HIV		
≥1 year ago	171	84.2
<1 year ago	32	15.8
Duration of ART medication		
≥1 year ago	164	80.8
<1 year ago	39	19.2
Ever forget to take ART		
Yes	86	42.4
No	117	57.6
Unmindful at times about ART		
Yes	90	44.3
No	113	55.7
Stopped taking medication when feeling worse		
Yes	34	16.8
No	169	83.2
How often medication was missed last week		
Never	121	59.6
1-2 times	61	30.1
3-5 times	13	6.4
6-10 times	8	3.9
>10 times		
Not taking any of the medication over the last weekend		
Yes	40	19.7
No	163	80.3
How many days of medication have not been taken over the past three months?		
<2 days	134	66.0
>2 days	69	34.0
Overall medication adherence		
Adherent	59	29.1
Non-adherent	144	70.9

Satisfaction with ART

Table III shows that most respondents (190; 93.6%) were satisfied, while 5 (2.5%) were dissatisfied with the ability of the medication to prevent or treat their condition. On the other hand, 176 (86.7%) respondents were satisfied

with the time taken for the onset of action and 149 (73.3%) found it easy to use the medication in its current form. Furthermore, some respondents (153; 75.4%) found it convenient, 27 (13.3%) somewhat convenient, and 23 (11.4%) inconvenient to take their medications as instructed.

Table III: Satisfaction with the effectiveness and convenience of medication (n=203)

	Satisfaction with the effectiveness of medication		
Item	***Satisfied n (%)***	***Somewhat satisfied n (%)***	***Dissatisfied n (%)***
The ability of the medication to prevent or treat the condition.	190 (93.6)	8 (3.9)	5 (2.5)
The way the medications relieve symptoms	184 (90.6)	13 (6.4)	6 (3.0)
The amount of time it takes the medication to start working	176 (86.7)	17 (8.4)	10 (4.9)
Satisfaction with the convenience of medication			
Item	***Easy***	***Somewhat easy***	***Difficult***
Ease in using the medication in its current form	149 (73.3)	28 (13.8)	26 (12.9)
Planning when to use the medication each time	145 (71.4)	28 (13.8)	30 (14.8)
Item	***Convenient***	***Somewhat convenient***	***Inconvenient***
Convenience in taking the medication as instructed	153 (75.4)	27 (13.3)	23 (11.3)

Satisfaction with side effects and global satisfaction with medication

Table IV shows that a higher proportion (83; 40.9%) of the respondents reported side effects of the medication. However, 45 (22.2%) were not at all bothered, and 12 (5.9%) were bothered about the side effects. Regarding the extent to which the side effects interfered with physical health, a higher number of respondents (35; 17.2%) reported no interference, while 19 (9.4%) reported quite a bit of interference. As regards the side effects interfering with their mental function, 45 (22.2%) reported not at all and 12 (6.0%) reported a great deal. For most respondents, overall satisfaction with medication was not affected by the side effects, as 54 (26.6%) were not affected at all, whereas only 11 (5.4%) were significantly affected. Furthermore, most respondents (125; 61.6%) were confident that taking the medication was good. Considering everything, 175 (86.2%) reported being satisfied with the medication, while 28 (13.7%) were dissatisfied.

Domains of satisfaction

Table V shows that the mean effectiveness domain score was 77.7±14.5, the convenience score was 69.2±18.5, and the global satisfaction score was 68.2±23.6. The lowest mean score was in the side effects domain (29.0±37.8), with 25% of respondents having a score of 50, about 50% having a score of 75.0, and 75% having a score of 93.8.

Table IV: Respondents' satisfaction with side effects and global satisfaction with medication (n=203)

Item	*Responses*		
	Yes n, (%)	*N n, (%)*	
Experiencing any side effects due to medication	83 (40.9)	120 (59.1)	
Satisfaction with side effects of medication			
	Not at all bothersome	*Somewhat bothersome*	*Bothersome*
How bothersome the side effects of the medication are (n = 83)	45 (54.2)	26 (31.3)	12 (14.5)
	Not at all	*Somewhat*	*A great deal*
The extent to which side effects interfere with physical health (n = 83)	53 (63.9)	19 (22.9)	11 (13.2)
The extent to which the side effects interfere with mental function (n = 83)	45 (54.2)	26 (31.3)	12 (14.5)
Side effects affecting overall satisfaction with medication (n = 83)	54 (65.1)	18 (21.7)	11 (13.2)
Respondents' global satisfaction with medication			
	Confident n (%)	*Somewhat confident n (%)*	*Not confident n (%)*
Confidence that taking the medication is a good thing (n = 203)	125 (61.6)	48 (23.6)	30 (14.8)
	Certain n (%)	*Somewhat certain n (%)*	*Not certain n (%)*
The certainty that the good things about the medication outweigh the bad things (n = 203)	120 (59.1)	50 (24.6)	33 (16.3)
	Satisfied n (%)	*Somewhat satisfied n (%)*	*Dissatisfied n (%)*
Satisfaction with the medication taking all things into account (n = 203)	175 (86.2)	17 (8.4)	11 (5.4)

Table V: Domains of satisfaction with medications

Domain	*Mean*	*SD*	**25th*	**50th*	**75th*
Effectiveness	77.7	14.5	66.7	77.8	88.9
Side effects	29.0	37.8	50.0	75.0	93.8
Convenience	69.2	18.5	55.6	72.2	83.3
Global Satisfaction	68.2	23.6	52.8	69.4	100.0

SD: Standard deviation; * Percentiles

Factors affecting adherence to ART

Table VI shows the factors affecting medication adherence (barriers with average score >2). These included finding it unpleasant when other people notice medication intake (mean score: 2.6), often feeling bad and sometimes feeling discouraged and depressed (mean score: 2.6), feeling healthy, and being unsure whether to take medications daily (mean score: 2.5), and difficulties adhering to treatment plan especially when away from home (mean score: 2.5).

Table VI: Factors affecting respondents' adherence to medication (n=203)

Item	*SA n (%)*	*A n (%)*	*D n (%)*	*SD n (%)*	*ΣXi*	*Mean Rating (ΣXi/n)*
Fully understands what the doctor has explained regarding medication therapy	93 (45.8)	104 (51.2)	3 (1.5)	3 (1.5)	322	1.6
Can mention the names of medicines and their scope without hesitation	46 (22.7)	65 (32.0)	63 (31.0)	29 (14.3)	481	2.4*
Trusts the doctor and agrees on a therapy plan together with him.	83 (40.9)	115 (56.6)	4 (2.0)	1 (0.5)	329	1.6
Medications only help if taken on a strict, regular basis	79 (38.9)	96 (47.3)	14 (6.9)	14 (6.9)	369	1.8
Medicines are all poisonous. Taking medicines at all should be avoided if possible	13 (6.4)	29 (14.3)	66 (32.5)	95 (46.8)	366	1.8
Feels healthy, therefore, sometimes unsure whether to take medicines daily	40 (19.7)	56 (27.6)	66 (32.5)	41 (20.2)	501	2.5*
Takes medicines automatically at a fixed time or on fixed occasions every day	71 (35.0)	88 (43.4)	35 (17.2)	9 (4.4)	388	1.9
Feels that payments for medication are a great burden	36 (17.7)	38 (18.7)	50 (24.6)	79 (39.0)	437	2.2*
Generally, he finds it unpleasant when other people notice medication intake	40 (19.7)	68 (33.5)	68 (33.5)	27 (13.3)	527	2.6*
Frequently forgets things daily	30 (14.8)	57 (28.1)	77 (37.9)	39 (19.2)	484	2.4*
Generally, often feels bad and sometimes feels discouraged and depressed	42 (20.7)	64 (31.5)	66 (32.5)	31 (15.3)	523	2.6*
Frequently have problems taking medications (e.g. swallowing)	30 (14.8)	44 (21.7)	84 (41.4)	45 (22.1)	465	2.3*
Have difficulties adhering to treatment plans, especially when away from home	30 (14.8)	71 (35.0)	64 (31.5)	38 (18.7)	499	2.5*
Receives great support from family and friends, who can be talked to at any time	70 (34.5)	96 (47.3)	25 (12.3)	12 (5.9)	385	1.9
Really frightened about the side effects of medicines	21 (10.3)	49 (24.1)	95 (46.9)	38 (18.7)	459	2.3*
In case any side effects are noticed, I will talk to the doctor about them as soon as possible	73 (36.0)	112 (55.2)	11 (5.4)	7 (3.4)	358	1.8
If side effects are noticed, will either stop or take fewer medications.	12 (5.9)	33 (16.3)	88 (43.3)	70 (34.5)	393	1.9

SA - Strongly agree; A – Agree; D – Disagree; SD - Strongly disagree

***Average scores greater than 2 depending on the formulation of each item.;**

ΣXi/n: average score per item obtained by dividing ΣXi by the total number of respondents (203).

ΣXi: Sum of frequency per item, which was obtained by multiplying each response by the apportioned score ranging from 4 to 1 or 1 to 4

Other factors identified included frequently forgetting things daily (mean score: 2.4), the ability to mention the names of the medications and their scope without hesitation (mean score: 2.4), being frightened about the side effects of drugs (mean score: 2.3) frequently having problems taking medication such as swallowing (mean score: 2.3) and feeling that payments for medication are a great burden (mean score: 2.2).

Discussion

The findings in this study demonstrated a high level of non-adherence among adolescents living

with HIV/AIDS, as only about 29.1% of them were adherent to their antiretroviral therapy. This finding is consistent with similar studies conducted in Northern Tanzania (24.6%) and Lagos, Nigeria (26.0%) with similarly poor adherence. [22-23] However, the finding differs from the results of studies in Uganda and Kenya, with remarkably higher adherence levels of 90.4% and 75.3%, respectively. [24-25] Similarly, the studies conducted in Kano and North Central Nigeria showed a significantly high adherence rate of 90.5% and 79%, respectively. [18, 26] In another study carried out in Benue, Nigeria, adherence rates recorded were high for both respondents in urban settings (90.3%) and rural settings (95.1%).[27] The differences observed in these results compared to our study could be due to varying characteristics in demography, culture, and methods used in the study. For example, the survey from Uganda assessed adherence using focused group discussions and records made by clinicians during their routine clinical practice. [24] Also, the Benue, Nigeria survey used pharmacy refills to measure adherence levels, unlike this study, where the patients were directly questioned. [27] Furthermore, the study conducted in North Central Nigeria focused on young women and adolescents aged 10 to 24 years, with the majority being between the ages of 20 and 24 years. [26] The current study, on the other hand, included younger male and female adolescents between the ages of 10 and 19 years. The pressure for social approval is expected to make adherence "higher" in the present study; however, the adherence was remarkably low.

Recently, patient satisfaction with care and the health delivery system has been thoroughly studied with little emphasis on medication satisfaction. [28] This study found that the highest mean score for satisfaction was recorded in the effectiveness of medications domain (77.7±14.5), while the lowest mean score was recorded concerning medications' side effects (29.0±37.8). This explains that patients were most satisfied with the effectiveness of their medication therapy and least satisfied with the side effects. This finding aligns with a similar study in the USA, where most participants were satisfied with their current ART yet had experienced side effects. [29] This study also found a significant difference between adherent and non-adherent adolescents concerning their satisfaction with the effectiveness of the ART medication. Satisfaction with effectiveness was higher in adherent adolescents than in non-adherent adolescents. All other domains of satisfaction were equally higher in adherent patients. This implies that patient satisfaction with medication may play a significant role in medication adherence.

The present study found many barriers influencing medication adherence, which include finding it unpleasant when other people notice medication intake, often feeling inadequate and sometimes discouraged and depressed, feeling healthy and unsure whether to take medications daily and having difficulties adhering to treatment plans, especially when away from home. These findings were consistent with the study done in Malawi, where travelling from home, feeling depressed/overwhelmed, and feeling stigmatised by people around and within the home were identified barriers. [30] Also, in a Ghanaian study, perceived stigmatisation after status disclosure was among the most frequently mentioned barriers. [31] The social reasons for suboptimal adherence among adolescents are usually centred on perceived stigma. [32] Many adolescents were uncomfortable taking their medications where people were present to avoid unintended status disclosure, discrimination, and isolation from others. [32]

Other barriers identified in the present study include frequently forgetting things daily, the ability to mention the names of the medications and their scope without hesitation, being frightened about the side effects of drugs, often

having problems taking medication such as swallowing and feeling that payments for medication are a significant burden. These findings were similar to the study in North Central Nigeria, where forgetfulness to take medications and pill burden were major hindrances to effective adherence. [26] A Ghanaian study also reported forgetfulness, financial barriers, and adverse effects of ART as barriers identified. [31] In a similar Kenyan study, adverse effects of taking medications were associated with increased odds of poor ART adherence. [25] Forgetfulness as a barrier has been frequently reported in many similar studies. [25,26,31,33,34] This finding might be because adolescents usually have busy routines and competing priorities like school work, socialising and family commitments, which can make them forgetful or not take their medications on time. [35]

However, on the contrary, a study conducted in Lagos, Nigeria, identified long waiting times at the clinic, distance to the clinic, and schooling as the challenges hindering adolescents' adherence to medication. [23] Also, a Zambian study identified the loss of a mother and a lack of basic knowledge about HIV as factors associated with non-adherence. [36] The North Central Nigeria study identified medication management, physical reactions to medicine, and psychosocial distress as challenges to ART adherence. Still, these are different from the findings in the present study. [22] The variations observed in these findings could be explained by the difference in the methods and instruments used in data collection. For instance, the study done in Zambia was a mixed-method study. [36]

Limitations

Medication adherence was based on self-report, which could be influenced by recall bias. Also, the study was cross-sectional in design. Hence, the findings may not be generalisable. Further studies, especially interventional studies, using mixed methods are recommended to identify practical strategies that could be adopted to serve as reminders for medication use among the respondents.

Conclusion

There was a significant level of non-adherence to medications among adolescents. Major barriers to medication adherence were depression, perceived stigma, being away from home, side effects of drugs, pill burden, and forgetfulness. Respondents were most satisfied with the effectiveness of their medication and least satisfied with the side effects. There was also an association between satisfaction with medication effectiveness and medication adherence. It is recommended that peer support groups be encouraged in all ART centres.

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APPENDIX: QUESTIONNAIRE

Medication Adherence, barriers to adherence and Treatment Satisfaction with Antiretroviral Therapy among Adolescents Living with HIV in Lagos, Nigeria

Please tick the appropriate box or fill in the space required.

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS

1. Age at last birthday (in years) ---------
2. Sex: ☐Male ☐Female
3. Religion: ☐Christianity ☐Islam ☐Traditional ☐None ☐Others
4. Tribe: ☐Yoruba ☐Igbo ☐Hausa ☐Others
5. Highest level of education: ☐No formal education ☐Primary ☐Secondary ☐Tertiary
6. Are you employed? ☐Yes ☐No (If no, move to question 9)
7. If yes, state the type of occupation; ☐Professional ☐Intermediate ☐Non-manual skilled ☐Manual skilled ☐Partly skilled ☐Unskilled
8. What is your estimated income per month? ☐< 5000 naira ☐5000 - <15,000 naira ☐15,000 -<45,000 naira ☐45,000 -<50,000 naira ☐>=50,000 naira
9. How long ago were you diagnosed with HIV? ☐Years ☐Months ☐Weeks
10.. How long ago did you start your ART medication? ☐Years ☐Months ☐Weeks

SECTION B: MEDICATION ADHERENCE TO ANTIRETROVIRAL THERAPY

11. Do you ever forget to take your ART medicine? ☐Yes ☐No
12. Are you unmindful at times about taking your medicine? ☐Yes ☐No
13. Sometimes if you feel worse, do you stop taking your medicines? ☐Yes ☐No
14. Thinking about the last week. How often have you not taken your medicine? ☐Never ☐1-2 times ☐3-5 times ☐6-10 times ☐>10 times
15. Did you not take any of your medicine over the past weekend? ☐Yes ☐No
16. Over the past 3 months, how many days have you not taken any medicine at all? ☐< 2 days ☐> 2 days

SECTION C: TREATMENT SATISFACTION WITH ANTIRETROVIRAL THERAPY

Please tick your best option;

17 How satisfied or dissatisfied are you with the ability of the medication to prevent or treat your condition?
☐Extremely Dissatisfied ☐Very Dissatisfied ☐Dissatisfied ☐Somewhat Satisfied ☐Satisfied ☐Very Satisfied ☐Extremely Satisfied

18 How satisfied or dissatisfied are you with the way the medication relieves your symptoms?
☐Extremely Dissatisfied ☐Very Dissatisfied ☐Dissatisfied ☐Somewhat Satisfied ☐Satisfied ☐Very Satisfied ☐Extremely Satisfied

19 How satisfied or dissatisfied are you with the amount of time it takes the medication to start working? ☐Extremely Dissatisfied ☐Very Dissatisfied ☐Dissatisfied ☐Somewhat Satisfied ☐Satisfied ☐Very Satisfied ☐Extremely Satisfied

20 As a result of taking this medication, do you experience any side effects at all? ☐Yes ☐No (If no, move to question 25)

21 How bothersome are the side effects of the medication you take to treat your condition?
☐Extremely Bothersome ☐Very Bothersome ☐Somewhat Bothersome ☐A Little Bothersome ☐Not at All Bothersome

22 To what extent do the side effects interfere with your physical health and ability to function (i.e., strength, energy levels, etc.)?
☐A Great Deal ☐Quite a Bit ☐Somewhat ☐Minimally ☐Not at All

23 To what extent do the side effects interfere with your mental function (i.e., ability to think clearly, stay awake etc)
☐A Great Deal ☐Quite a Bit ☐Somewhat ☐Minimally ☐Not at All

24 To what degree have medication side effects affected your overall satisfaction with the medication?
☐A Great Deal ☐Quite a Bit ☐Somewhat ☐Minimally ☐Not at All

25 How easy or difficult is it to use the medication in its current form?
☐Extremely Difficult ☐Very Difficult ☐Difficult ☐Somewhat Easy ☐Easy ☐Very Easy ☐Extremely Easy

26 How easy or difficult is it to plan when you will use the medication each time?
☐Extremely Difficult ☐Very Difficult ☐Difficult ☐Somewhat Easy ☐Easy ☐Very Easy ☐Extremely Easy

27 How convenient or inconvenient is it to take the medication as instructed?
☐Extremely Inconvenient ☐Very Inconvenient ☐Inconvenient ☐Somewhat Convenient ☐Convenient ☐Very Convenient ☐Extremely Convenient

28 Overall, how confident are you that taking this medication is a good thing for you?
☐Not at All Confident ☐A Little Confident ☐Somewhat Confident ☐Very Confident ☐Extremely Confident

29 How certain are you that the good things about your medication outweigh the bad things?
☐Not at All Certain ☐A Little Certain ☐Somewhat Certain ☐Very Certain ☐Extremely Certain
30 Taking all things into account, how satisfied or dissatisfied are you with this medication?
☐Extremely Dissatisfied ☐Very Dissatisfied ☐Dissatisfied ☐Somewhat Satisfied ☐Satisfied ☐Very Satisfied ☐Extremely Satisfied

SECTION D; FACTORS AFFECTING MEDICATION ADHERENCE TO ANTIRETROVIRAL THERAPY
Please tick your best option
Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD)

	Questions	SA	A	D	SD
31	"I fully understand what my doctor has explained to me regarding my medication therapy."				
32	"I can mention the names of my medicines and their scope without hesitation."				
33	"I trust my doctor and agree on my therapy plan together with him."				
34	"My medications only help me if I take them on a strict regular basis."				
35	"Medicines are all poisonous. You should avoid taking medicines at all if possible."				
36	"I feel basically healthy. Therefore, I am sometimes unsure whether I really have to take my medicines daily."				
37	"I take my medicines automatically at a fixed time or on fixed occasions every day."				
38	"I feel that payments for medication are a great burden."				
39	"Generally, I find it unpleasant when other people notice my medication intake."				
40	"I frequently forget things on a daily basis."				
41	"Generally, I often feel bad, and sometimes I feel discouraged and depressed."				
42	"I frequently have problems taking my medications (e.g. swallowing} or it is difficult for me to adhere to the accompanying conditions of the medication intake (e.g. on an empty stomach, with food or alcohol restrictions)."				
43	"I have difficulties adhering to my treatment plan, especially when I am away from home"				
44	"I receive great support from my family and friends, who I can talk to at any time and ask for help."				
45	"I am really frightened about the side effects of my medicines."				
46	"In case I notice any side effects, I will talk to my doctor about them as soon as possible."				
47	"In case I notice side effects, I will either stop or take less of my medications"				