

ORIGINAL RESEARCH ARTICLE

Prevalence and Determinants of Adherence to Highly Active Anti-Retroviral Therapy Amongst People Living with HIV/AIDS in a Rural Setting in South-South Nigeria

Afiong O. Oku^{1*}, Eme T. Owoaje², Oboko O. Oku³ and Emmanuel Monjok^{4,5}

¹Department of Community Medicine, University of Calabar Teaching Hospital, Calabar, Cross River State, Nigeria; ²Department of Preventive Medicine and Primary care, University of Ibadan, Ibadan, Oyo state, Nigeria; ³Department of Anaesthesia, University of Calabar Teaching Hospital, Calabar, Cross River State, Nigeria; ⁴Department of Family Medicine, University of Calabar Teaching Hospital, Calabar, Cross River State, Nigeria; ⁵University of Houston, Institute of Community Health, Texas Medical Center, Houston TX USA

*For correspondence: E-mail: afyoku@yahoo.com; Phone: 08037106385

Abstract

Adherence to HAART is necessary to achieve the best virologic response and lower the risk of drug resistance amongst People living with HIV/AIDS (PLHIV). However, there is limited documentation of adherence amongst patients on HAART in the south-south region of Nigeria. This study aimed to determine the prevalence and determinants of adherence to HAART amongst PLHIV in a rural setting in Cross River State. A descriptive cross-sectional study was conducted among 393 patients on HAART attending the Heart to Heart centre Ugep using an interviewer-administered questionnaire. Adherence was measured via self report and patients were termed adherent if they took at least 95% of prescribed doses. The self reported adherence rate based on a one week recall was 50.4%. The main reason for skipping doses were being busy (50.6%), simply forgetting to take medications (43.8%) and religious constraints (16%). Perceived improved health status [OR 2.7; CI: 1.37-5.39], Non use of herbal remedies, [OR 1.8; 95% CI: 1.23- 2.64] and ARV regimens devoid of dietary instructions [OR 1.49; 95% CI: 1.07- 2.06] were significant predictors of adherence. The adherence rate reported in this study was low. Appropriate adherence enhancing intervention strategies targeted at use of simplified ARV regimens and discouraging herbal use is strongly recommended. (*Afr J Reprod Health 2014; 18[1]: 133-144*).

Keywords: Adherence, PLHIV, HAART, rural setting, Nigeria.

Résumé

Adhérence thérapeutique est nécessaire pour atteindre la meilleure réponse virologique et réduire le risque de résistance aux médicaments chez les personnes vivant avec le VIH / SIDA (PVVIH). Cependant, il y a peu de documentation de l'adhésion chez les patients en multi thérapie (TARHA) dans la région sud-sud du Nigeria. Cette étude visait à déterminer la prévalence et les déterminants de l'adhérence à la multi thérapie antirétrovirale chez les PVVIH en milieu rural de l'État de Cross River. Une étude descriptive transversale a été menée auprès de 393 patients en multi thérapie qui fréquentent le Heart to Heart Centre à Ugep à l'aide d'un questionnaire administré par un intervieweur. L'adhérence a été mesurée à travers des auto-déclarations par les patients. On a qualifié d'adhérents ceux qui ont pris au moins 95 % des doses prescrites. Le taux d'adhérence d'après l'auto déclaration basé sur un rappel d'une semaine était de 50,4 %. Les principales raisons de sauter des doses comprenaient le fait d'être occupés (50,6 %), d'oublier tout simplement de prendre des médicaments (43,8 %) et les contraintes religieuses (16%). Le statut de la sante améliorée perçue [OR 2,7, IC : 1,37 à 5,39], non utilisation de remèdes à base de plantes, [1,8 ; IC à 95% : 1,23 à 2,64] et les schémas ARV dépourvu de consignes alimentaires [OR 1,49, IC 95% : 1,07 2.06] sont des indices significatifs de l'adhésion. Le taux d'adhérence rapporté dans cette étude était faible. Nous recommandons les stratégies d'intervention qui favorisent l'adhérence ayant comme cible l'utilisation des traitements antirétroviraux simplifiés et qui découragent l'utilisation de médicament à base de plantes. (*Afr J Reprod Health 2014; 18[1]: 133-144*).

Mots clés: adhérence, PVVIH, TARHA, cadre champêtre, Nigeria.

Introduction

The Human Immunodeficiency Virus (HIV) pandemic continues to spread in the population making HIV infection one of the most important

public health crises in the world¹. HIV/ AIDS is also one of the most destructive epidemics the world has ever witnessed. The HIV epidemic has impacted on all segments of the society markedly reducing the life expectancy in Nigeria to 48.4

African Journal of Reproductive Health March 2014; 18(1): 133

years²⁻³. It has further weakened and overwhelmed the Nigerian health system, increased the cost of achieving self developmental goals by decreasing the size of the workforce, affecting mainly adults in their most productive years of life⁴. In 2010, about 33.3 million persons were estimated to be infected with the human Immunodeficiency virus (HIV) globally. Of these, 22.5 million (68%) were in sub Saharan Africa and about 2.98 million in Nigeria which makes it the country with the second highest burden of HIV and AIDS in the world after South Africa¹. The current prevalence of HIV in Nigeria as at 2010 based on the sentinel surveillance is 4.1%. ranging from 1.0% in Kebbi State to 12.7% in Benue State². Cross River state, in the south-south geopolitical zone of Nigeria is the 9th highest prevalence in the country as at 2010, and the third highest prevalence (7.1%) in the zone after Akwa Ibom and Bayelsa states. The prevalence is higher in the urban (9.9%) compared with the rural area (1.6%)².

Antiretroviral therapy (ART) has remained the only available option that offers the possibility of dramatically reducing HIV/AIDS related morbidity and mortality in the absence of a cure, while improving the status of people living with AIDS (PLHIV). ART has proved effective in reducing viral load, improving immune function⁵, reducing HIV-related morbidity and mortality⁶⁻⁸ and improving the quality of life of PLHIV⁵⁻⁶. However, successful long-term treatment of HIV requires strict adherence to the Highly Active Antiretroviral Therapy (HAART) regimen. This is of great importance especially in Nigeria where PLHIV apart from making up 10% of the global burden of HIV/AIDS¹ where about 300,000 PLHIV are currently on treatment and about 1.5 million require treatment⁹. Several studies conducted in various parts of the world including reviews reported that non-adherence rates range from 50%-80% in different contexts¹⁰⁻¹². The few studies done in some rural settings have reported fairly good adherence rates. A recent study conducted by Nozaki and colleagues in a rural setting in Zambia revealed that majority 88% of patients had not missed taking their drugs in the four day period prior to the study days¹³. In another study conducted in rural China, an adherence rate of $\geq 95\%$ was reported by 81.8% of

clients on HAART. Furthermore, 49.7% of patients claimed to have never missed a single dose over the entire duration of their ART¹⁴. The consequences of low adherence are serious for the individual, public health and the optimal use of limited health care resources¹⁵. Failure to adhere to prescribed regimens results in low blood drug levels, which can quickly render the drug combinations ineffective, because of rapid and irreversible selection of genetic variants of the virus with decreased drug susceptibility. The main factors responsible for non adherence have been divided into three domains; patient -related factors; medication - related factors; and health care provider/ health system related factors¹⁶⁻¹⁷.

Since non-adherence leads to the development of resistant strains, it is therefore vital to continuously monitor and identify interventions to improve treatment adherence especially in a resource limited setting. The rates of HIV adherent clients is between Nigeria quite low¹⁸⁻²⁰, despite the huge amount of resources invested into the control of HIV/AIDS in the country. Although there have been several studies done on adherence to HAART amongst PLHIV in Nigeria, there is paucity of information regarding the prevalence and determinants of adherence among PLHIV in rural settings. This study was therefore conducted to fill the knowledge gap by providing data on adherence patterns amongst PLHIV in a rural area where stigma still persists and harbour a large population of PLHIV. The objectives of the present study were to determine the prevalence of adherence to HAART and identify factors associated with adherence.

Method

Study site and population

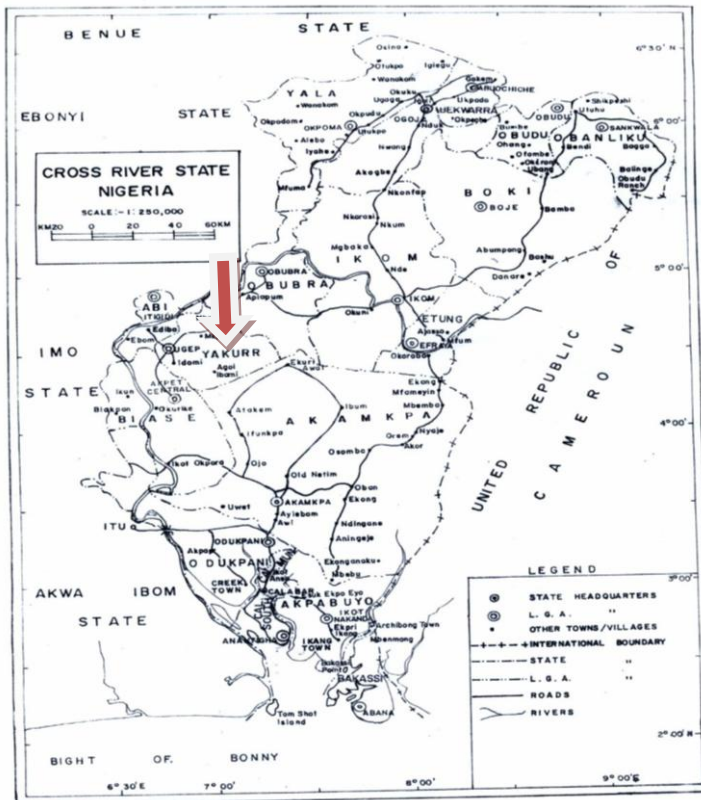
Ugep is in Yakuur Local Government area (LGA) in the central Senatorial district of Cross River State in the south-south geopolitical zone of Nigeria. Ugep has one of the largest ethnic groups among the 18 LGAs in Cross River State. Yakuur is 120 km (75 miles) northwest of Calabar and is bounded in the north by the Obubra LGA, south by Biase LGA, west by Abi LGA and east by Akamkpa LGA. Yakuur is a densely populated

town with a population of 196,271²¹ and is a concentration of five autonomous divisions Ikpakpait, Ijiman, Ijom, Biko biko and Ketabebe. The LGA is a predominantly rural where people live in cluster group communities. Majority of the population are subsistence farmers and are Christians

Ugep is the largest of five Yakuur settlements and is densely populated by the Yakuur people. It is also the Local government headquarters of Yakuur. It is in the southern end of the LGA about 11.2 kilometres east of Cross River East in south eastern Nigeria and forms a sprawling semi-urban settlement. Though Ugep is semi urban, it was chosen as a treatment site by Global HIV/AIDS Initiative of Nigeria (GHAIN) to provide ART services to cover other rural LGAs which include Abi, Biase, and Obubra.

The study site was the General Hospital (GH) Ugep which was established in 1979 initially as a community Hospital and was upgraded to a General Hospital in 1991 by the state government. The General Hospital Ugep serves the people of Yakuur, who reside in Abi, Biase and Obubra LGAs (all rural LGA's) and neighbouring states including Ebonyi and Abia states in the South-east geopolitical zone of Nigeria and also the South-West region of Cameroun. The Hospital was selected in 2006 to initially function as a Voluntary Counselling and testing (VCT) centre thereafter in February 2007 it was upgraded to provide comprehensive care and support services for PLHIV. The total number of PLHIV on treatment in the facility was 1,029 by the end of 2010. The study population comprised of HIV positive clients receiving treatment in GH, Ugep

Map of Cross River State showing Yakuur and Other LGAs.



Study Design/ Eligibility Criteria

A descriptive cross-sectional study was conducted among PLHIV receiving treatment in a rural

setting in Cross River State. Eligibility criteria consisted of HIV positive clients on HAART, were ≥ 18years and had been on been on HAART for at least three months. Terminally ill patients,

pregnant mothers and non consenting patients were excluded from study

Sample size calculation

The Sample size formula for a single proportion was used to calculate the sample size

$$n = z^2 pq / d^2$$

n = minimum sample size

z = critical value at 95% confidence interval

p = proportion of adherent patients in rural Zambia

$$59.9\% = 0.6^{22}$$

d = Level of precision taken as 0.05

$$q = 1 - p = 0.4$$

$$z = 1.96$$

$$p = 0.6$$

$$\text{Therefore } n = \frac{1.96^2 \times 0.60 \times 0.40}{0.05 \times 0.05}$$

$$= + 10\% \text{ allowance for non response}$$

$$= 368.8 / 0.9 = 409.8$$

$$= 410$$

Sampling Technique

PLHIV who met the inclusion criteria were consecutively recruited till the desired sample size was attained. The time period for the study was six months (January- June 2012)

Study Instrument

This consisted of an interviewer administered semi-structured questionnaire which was divided into sections to collect relevant information on socio-demographic data, medical profile and factors influencing adherence to HAART. Adherence to HAART in the previous seven days of the interview was measured by self-report. The questions were adapted from The Brief Medication Questionnaire self-report tool for screening adherence and barriers to adherence²³. The degree of adherence from patient self reporting was estimated using the following formula:

$$\% \text{ Adherence over last 7 days} = \frac{\# \text{ doses should have taken} - \# \text{ missed doses}}{\# \text{ doses should have taken}} \times 100\%^{19}$$

Doses should have taken

Then, the percentage of adherence to HAART was estimated by the average of adherence to the

drugs. For the purpose of this study a score of 95% and above represented good adherence and less than 95% was rated as having poor/ suboptimal adherence. Factors influencing adherence was grouped into patient related, medication related, socioeconomic and health care provider related factors. The questionnaire was translated from English to the local language (Yakuur) and thereafter back translated in English. Checks were conducted to ensure that errors such as loss of meanings of certain concepts/phrases did not occur during the process.

Data analysis

Data were analyzed using SPSS for windows version 19.0. Descriptive and inferential statistical tests were employed. These included bivariate (chi-square) and multivariate (logistic regression) analysis to determine correlates or predictors of adherence. The dependent variable considered for this study was adherence to HAART where patients who achieved 95% based on self-report had good adherence while < 95% was termed poor adherence adherent. The independent variables consisted of some socio-demographic and medical variables including treatment experiences at ARV clinic. Data was summarised using descriptive statistics i.e. frequency, proportions, means and standard deviation to summarize variables. e.g. (Chi-square, was used to test the significance of association between two categorical variables. The level of significance was set at 5%. An adherence rate of 95% and above was taken as good adherence while <95% was term poor adherence. Logistic regression analysis was used to identify true predictors of adherence to HAART in the study population. Variables entered into the logistic model were those which had earlier been significantly associated on bivariate analysis at 10% significance and derived from literature as related outcomes or plausibly related to the outcome variable. Predictors were determined at 0.05 level of significance.

Ethical clearance and consent

The State Ministry of Health Research Ethics Committee reviewed and approved the study procedures and data collection instruments

Results

Table 1: Frequency distribution of the Socio-demographic characteristics of study participants (n=393)

Characteristics	Frequency N=393	Percentage
Age group (years)		
< 25	36	9.2
25-34	150	38.2
35-44	121	30.8
45-54	66	16.8
Mean (SD)	35.9 ± 9.6	
Sex		
Male	75	19.1
Female	318	80.9
Marital status		
Single	83	21.1
Married	179	45.5
Divorced	48	12.2
Widowed	83	21.1
Educational status		
None	29	7.4
Primary	157	39.9
Secondary	162	41.2
Post secondary	45	11.5
Occupation		
Professional/managerial/technical	40	10.2
Skilled manual	184	46.8
Skilled non-manual	117	29.8
Unskilled/unemployed/retired	52	13.2
Religion		
Christianity	392	99.7
Islam	1	0.3
Place of residence		
Within Cross river	384	97.7
Outside Cross river	9	2.3
Average Household monthly income		
< ₦19,000 (\$118.75)	347	88.4
≥ ₦19,000 (\$118.75)	46	11.6
Median(range)	7000(5,000)	

A total of 410 questionnaires were administered and 393 were correctly and completely filled and thus included for analysis. 5 patients declined from participating and 12 questionnaires were incorrectly filled thus excluded from analysis. Three hundred and ninety three eligible respondents receiving ART at the General Hospital Ugep were studied.

The mean age of the respondents was 35.9±9.6 years. The largest proportion of the PLHIV

150(38.2%) were in the age group 25-34years, followed by 121(30.8%) in the 35 to 44 age group. The majority of those interviewed were female, 318(80.9%) and currently married 45.5%. More than a third, 162 (41.2 %) had attained at least secondary education and 184(46.8%) were engaged in skilled manual occupations of which majority were farmers. Almost all the respondents, 384 (97.7%) were resident in Cross River State and 347(88.3%) had an average household monthly income less than the minimum wage in Nigeria ₦19,000 (< \$118.75) Almost all (99.7%) respondents interviewed were Christians. Table 1

Table 2: Medication/treatment variables including treatment experiences

Characteristics	Frequency	Percentage
Duration of HAART treatment(months)		
<12	83	21.1
12-24	140	35.6
>24	170	43.3
Median duration of treatment (range)	26(3-149)	
Encountered side effects		
Yes	136	34.6
No	257	65.4
Use of Herbal remedies		
Yes	114	29.0
No	279	71.0
Number of pills/ day		
≤ 2	331	84.2
3-4	60	15.3
>4	2	0.2
Opportunistic infections		
Yes	11	2.8
No	382	97.2
Paid for ART services		
Yes	6	1.5
No	387	98.5
Perceived improvement in health status since commencement on HAART		
Improved	371	94.1
Perceived health rating		
Excellent	15	3.8
Very good	335	85.2
Good	22	5.6
Fair/poor	21	5.4
ARV with fluid and Food restrictions		
Yes	280	71.2
No	113	28.8

The medical profile of the respondents as shown in Table 2 indicated that more than half (51.1%) of the respondents interviewed had been on HAART for more than 24 months. The median duration on HAART was 26 months (range 3-149 months). More than a third, 136(34.6%) of the study population had experienced side effects since the commencement of HAART and more than a fifth,114 (29.0%) were using herbal treatment alongside their antiretroviral medications. Most of the respondents 331(84.2%) were on at least two pills per day and a vast majority 371(94.1%)

perceived their health status as improved since the commencement of HAART.

The result of assessment of adherence to HAART is summarized in Figure 1. Based on the patient’s self reporting in the previous week prior to the study, 50.4% of the respondents’ attained 95% adherence to prescribed HAART regimen.

The main reasons cited for missing or skipping doses among respondents who missed their medications (Figure 2) included being busy 50.6%, simply forgetting 48.9%, religious constraints such as fasting 16%, frequent travelling 14.8%, depression 12.2% and lack of food 11.2%.

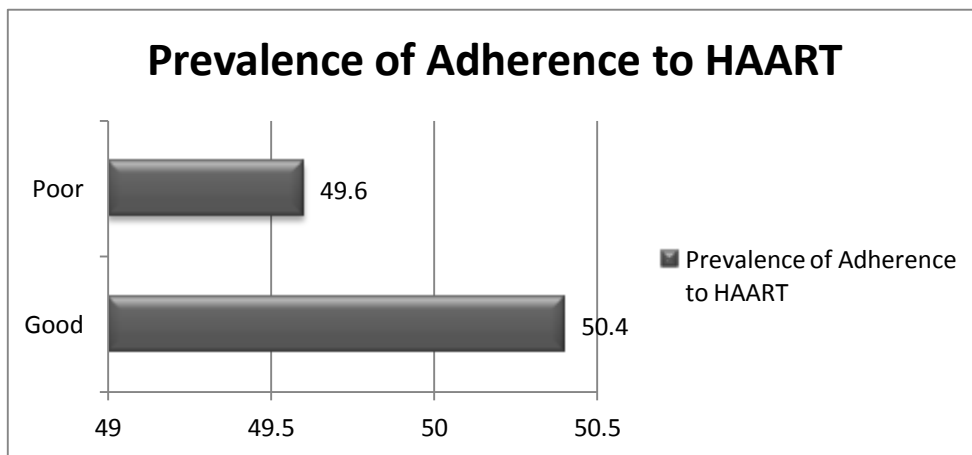


Figure 1: Prevalence of Adherence to Highly active antiretroviral therapy

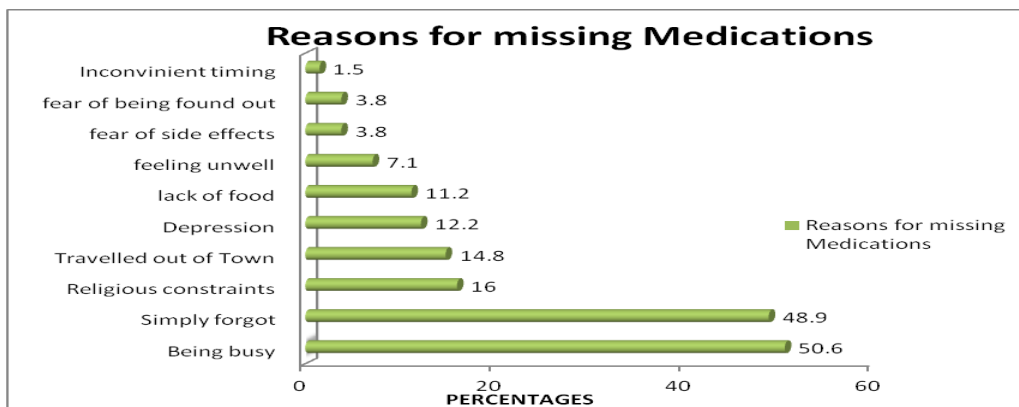


Figure 2: Reasons for missing /skipping medications

The socio-demographic characteristics and medical profile/treatment experiences of the respondents by their ART adherence pattern are shown in Table 4. A higher proportion of PLHIV

whose household monthly income was more than ₦19,000 (\$118.75),(72.4%) were significantly more likely to adhere to HAART compared with those who earned less than ₦ 19,000 (57.8%)

($p < 0.05$). Other significant correlates of adherence included: Perceived health status as improved since commencement on HAART, use of ARV

regimens devoid of fluid and food restrictions, and non use of herbal remedies ($p < 0.05$).

Table 4: Distribution of socio-demographic characteristics and medical profile of the study participants by their ART adherence pattern

Characteristics	Good Adherence N=198	Poor Adherence N=195 N (%)	Significance
Age (years)			
≤35	107(48.2)	115(51.8)	p= 0.97
>35	91(53.2)	80(46.8)	$\chi^2 = 0.32$
Sex			
Male	45(60.0)	30(40.0)	p = 0.06
Female	153(48.1)	165(51.9)	$\chi^2 = 3.43$
Marital status			
Married	92(51.4)	87(48.6)	p= 0.71
Not married	106(49.5)	103(50.5)	$\chi^2 = 0.14$
Average Household monthly income			
< ₦19,000 (\$118.75)	168(48.4)	179(51.6)	p= 0.023
≥ ₦19,000 (\$118.75)	30(65.2)	16(34.8)	$\chi^2 = 4.59$
Use of Herbal remedies			
Yes	46(40.4)	64(59.6)	p= 0.011
No	172(54.5)	127(45.0)	$\chi^2 = 6.46$
ARV with Fluid and Food restrictions			
Present	128(45.7)	152(54.3)	p= 0.004
Absent	70(61.9)	43(38.1)	$\chi^2 = 8.49$
Perceived Improvement in Health status			
Improved	194(52.3)	177(47.7)	
Not improved	4(18.2)	18(81.8)	p=0.002
Encountered side effects			
Yes	64(47.1)	72(52.9)	p= 0.338
No	134(52.1)	123(47.9)	$\chi^2 = 0.92$
Opportunistic infection			
Yes	6(54.5)	5(45.5)	p = 0.78
No	192(50.3)	190(49.7)	$\chi^2 = 0.79$

The significant predictors of adherence to HAART amongst PLHIV in this centre were; non use of herbal remedies [OR1.8; 95% CI 1.23-2.64], perceived improvement in health status [OR 2.72; 95% CI 1.37-5.39], and use of ARV regimens devoid of dietary instructions [OR 1.5;

95% CI 1.07-2.06]. Participants who were not using herbal remedies were more likely to adhere to their prescribed doses compared with those using herbal remedies. Similarly, perceived improvement in health following the commencement of HAART, and use of ARV

regimen devoid of food and fluid restrictions were more likely adherent than those who reported their perceived health status as not improved or took ARV regimens with dietary instructions. See Table 5

Table 5: Predictors of adherence among respondents in the rural treatment location

Characteristic	Odds Ratio	95% Confidence Interval	p-value
Sex			
Male	1.40	0.96- 2.04	0.82
Female	1		
Use of Herbal remedies			
No	1.80	1.23- 2.64	0.003
Yes	1		
Perceived health status			
Improved	2.72	1.37-5.39	0.004
Not improving	1		
Average Household monthly income			
< ₦19,000 (\$118.75)	1.18	0.79-1.76	0.42
≥ ₦19,000 (\$118.75)	1		
ARV regimen with fluid and food restrictions			
No	1.49	1.07- 2.06	0.018
Yes	1		

Discussion

Adherence to effective ARV therapy has strongly correlated with HIV suppression, reduced rates of resistance increase in survival and improved quality of life²⁴⁻²⁵. Adherence has been described as the corner stone for HAART and poor adherence poses a great threat to treatment success. In our study, more than half (50.5%) of the respondents were classified as being adherent while over two out of five were non adherent. The adherence rate reported in this study was low compared to other studies done in similar rural settings which recorded adherence rates of between 59.2%- 87.3%²²⁻²³. This clearly indicates that there were serious barriers to adherence. The resultant low adherence rate recorded in the rural site may be attributable to the low socioeconomic status and low literacy level of the respondents residing in the rural areas. This has been observed by other studies as a risk factor for non adherence in a study done by Afolabi and colleagues in south western Nigeria²⁶.

The commonest reasons cited in this study population for missing or skipping doses were being busy, simply forgetting medications and religious constraints. The first two reasons have been reported consistently in several studies conducted in both urban and rural settings^{19,27-30}.

The use of effective treatment reminders, treatment partners, memory aids especially for patients who operate busy schedules, travel frequently and forget to carry their medications may be of immense help in reducing adherence. This has shown to drastically improve adherence rates amongst PLHIV in a similar setting¹⁴. Religious constraints especially fasting, attending church programmes has also been identified as a major reason for non adherence in this study. This has been identified in a study done by Olowookere and colleagues in south western Nigeria as a risk factor for non-adherence¹⁹. A possible explanation for this could be that during church programmes respondents may not adhere strictly to timing for their medications as agreed with their healthcare provider for fear of being seen taking ARVs. In addition, the role of faith may also be a contributory factor to their poor adherence. Furthermore, during fasting periods, even when they have been reassured by their health care providers of the safety of taking their drugs on an empty stomach, most respondents may not yield to instructions and in the process miss the allotted timing for their medications till the fasting period is over. Thus it may be beneficial if ART adherence strategies are incorporated into their daily lives with individualised coping strategies for the various barriers identified²⁰.

Factors associated with Adherence to HAART

Most of the socio-demographic characteristics such as age, sex, marital status, educational attainment did not significantly affect adherence levels amongst our study population. This corroborates the findings of some other authors^{28,31-32-33}, is at variance with the findings of others where certain socio-demographic variables were associated with being adherent to HAART^{26,34}.

Perceived Health Status

Self reported improved health status was significantly associated with adherence in our study population. PLHIV who perceived their health status as improved since commencement on HAART were more adherent compared to those who perceived their health as not improved. The odds of adherence among those who rated their health status as improved was three times higher compared to those who perceived their health as not improved. This study was in agreement with another study³⁵, where staying healthy was a key motivator of adherence to treatment. In contrast to our findings, Olowookere and colleagues in south western Nigeria reported that feeling good/healthy following treatment, were risk factors for non-adherence. They further reported that most patients tend to abandon treatment once there is an improvement in their health^{19,30}.

Non-use of Herbal remedies

The prevalence of herbal use amongst the study population was 29%. This was slightly lower than was observed in southern Africa where more than a third of PLHIV used herbal medicine concurrently with ARV drugs³⁶. A study done in rural eastern Nigeria by Ibekwe and colleagues further revealed that 40% of respondents were of the opinion that herbal treatment was better than HAART³⁷. This may be due to the fact that PLHIV in rural areas often rely on herbal remedies due to lack of correct information and access to treatment.

Non-use of herbal remedies was demonstrated as a significant predictor of adherence amongst our study population. This finding is in agreement

with a study conducted in Ilorin where the use of herbal medicines was a major risk factor for non adherence³⁸, and a study conducted in South Africa by Peltzer et al which demonstrated non-use of herbal remedies as a major facilitator of adherence³⁶. The reason respondents may consider using herbal remedies could be attributable to the fact that some of the patients may gradually be losing faith in the anti-retrovirals because of the awareness that these drugs do not provide a cure. Hence the preference herbal remedies. Secondly, the proliferation of alternative healers and the claims on the media by traditional medicine practitioners of an instant cure for HIV infection may lead some to abandon their treatment. There is need to explore the efficacy of these herbal remedies through clinical trials but in the interim the use of traditional herbal remedies must be strongly discouraged during counselling sessions in the clinics in order to help the patient focus on attaining optimal adherence to his antiretroviral medications.

ARV regimen with fluid and food restrictions

This study further revealed that respondents on ARV regimen devoid of food and fluid restrictions were better adherers to treatment. This is consistent with a similar study conducted in India³⁹. The respondents especially those in rural areas may find it difficult to follow complicated regimens compared to their urban counterparts because majority in these areas may be illiterate and may not understand instructions given by the health care provider on treatment compared to their urban counterparts. It would be expected that those with a higher level of education would be able to understand and adhere to instructions regarding complicated regimens and possibly have better adherence but this may be unlikely especially for the rural dwellers.

Limitations

Certain limitations of this study are well recognized. The cross-sectional nature of the survey did not allow for inferences to be drawn as to causal relationship among variables.

The use of self reported medication adherence to assess medication adherence was a limitation in

this study since participants had to recall their medication adherence in the previous week and methodology could be associated with recall bias. Concerted efforts were made to reduce recall bias by limiting recall of medication to 7 days prior to the study which was in itself a limitation because of the possibility that subjects would either over- or underestimated their adherence to HAART. This was further worsened by the inability to corroborate patient self-report of adherence with viral loads and CD4 counts because of financial and logistic constraint of frequent laboratory monitoring.

Conclusion

This study showed that medication adherence rate was low among PLHIV receiving treatment in a rural treatment site. The main reasons for non adherence cited by respondents included having a busy schedule, simply forgetting medications and religious constraints. Respondents who perceived themselves in good health, did not use herbal remedies and whose ARV regimen lacked dietary instructions were significantly more adherent to treatment. The findings from this study are crucial in designing adherence enhancing strategies among PLHIV in rural settings in Nigeria. The use of treatment reminders, supporters, using mobile phone technology and memory aids to reduce non-adherence is recommended. Secondly, emphasis during counselling sessions should discourage the use of traditional herbal remedies alongside HAART which has been seen to affect adherence in the present study. In addition, curtailing the activities of Alternative medical practitioners in the country claiming to have found a cure for HIV/AIDS would be of immense help. The use of simplified HAART regimens especially amongst rural dwellers would further reduce the challenges of inconsistencies experienced in adhering to HAART

Conflict of Interest

No conflict of interest associated with this work

Contribution of Authors

We declare that this work was done by the authors named in this article and all liabilities pertaining to

claims relating to the content of this article will be borne by the authors.

OA conceived, designed and coordinated the study, she carried out statistical analysis and drafted the manuscript; OE contributed by means of her competence and experience in reviewing the manuscript critically for its intellectual content and also participated in the conception and design of the study. OO participated in the design of the study and critically reviewed the manuscript. ME reviewed the manuscript critically for its intellectual content.

All authors read and approved the final manuscript

Acknowledgements

The authors would like to thank the staff of the HIV care and support centre General Hospital Ugep for the support and assistance during the collection of data.

References

1. UNAIDS. Global HIV/AIDS Epidemic Update. Geneva, Switzerland 2011.
2. Federal Ministry of Health (FMOH). 2010 National HIV sero- prevalence Senntinnel Survey. Abuja: Federal Ministry of Health 2010.
3. World Health Organisation (WHO). WHO African Region Nigeria 2008.
4. Federal Ministry of Health (FMOH). National Guidelines for HIV and AIDS Treatment and Care in Adolescents and Adults. Abuja, Nigeria. Federal Ministry of Health 2010.
5. Rao Ds, Kekwaletswe TC, Hosek S, Martinez J, Rodriguez F, . Stigma and social barriers to medication adherence with urban youth living with HIV. *AIDS Care*. 2007;19(1):28-33.
6. Lewis MP, Colbert A, Erlen J, Meyers M. A Qualitative study of persons who are 100% adherent to antiretroviral therapy. *AIDS Care* 2006;18(2):140-8.
7. Lee L, Karon JM, Selik R, Neal JJ, Fleming P. Survival after AIDS diagnosis in adolescents and adults during the treatment era United States. *Journal of the American Medical Association*. 2001;285(10):1308-131.
8. Monjok E, Smesny A, Okokon IB, Mgbere O, Essien J. Adherence to antiretroviral therapy in Nigeria: An overview of research studies and implications for policy and practice. *HIV/AIDS - Research and Palliative Care* 2010;2:69-76.
9. National Agency for the control of AIDS (NACA). Antiretroviral Therapy (ART) in Nigeria . Fact sheet 2011; 2011.

10. Amico KR, Toro-Alfonso J, Fisher JD. An empirical test of the Information, Motivation and Behavioural Skills model of antiretroviral therapy adherence. *AIDS Care*. 2005;17(6):661-73.
11. Remien RH, Bastos FI, Terto Jnr V, Raxach JC, Pinto RM, Parker RG, et al. Adherence to antiretroviral therapy in a context of universal access, in Rio de Janeiro, Brazil. *AIDS Care*. 2007;19(6):740-8.
12. Reynolds NR, Testa M, Marc L, Chesney M, Neidig J, Smith S, et al. Factors influencing medication adherence beliefs and self-efficacy in persons naïve to antiretroviral therapy: a multicentre, cross-sectional study. *AIDS Behaviour*. 2004;8(2):141-50.
13. Nozakia I, Christopher D, Kazuhiro K, Norio Y, James BS. Social factors affecting ART adherence in rural settings in Zambia. *Aids care*. 2011;23(7):831-8.
14. Wang X, Wu Z. Factors associated with adherence to antiretroviral therapy among HIV/AIDS patients in rural China. *AIDS*. 2007; 21 (suppl 8):149-55.
15. Wainberg M, Friedland G. Public health implications of antiretroviral therapy and HIV drug resistance. *JAMA*. 1998;279:1977-83.
16. Read T, Mijch A, Fairley CK. Adherence to antiretroviral therapy: are we doing enough? *Internal Medicine Journal*. 2003;33(5-6): 254-6
17. Bartlett JA. Addressing the challenges of adherence. *Journal of Acquired Immune Deficiency Syndrome*. 2002;29(suppl 1):2-10.
18. Nwauche C, Erhabor O, Ejele O, Akani C. Adherence to Antiretroviral therapy among HIV-infected subjects in a resource limited setting in the Niger Delta of Nigeria. *African Journal of Health Sciences*. 2006; 13(3):13-7.
19. Olowookere SA, Fatiregun AA, Akinyemi JO, Bamgboye AE, GK. O. Prevalence and determinants of nonadherence to highly active antiretroviral therapy among people living with HIV/AIDS in Ibadan, Nigeria. *J Infect Dev Ctries*. 2008;2(5):369-72.
20. Erah P, Arute J. Adherence of HIV/AIDS patients to antiretroviral therapy in a tertiary health facility in Benin City. *African Journal of Pharmacy and Pharmacology*. 2008;2(7):145-52.
21. National Population Commission (NPC). National census Nigeria 2006.
22. Sasaki Y, Kakimoto K, Dube C, I S, Moyo C, Syakantu G, et al. Adherence to Antiretroviral therapy (ART) during the early months of treatment in rural Zambia: influence of demographic characteristics and social surroundings of patients. *BMC Annals of Clinical Microbiology and Antimicrobials*. 2012;11(34):1-11.
23. Svarstad B, Chewning B, Sleath B, Claesson C. The brief medication questionnaire: A tool for screening patient adherence and barriers to adherence. *Patient Education and Counseling* 1998;37:113-24.
24. Paterson G, Swindells S, Mohr J. Adherence to protease inhibitor therapy and outcome in patients with HIV infection. *Ann Intern Med*. 2000;133:21-30.
25. Hogg R, Heath K, Bangsberg D, Yip B, Press N, O'Shaughnessy M, et al. Intermittent use of triple-combination therapy is predictive of mortality at baseline and after 1 year of followup. *AIDS Care*. 2002;16(10):51-8.
26. Afolabi MO, Ijadunola KT, Fatusi AO, OA. O. Determinants of adherence to antiretroviral drugs among people living with HIV/AIDS in the Ife-Ijesa of Osun State, Nigeria. *African Journal of Primary Health Care and Family Medicine*. 2009;1(1):6
27. Amberbir A, Woldemichael K, Getachew S, Girma B, Deribe K. Predictors of adherence to antiretroviral therapy among HIV-infected persons: a prospective study in Southwest Ethiopia. *BMC Public Health*. 2008;8(265):1-10.
28. Talaam NC, Gatongi P, Rotich S. Factors Affecting Antiretroviral Drug Adherence among HIV/AIDS Adult Patients attending HIV/AIDS clinic at Moi Teaching and Referral Hospital, Eldoret, Kenya. *East African Journal of Public Health*. 2008;5(2):74-8.
29. Wakibi SN, Ng'ang'a ZW, Mbugua GG. Factors associated with non-adherence to highly active antiretroviral therapy in Nairobi, Kenya. *AIDS Research and Therapy* 2011;43:1-8.
30. Agu KA, Okojie O, Oqua D, King RC, Omonaiye O, Onuoha C, et al. Medication Adherence and Risk factors for Non-adherence among Patients taking Highly Active Antiretroviral Therapy West African Journal of Pharmacy. 2011;22(1):19 - 26.
31. Mohammed MD, R. S. Adherence to antiretroviral drugs in North-Central zone of Nigeria. *East and Central African Journal of Pharmaceutical Sciences*. 2004;7(3):52-5.
32. Kleeberger C, Phair J, Strathdee S, Detels R, Kingsley L, Jacobson L. Determinants of heterogeneous adherence to HIV antiretroviral therapies in the Multicentre AIDS Cohort Study. *J Acquir Immune* 2001;26(1):82-92.
33. Gifford A, Bormann J, Shively M, Wright B, Richman D, Bozzette S. Predictors of self-reported adherence and plasma HIV concentrations in patients on multidrug antiretroviral regimens. *Journal of Acquired Immune Deficiency Syndrome*. 2000;23:386-95.
34. Uzochukwu B, Onwujekwe O, Onoka A, Okoli C, Uguru N, Chukwuogo O. Determinants of non-adherence to subsidized anti-retroviral treatment in southeast Nigeria. *Health Policy Plan*. 2009;24:189-96.
35. Malcolm S, Ng J, Rosen R, Stone V. An examination of HIV/AIDS patients who have excellent adherence to HAART. *AIDS Care*. 2003;15(2):251-61.
36. Peltzer K, Preez NF-d, Ramlagan S, Anderson J. Antiretroviral treatment adherence among HIV patients in KwaZulu-Natal, South Africa. *BMC Public Health*. 2010;10:1-10.
37. Ihekwe NA, Iloghalu CN, Omile JN, editors. Non adherence as a challenge to a successful HIV/AIDS treatment International AIDS conference; 2010; Italy.
38. Bello SI. HIV Patients adherence to ART in Sobi Specialist Hospital, Illorin, Nigeria. *Global Journal of Medical Research*. 2011;11(2):16-21.
39. Cauldbeck MB, O'Connor C, O'Connor MB, Saunders JA, Rao B, Malleh VG, et al. Adherence to anti-retroviral

Oku et al.

Prevalence, determinants adherence to HAART rural Nigeria

therapy among HIV patients in Bangalore, India.

AIDS Research and Therapy 2009;6(7):1-8.