

# Factors influencing adherence to anti-retroviral therapy among people living with HIV/AIDS attending the State Hospital, Osogbo, Nigeria

Caroline O. Muoghalu

Department of Sociology and Anthropology, Obafemi Awolowo University, Obafemi, Ile-Ife, Osun State, Nigeria

## Abstract

**Introduction:** Since the introduction of anti-retroviral therapy (ART) for managing human immunodeficiency virus (HIV) and acquired immune deficiency syndrome (AIDS) in Nigeria, adherence to treatment has been a critical issue due to its importance in improving the quality of life of people living with HIV/AIDS (PLWHA). The aim of this paper is to determine level of adherence to ART, examine reasons for non-adherence and the association between socio-demographic characteristics, and adherence to ART among PLWHA who were attending the State Hospital, Osogbo, Nigeria. These are with the view to establishing factors influencing adherence to ART among PLWHA in Nigeria.

**Material and methods:** The health belief model and political economy perspectives framed the paper. Purposive/systematic sampling techniques were used to select 200 PLWHA (men and women) attending clinic in the State Hospital, Osogbo, South Western Nigeria.

**Results:** Findings indicated adherence level of 69%. Furthermore, the reasons for non-adherence were forgetfulness (21.5%), work/travel (16.0%), fasting and spiritual interruption (8.5%), inadequate meal (7.0%), stigma (7.0%), and side effect of the drug (7.0%). It was revealed that the size of the ART was too big for some of the respondents, which militated against adherence. Moreover, the socio-demographic characteristics that influenced adherence were sex, age, marital status, marriage type, education, number of children, and occupation. However, most of these influences were not statistically significant. Finally, respondents' suggestions on how to improve adherence were PLWHA should be encouraged to take their drugs (33.5%), improve the size because it is too big (10.0%), educate PLWHA (24.0%), make ART more private (9.0%), and legislation on stigma (9.5%).

**Conclusions:** The paper concluded that health behavior of PLWHA, socio-economic, and demographic factors influenced PLWHA's adherence to ART in the study area.

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**Key words:** anti-retroviral therapy, HIV/AIDS, adherence, socio-demographic factors, people living with HIV/AIDS.

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**Address for correspondence:** Dr. Caroline O. Muoghalu,  
Department of Sociology and Anthropology, Obafemi Awolowo  
University, Obafemi, +234, Ile-Ife, Osun State, Nigeria,  
phone: +2348056681600, e-mail: [omuoghal@yahoo.co.uk](mailto:omuoghal@yahoo.co.uk)

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## Introduction

The identification of human immune deficiency virus/acquired immune deficiency syndrome (HIV/AIDS) in the early 1980s became a turning point in health of populations around the world. The HIV/AIDS means that it is a disease that attacks the immune system and comes with series of associated symptoms and illnesses. Ever since its inception, it has devastated countries and families especially in sub-Saharan Africa. For instance, of the thirteen million people living with HIV/AIDS in the world, 70% were from sub-Saharan Africa [1]. In Nigeria, the prevalence of HIV infection is 3.4% [2], which is quite large in absolute numbers considering the population of the country. Nigeria has the second largest number of people living with HIV in the world and one of the highest new infection rates in sub-Saharan Africa, with 3.2 million people living with the virus [3]. The Joint United Nations Programme on HIV and AIDS (UNAIDS) [3] also reported that 160,000 Nigerians died in 2016 from AIDS-related illnesses. These gloomy statistics is a sign that Nigeria bears a heavy burden of the disease. At the onset of this disease, there was no cure or even management strategy, and being infected almost meant a death sentence.

However, with the introduction of anti-retroviral therapy (ART) as a management strategy, it became easier to reduce morbidity and mortality associated with the disease. Anti-retroviral means that the drug makes it difficult for virus to thrive. The ART works by inhibiting the multiplication of the virus in the body. Adherence to this drug regimen became a life saver making it possible for infected people to live normal lives. When an infected person takes the drugs at the right time and in the correct dosage as prescribed by the physician and without skipping, it is said that the person's level of adherence is high. Monjok *et al.* [4] defined adherence as the extent, to which a person currently takes prescribed medication.

Adherence is very critical to treatment outcomes and containment of the pandemic. As noted by Olowookere *et al.* [5], interrupting medication permits the virus to resume rapid replication and as many as 10 viral particles will be produced a day. This allows resistant mutant strains to be generated, which are no longer responsive to available anti-retroviral drugs, thereby posing a public health danger. Adherence levels are mixed in Nigeria and may need state by state study to untangle. For instance, in Bayelsa State, Suileman and Momo [6] found 73.4% adherence level, which they interpreted as low adherence level. Also, Monjok *et al.* [4] found high and low adherence levels in Nigeria. Furthermore, Onyeonoro *et al.* [7] found adherence level of 97.8% in South East Nigeria. However, another study in different part of South East found 85.1% non-adherence level [8].

Adherence became topical due to the fact that low-level of adherence to ART may result in the virus to multiply and become resistant to drugs, thereby resulting in preventable deaths. This applies especially to Nigeria, where adherence to ART continues to be low due to social, cultural, eco-

nomical factors, and side effects of the drug [6]. People living with HIV/AIDS in Nigeria may find it difficult to adhere to ART regimen due to cost of therapy (even when the drugs are heavily subsidized), medication side effects, stigma, and non-availability of ARV drugs [4]. Also, Okoronkwo *et al.* [8] and Odili *et al.* [9] had similar findings. Their studies indicated that forgetfulness, busy schedule, side effects of drug, and stigma were the factors militating against adherence to ART. Furthermore, socio-demographic characteristics of PLWHA tend to exert some influence on adherence to ART. For instance, Okoronkwo *et al.* [8] found that females adhere to ART more than males, unemployed and artisans adhere more than their employed counterparts, and PLWHA with no formal education were more likely to attribute poor adherence to poor communication, side effects of the drug, and stigma than those with formal education. Moreover, marital status, income, and occupation were found to be statistically significant [9].

There had been studies on adherence in Nigeria but not much had been done in Osun State and on association between socio-demographic characteristics and adherence as well as reasons for non-adherence in the study area. As such, this paper becomes significant, as it would contribute to knowledge on factors influencing adherence to ART in Osun State in particular and Nigeria in general. This could engender effective intervention programs towards eliminating factors that fuel non-adherence and towards the containment of the pandemic.

This study was carried out among people living with HIV/AIDS who were attending clinic in the State Hospital, Osogbo in Osun State, Nigeria. The reason to choose this study location was the fact that people living with HIV/AIDS from Osogbo, Lagos, Oyo, Ikire, and other neighbouring towns attend the HIV/AIDS clinic in this hospital, which makes it possible to reach diverse patients from different backgrounds. The specific objectives of this paper were to ascertain PLWHA's level of adherence to ART drug regimen, analyze factors influencing adherence to ART drug regimen, and examine the association between socio-demographic characteristics and adherence to ART. These were with a view to establishing factors influencing adherence to ART in Osun State, Nigeria.

## Theoretical framework

Health belief model and political economy theory were employed in framing this study. Health belief model came from the premise that perceived seriousness and susceptibility, perceived barrier and benefit could drive people's adherence levels. The perceived seriousness of the HIV/AIDS disease was likely to push people living with HIV/AIDS to adhere to ART. Also, the perceived benefits of adhering to the drug regimen was expected to encourage people living with HIV/AIDS to adhere strictly to ART.

The political economy theory in this paper was employed to explain the influence of government policies,

economic situation, and cultural values as well as practices on PLWHA's tendency/ability to adhere strictly to ART. At the government policy level, ART is administered free to people living with HIV/AIDS attending government/public hospitals. In spite of this free treatment, many Nigerians with the disease do not adhere to ART drug regimen due to several issues in the socio-political/cultural circumstances of the people. For instance, the present economic recession in Nigeria has resulted in many families falling into abject poverty. High-level of poverty has made it difficult for some people living with HIV/AIDS to pay for transportation to the hospital. As such, many of them skip their clinic appointments, where they would be given their next batch of drugs, thereby creating a gap in the drug regimen and failing to adhere to ART.

## Material and methods

### Context

This study was conducted in the State Hospital, Osogbo, Osun State, Nigeria. The state hospital is situated in the heart of Osogbo town. It is a government hospital with big capacity to cater to 3,000 patients daily, who come for consultation and treatment for different forms of ailments. This hospital was purposively selected because it was designated as one of the catchment hospitals for ART for people living with HIV/AIDS in Osogbo, Lagos, Ikire, Iwo, and other towns in South West Nigeria. The hospital has many health workers including social workers, doctors, and nurses who specialize in ART treatment for their numerous patients. Osun State is one of the thirty-six states in Nigeria and the indigenes are Yoruba speaking people who are traditionally farmers and have strong family ties, which may implicate adherence to ART.

The respondents were selected from the population, which comprised of 2,000 people living with HIV/AIDS (based on the registered PLWHA in the hospital) that come for consultation and ART in the hospital. The respondents were adult males and females, and adolescents, whose ages ranged from 16 to 56 years and above. The sample size was 200 males and females, and arrived at using Teddlie and Yu (2007) [10], in which 10% of a population size that is below 10,000 is considered as representative in a small study. The sampling procedure was systematic sampling in such a way that 10 respondents were selected on each clinic day. That is, 10 were selected on Monday clinic and ten on Wednesday clinic, making it 20 respondents in a week. The same thing happened in subsequent weeks, and anybody who had filled the questionnaire once was excluded from filling it a second time. The essence of this systematic data collection was to facilitate and enable the researcher to have access to all the PLWHA that attend the state hospital for ART. This was because the PLWHA attend the clinics once in a month and in some cases, once in two months, and this method made it possible to have access to all the people living with HIV/AIDS attending the hospi-

tal. Each respondent was reached through convenience sampling, in which questionnaire were administered on people living with HIV/AIDS who were willing to participate in the study. To ensure that sample size of 200 was maintained, the researcher went back to the hospital to administer more questionnaire in order to replace badly filled questionnaires.

Data were analyzed with the statistical package for social sciences that employed descriptive (frequency and percentages) and inferential statistics (cross tabulation and regression analysis). Data were analyzed in themes as each objective formed a theme.

Adherence was gotten from self-reports of the respondents and was measured by percentage of those who do not miss their medication at all. To arrive at the adherence levels of those who fail to take their drugs sometimes, the number of times they fail to take their drugs was divided by 7 (that is, 7 days in a week) and multiplied by 100 to arrive at the percentage of adherence level. For instance, to arrive at the adherence level for those that fail twice was computed accordingly:

$$\frac{2}{7} \times 100 = 28.6.$$

Then, 28.6 was deducted from 100, which came to 71.4% adherence level. Also, adherence was further measured by whether PLWHA utilize other therapies apart from ART.

Ethical approval was obtained from the ethical committee of the state hospitals management board, Osogbo. Also, verbal consent was obtained from the respondents before the administration of the questionnaire. Furthermore, the respondents were assured that their responses will be treated with utmost confidentiality and that they were not going to come to any harm as a result of their participation in the study.

## Results

### Socio-demographic/economic characteristics of respondents

Table 1 showed that many of the respondents (38%) were within the ages of 36-45 years, which is the most economic viable age. This meant that they were always occupied, and it could be very easy for them forget their ART since they were always at work or in the midst of people, which could make it difficult for them to adhere strictly to drug ART regimen. Furthermore, 34% of the respondents have four or more children, which was likely to motivate them to adhere to the ART because they would want to struggle to live to take care of their children. Also, majority of them were married, which could help in adherence because the spouse can remind the person to take his/her drugs, especially if the person had disclosed his/her seropositive status.

### Level of adherence

Table 2 shows that 69% of the respondents adhere strictly to ART without skipping their drugs. Also, of those that

**Table 1.** Socio-demographic/economic characteristics of respondents

Variable/Categories	Frequency	Percentage
<b>Age (years)</b>		
< 16	1	0.5
≥ 16-25	14	7.0
26-35	62	31.0
36-45	76	38.0
46-55	34	17.0
≥ 56	13	6.5
Total	200	100.0
<b>Sex</b>		
Male	36	18.0
Female	164	82.0
Total	200	100.0
<b>Marital status</b>		
Married	150	75.0
Single	22	11.0
Divorced	7	3.5
Separated	3	1.5
Widowed	18	9.0
Total	200	100.0
<b>Marriage type</b>		
Monogamy	127	73.0
Polygamy	47	27.0
Total	174	100.0
<b>Number of children</b>		
None	34	17.0
One	32	16.0
Two	33	16.5
Three	33	16.5
Four and above	68	34.0
Total	200	100.0
<b>Religious affiliation</b>		
Christianity	105	52.5
Islam	95	47.5
Traditional	0	0
Total	200	100.0
<b>Highest educational level</b>		
None	14	7.0
Primary	50	25.0
Secondary	78	39.0
Tertiary	58	29.0
Total	200	100.0

**Table 1. Cont.**

Variable/Categories	Frequency	Percentage
<b>Highest educational level of spouse</b>		
None	2	1.3
Primary	29	18.6
Secondary	68	43.6
Tertiary	57	36.5
Total	156	100.0
<b>Occupation</b>		
Civil servant	14	7.0
Trader	87	43.5
Self-employed/artisan	63	31.5
Blue-collar employee	12	6.0
Unemployed	11	5.5
Quit-working	8	4.0
Student	5	2.5
Total	200	100.0
<b>Level of income</b>		
10,000-50,000	68	34.0
51,000-100,000	42	21.0
101,000-150,000	32	16.0
151,000-250,000	29	14.5
251,000 and above	29	14.5
Total	200	100.0

**Table 2.** Respondents' level of adherence to anti-retroviral therapy (ART) drug regimen

Variable/Categories	Frequency	Percentage
<b>Drug usage/dosage per week</b>		
7 times/week (once daily)	103	51.5
14 times/week (twice daily)	97	48.5
Total	200	100.0
<b>Failure to take drugs sometimes</b>		
Yes	62	31.0
No	138	69.0
Total	200	100.0
<b>Times I miss taking antiretroviral drugs in a week</b>		
Once	33	66.0
Twice	5	10.0
Thrice	3	6.0
More than three times	9	18.0
Total	50	100.0

**Table 3.** Reasons for failure to adhere to anti-retroviral therapy (ART) drug regimen

Factors/Categories	Frequency	Percentages
Reasons for missing drug usage sometimes		
Forgetfulness	43	21.5
Just feel like not taking it every occasionally	19	9.5
I don't take it seriously	14	7.0
Fasting and other spiritual interruption	17	8.5
Work/travel	32	16.0
Sometimes I forget it at home while I'm out	17	8.5
Inadequate meal	14	7.0
Side effects	14	7.0
Didn't realize till it finished	16	8.0
The presence of those who are unaware of my positive status (fear of stigma)	14	7.0
Total	200	100.0
Does the drug affect you in any way?		
Yes	15	7.5
No	185	92.5
Total	200	100.0
Effects of the drug		
Make me feel very weak	4	26.7
Makes me urinate often	2	13.3
When the drug type was changed	1	6.7
When I first started taking the drug, it affected me	4	26.7
No effect per say	1	6.7
Gives me more strength to perform daily routine	1	6.7
ART sessions sometimes do clash with daily routine	2	13.3
Total	15	100.0
Factors that made it difficult for drug usage at the right time		
Nothing	132	66.0
Delay in meal time	13	6.5
If am not with it	10	5.0
Inadequate/no meal	9	4.5
Only when I forget/slept off	13	6.5
Get tired and busy sometimes	17	8.5
If friends/families not yet aware of my positive status are present	3	1.5
When on tour or long journey	3	1.5
Total	200	100.0

**Table 3. Cont.**

Factors/Categories	Frequency	Percentages
Reluctant to take my ART drug		
Yes	18	9.0
No	182	91.0
Total	200	100.0
Reasons for reluctant attitude to take ART drugs		
Side effects	14	77.8
The fact that I must take it always	2	11.1
Wasn't used to the schedule when I first started	2	11.1
Total	18	100.0
Suggested measures to reduce the incidence of people not taking their ART		
Encouragement	67	33.5
Improving on its size (too big)	20	10.0
Proper education for PLWHA	48	24.0
Nothing	28	14.0
Make ART more private to protect patients' status' privacy	18	9.0
Legislation	19	9.5
Total	200	100.0

failed to take their drugs sometime, 66.0% of them failed once to take their drugs in a week, while 10% of them failed twice in a week to take their drugs, 6.0% failed thrice, and 18.0% of them failed more than three times to take their drugs in a week. Further analysis of this failure trend showed that the 66.0% of PLWHA who failed to take their drugs once had the adherence level of 85.7%, while 10.0% of them who failed twice had adherence level of 71.4%, 6.0% who failed thrice to take their drugs had 57.1% level of adherence, and 18.0% of PLWHA who failed to take their drugs more than thrice had adherence levels of 42.9% and below. Generally, the 31% failure rate showed that many people living with HIV/AIDS who were taking ART were not adhering to the drug regimen, which has serious implications for their health, the outcome of treatment, and the containment of the epidemic.

Table 3 presents the reasons that prevented some of the respondents from taking their ART: forgetfulness (21.5%), work/travel (16.0%), fasting and spiritual interruption (8.0%), stigma (7.0%), and side effects of the drug (7.0%). Also, the effects of the drug on PLWHA were examined, and 26.7% of those saying that the drug affected them indicated that the drug made them feel weak, while 13.3% indicated frequent urination, and 13.3% of them said that it clashes with their daily routine. However, 6.7% of them indicated that the drug made them feel strong and enable them to



**Table 4.** Respondents usage of alternative therapies

Factors/Categories	Frequency	Percentages
Usage of other therapy apart from the ART		
Yes	59	29.5
No	141	70.5
Total	200	100.0
Aborting ART drugs for alternative drugs		
Yes	3	5.1
No	56	94.9
Total	59	100.0
Usage of both hospital therapy and alternative drugs together		
Yes	13	22.0
No	46	78.0
Total	59	100.0
Justification for the usage of both therapies simultaneously		
They were not given to me at the same time	13	22.0
eager to be healed	13	22.0
I take alternative drugs sometimes when I can afford them	11	18.6
I take alternative drugs in the morning and ART drugs at night	11	18.6
Sometimes when ART drugs are not available	11	18.6
Total	59	100.0

ART – antiretroviral therapy

carry out their daily routines. Furthermore, there were other issues that contributed to non-adherence as indicated by the respondents, including delay in meal or no food to eat, when on a long journey, and being in the midst of people who were not yet aware of their sero-positive status (fear of stigma). Importantly, 9.0% of the respondents indicated that they were reluctant to take their drugs, and 77.8% of them mentioned side effects of the drug as the discouraging factor.

Furthermore, the respondents were asked to suggest measures to curb the problem of non-adherence, and 33.5% of them indicated that PLWHA should be encouraged to take their drugs, 10.0% of them pointed out improving the size of the drug (too big size), 24.0% indicated education of PLWHA, and 9.0% of them said that ART drug administration should be made more private to protect the status of PLWHA.

As a measure of adherence, respondents were asked whether they utilize alternative medication apart from ART. Table 4 shows that 29.5% of the respondents utilize alternative medication other than the ART. Also, 22.0% of the respondents utilize both alternative medication and ART. The reasons for this trend was investigated, and 22.0% of those that utilize alternative medication indicated that they were eager to

**Table 5.** Further constraints to adherence to anti-retroviral therapy (ART) drug regimen

Factors/Categories	Frequency	Percentages
Discouragement from taking the drugs by family		
Yes	9	4.5
No	191	95.5
Total	200	100.0
Family factors that discourage people from taking their drugs		
Baby caring and nursing	1	11.1
They don't see it as important	1	11.1
Family religious faith	1	11.1
Stigmatization	3	33.3
Their unawareness of my positive status	1	11.1
Malnutrition/poverty	2	22.2
Total	9	100.0
Constraints encountered when coming to clinic		
Money for transport	20	10.0
Long journey	12	6.0
Getting permission from husband	2	1.0
No constraint	161	80.5
My job	5	2.5
Total	200	100.0

be healed. Another 22.0% said that the drugs were not given to them at the same time, while 18.6% indicated that they take alternative medication whenever they can afford it. Furthermore, 18.6% take alternative medication in the morning and ART at nights, and another 18.6% take alternative medication when ART drugs are not available. These are dangerous trends with serious implications on ART treatment outcomes and the health of PLWHA in the study area.

Table 5 presents additional constraints that made it difficult for PLWHA to adhere to ART drug regimen. The table showed that 4.5% of respondents were discouraged from adhering to ART by family factors such as caring and nursing of babies, family members not seeing taking ART as important, family religious faith, stigmatization, family members not being aware of their HIV positive status, and malnutrition and poverty. Apart from family factors, some respondents also encountered constraints when coming to clinic. Table 5 showed that 10.0% of them did not have money for transportation, while 6.0% considered it a long journey, 1.0% had problem getting permission from husbands, and 2.5% had problem leaving their jobs to come to clinic. These constraints were partly cultural and partly political/economical in the sense that no money for transport was an issue in the political economy of Nigeria, in which many families had fallen into poverty.

### Cross tabulation and $\chi^2$ analysis of socio-demographic/economic characteristics and adherence to anti-retroviral therapy

Adherence level was measured (Table 2) by the number of times respondents reported missing their drugs in a week. Adherence was further measured by whether respondents combined hospital therapy (ART) and any other alternative therapy or not. Any of the PLWHA who combined ART with any other medication intended for the HIV management was not adhering strictly to ART. Thus, the indicator for adherence in this section was the combination of ART with any other alternative therapy or ART treatment only. This dependent variable was tested against respondents' socio-demographic/economic characteristics to investigate any possible association between them.

Table 6 shows that 78.6% of PLWHA within the age of 16-25 adhere strictly to ART, 76.9% of PLWHA who were 56 years and above adhere strictly to ART, 76.5% of PLWHA within the age of 46-55 adhere strictly to ART, and 72.4% of PLWHA within the age of 36-45 adhere strictly to ART. The age group with the lowest adherence to ART were PLWHA within the age of 26-35, with 61.3% strict adherence to ART. Importantly, the prevalence of HIV infection is high among people of this age group and their low-level of adherence had serious implications for their health. People living with HIV/AIDS who were within the age of 26-45 years adhere less than other groups. This could be as a result of the fact that people in this group were busier than people in other age groups, which could influence their level of adherence. This constitute a big problem because this age group is the most mobile, and people in their prime and their low adherence may likely result in poor outcome of the ART program in the country. Furthermore, the  $\chi^2$  result showed  $\chi^2$  of 4.354 (df5) ( $p > 0.05$ ), which was not significant at 95% confidence level.

Table 7 indicates that 63.9% of males and 72.0% of females were using only ART, which was an indication that females adhere more to ART regimen than males. However, this was not significant at 95% confidence level with  $\chi^2$  0.923 (df 1) ( $p > 0.05$ ).

Table 8 shows that 72.7% of married respondents, 63.6% of single respondents, and 57.1% of those who were divorced used only ART. These differences were not significant at 95% confidence level with  $\chi^2$  1.586 (df 4) ( $p > 0.05$ ). This was an indication that this factor was not statistically significant.

Table 9 indicates that 87.2% of those in polygamous relationships and 66.9% of respondents in monogamous relationships adhere strictly to ART, which means that people in polygamous relationships adhere more to ART than those in monogamous relationships. Also, there was a significant association between the type of marriage and whether respondents strictly adherence to ART with  $\chi^2$  7.080 (df 1),  $p < 0.05$ .

Table 10 shows that 84.4% of respondents with one child and 77.9% of respondents with four children and

**Table 6.** Cross tabulation and  $\chi^2$  analysis of respondents' age and adherence to anti-retroviral therapy (ART)

	Adherence		Total
	ART + alternative therapy	Only ART	
Age (years), n (%)			
< 16	0 (0)	1 (100)	1 (100)
≥ 16-25	3 (21.4)	11 (78.6)	14 (100)
26-35	24 (38.7)	38 (61.3)	62 (100)
36-45	21 (27.6)	55 (72.4)	76 (100)
46-55	8 (23.5)	26 (76.5)	34 (100)
≥ 56	3 (23.1)	10 (76.9)	13 (100)
Total	59 (29.5)	141 (70.5)	200 (100)
Pearson $\chi^2$ (df)	4.354 (5)		
Level of significance	0.500 ( $p > 0.05$ )		

**Table 7.** Cross tabulation and  $\chi^2$  analysis of respondents' sex and adherence to anti-retroviral therapy (ART)

	Adherence		Total
	ART + alternative therapy	Only ART	
Sex, n (%)			
Male	13 (36.1)	23 (63.9)	36 (100)
Female	46 (28.0)	118 (72.0)	164 (100)
Total	59 (29.5)	141 (70.5)	200 (100)
Pearson $\chi^2$ (df)	0.923 (1)		
Level of significance	0.337 ( $p > 0.05$ )		

**Table 8.** Cross tabulation and  $\chi^2$  analysis of respondents' marital status and adherence to anti-retroviral therapy (ART)

	Adherence		Total
	ART + alternative therapy	Only ART	
Marital status, n (%)			
Married	41 (27.3)	109 (72.7)	150 (100)
Single	8 (36.4)	14 (63.6)	22 (100)
Divorced	3 (42.9)	4 (57.1)	7 (100)
Separated	1 (33.3)	2 (66.7)	3 (100)
Widowed	6 (33.3)	12 (66.7)	18 (100)
Total	59 (29.5)	141 (70.5)	200 (100)
Pearson $\chi^2$ (df)	1.586 (4)		
Level of significance	0.811 ( $p > 0.05$ )		

**Table 9.** Cross tabulation and  $\chi^2$  analysis of respondents' marriage type and adherence to anti-retroviral therapy (ART)

	Level of adherence		Total
	ART + alternative therapy	Only ART	
Marriage type, <i>n</i> (%)			
Monogamy	42 (33.1)	85 (66.9)	127 (100)
Polygamy	6 (12.8)	41 (87.2)	47 (100)
Total	48 (27.6)	126 (72.4)	174 (100)
Pearson $\chi^2$ (df)	7.080 (1)		
Level of significance	0.008 ( $p < 0.05$ )		

**Table 10.** Cross tabulation and  $\chi^2$  analysis of respondents' number of children and adherence

	Adherence		Total
	ART + alternative therapy	Only ART	
Number of children, <i>n</i> (%)			
None	6 (60.0)	4 (40.0)	10 (100)
One	5 (15.6)	27 (84.4)	32 (100)
Two	14 (42.4)	19 (57.6)	33 (100)
Three	11 (33.3)	22 (66.7)	33 (100)
Four and above	15 (22.1)	53 (77.9)	68 (100)
Total	51 (29.0)	125 (71.0)	176 (100)
Pearson $\chi^2$ (df)	12.234 (4)		
Level of significance	0.016 ( $p < 0.05$ )		

above adhere strictly to ART, and 40.0% of those with no child adhere strictly to ART. This was an indication that having a child/children exerts influence on PLWHA's adherence to ART.

Moreover, there was a significant association between the number of children and whether respondents will strictly adhere to ART with  $\chi^2$  12.234 (df 4),  $p < 0.05$ .

Table 11 indicates that 74.7% of Muslims and 66.7% of Christians adhere strictly to ART. This means that those that practice Islam adhere more to ART than PLWHA that practice Christianity. However, this difference was not significant at 95% confidence level with  $\chi^2$  1.562 (df 1) ( $p > 0.05$ ).

Table 12 shows that 92.9% of people with no formal education adhere strictly to ART, and 76.0% of primary school leavers, 67.9% of secondary school leavers, and 63.8% of respondents with tertiary educational level adhere strictly to ART. This was an indication that the higher the level of education, the less PLWHA adhere strictly to ART. However,

**Table 11.** Cross tabulation and  $\chi^2$  analysis of respondents' religious affiliation and adherence to anti-retroviral therapy (ART)

	Level of adherence		Total
	ART + alternative therapy	Only ART	
Religious affiliation, <i>n</i> (%)			
Christianity	35 (33.3)	70 (66.7)	105 (100)
Islam	24 (25.3)	71 (74.7)	95 (100)
Total	59 (29.5)	141 (70.5)	200 (100)
Pearson $\chi^2$ (df)	1.562 (1)		
Level of significance	0.211 ( $p > 0.05$ )		

**Table 12.** Cross tabulation and  $\chi^2$  analysis of respondents' highest educational level and adherence to anti-retroviral therapy (ART)

	Level of adherence		Total
	ART + alternative therapy	Only ART	
Highest educational level, <i>n</i> (%)			
None	1 (7.1)	13 (92.9)	14 (100)
Primary	12 (24.0)	38 (76.0)	50 (100)
Secondary	25 (32.1)	53 (67.9)	78 (100)
Tertiary	21 (36.2)	37 (63.8)	58 (100)
Total	59 (29.5)	141 (70.5)	200 (100)
Pearson $\chi^2$ (df)	5.591 (3)		
Level of significance	0.133 ( $p > 0.05$ )		

this difference was not statistically significant. The statistical test conducted showed a  $\chi^2$  of 5.591 (df 3), which was not significant at ( $p > 0.05$ ).

Table 13 shows that 100% of PLWHA whose spouses had no formal education and 82.8% of those whose spouses had primary education adhere strictly to ART, and 64.9% of those whose spouse had tertiary education adhere strictly to ART. This result indicated that the higher the level of education of spouse of PLWHA, the less they adhere to ART. The  $\chi^2$  test showed a  $\chi^2$  of 3.806 (df 3) ( $p > 0.05$ ), which was not significant at 95% confidence level. Interestingly, the association between PLWHA educational level and adherence to ART showed the same trend with the association between PLWHA's spouse level of education and PLWHA adherence to ART.

Table 14 indicates that 57.1% of civil servants adhere to ART, and 71% of trader/artisan/self-employed and 81.8% of unemployed adhere to ART. This was an indication that civil servants and students adhere less than those in other



**Table 13.** Cross tabulation and  $\chi^2$  analysis of respondents' spouse's highest educational level and adherence to anti-retroviral therapy (ART)

	Adherence		Total
	ART + alternative therapy	Only ART	
Spouse highest educational level, n (%)			
None	0 (0)	2 (100)	2 (100)
Primary	5 (17.2)	24 (82.8)	29 (100)
Secondary	20 (29.4)	48 (70.6)	68 (100)
Tertiary	20 (35.1)	37 (64.9)	57 (100)
Total	45 (28.8)	111 (71.2)	156 (100)
Pearson $\chi^2$ (df)	3.806 (3)		
Level of significance	0.283 ( $p > 0.05$ )		

occupations, which means that occupation exerts influence PLWHA adherence to ART. The association between occupation and adherence to ART was not statistically significant with  $\chi^2$  2.357 (df 6) ( $p > 0.05$ ).

Therefore, the above  $\chi^2$  tests showed that “marriage type” and “number of children” were the only socio-demographic characteristics that had significant association with the respondents' adherence to ART.

### Regression analysis

Further analysis on significant test above explained how much variation in adherence independent variables (marriage type and number of children) can account for. However, multiple regression analysis was also conducted for other independent variables with no significant relationship with adherence to ART.

Three important statistics in regression analysis are  $R^2$ , F-ratio and the associated significance of F-ratio. The  $R^2$  account

**Table 14.** Cross tabulation and  $\chi^2$  analysis of respondents' occupation and adherence to anti-retroviral therapy (ART)

	Adherence		Total
	ART + alternative therapy	Only ART	
Occupation, n (%)			
Civil servant	6 (42.9)	8 (57.1)	14 (100)
Trader	25 (28.7)	62 (71.3)	87 (100)
Self-employed/artisan	18 (28.6)	45 (71.4)	63 (100)
Blue-collar employee	4 (33.3)	8 (66.7)	12 (100)
Unemployed	2 (18.2)	9 (81.8)	11 (100)
Quit-working	2 (25.0)	6 (75.0)	8 (100)
Student	2 (40.0)	3 (60.0)	5 (100)
Total	59 (29.5)	141 (70.5)	200 (100)
Pearson $\chi^2$ (df)	2.357 (6)		
Level of significance	0.884 ( $p > 0.05$ )		

for variation in the dependent variable that can be explained by the corresponding independent variable. The F-ratio is a measure of how much the model has improved the prediction of the outcome compared to the level of inaccuracy of the model (calculated by dividing the mean squares for the model by the residual mean squares). The associated significance level of F-ratio explains whether the test is significant or not (test is significant if  $p$ -value is less than or equals to 0.05, and not significant if  $p$ -value is greater than 0.05).

The value of  $R^2$  is 0.055, which indicates that marriage type and number of children can account for 5.5% of the variation in respondents' level of adherence (94.5% of the variation in level of adherence cannot be explained by marriage type and number of children). F-ratio and level

**Table 15.** Regression analysis of adherence, marriage type, and number of children

Model summary		ANOVA					
R	$R^2$		Sum of squares	df	Mean square	F	Sig.
0.236	0.055	Regression	1.895	2	0.948	4.964	0.008
		Residual	32.262	169	0.191		
		Total	34.157	171			

**Table 16.** Regression analysis of level of adherence and other socio-economic characteristics

Model summary		ANOVA					
R	$R^2$		Sum of squares	df	Mean square	F	Sig.
0.278	0.077	Regression	2.474	7	0.353	1.770	0.097
		Residual	29.545	148	0.200		
		Total	32.019				

of significance showed that the regression model overall predicts level of adherence significantly well (F-ratio is 4.964, significant at  $p < 0.05$ ).

Though  $R^2$  showed that 7.7% of the variation in level of adherence can be explained by other socio-demographic/economic characteristics (excluding marriage type and number of children), the associated significance value of F-ratio revealed that the regression model does not significantly predict level of adherence.  $\chi^2$  tests for these characteristics also revealed no significant association with adherence to ART.

## Discussion

This paper examined the level of adherence to ART and factors that influenced adherence to ART including how socio-demographic characteristics may influence the adherence of PLWHA to ART regimen. The study found a 69.0% full adherence level. This result is similar to Suileman and Momo [6] who found 73.4% adherence level in Bayelsa State. The 69.0% adherence level found in this study was considered quite low by this author because the 31 of PLWHA who were not adhering to ART represented a large number. The implication of this was that the few PLWHA who were on ART were not benefiting fully from the advantages of using ART due to low adherence level. Importantly, the 31.0% of the PLWHA who were not adhering to ART were at different levels of adherence failure. For instance, the adherence level of 18.0% of those who failed to adhere to ART were as low as 42.9% adherence level and below. This was corroborated by Okoronkwo *et al.* [8] who found 85% non-adherence level in South East Nigeria. The indication was that even in this particular study there were low and moderate adherence levels, which validated Monjok *et al.* [4] that found low and high adherence level in Nigeria. The low adherence level was a sign that ART may not be effective in the bid to contain the epidemic in the study area.

The paper further examined the factors that may influence PLWHA adherence to ART. It was indicated that forgetfulness, reluctance to take the drugs, fasting and spiritual interruption, inadequate meal, side effects of the drugs, size of the drug being too big, fear of stigma, no money for transport, long journey, caring for baby-family responsibility, and usage of alternative therapies were the major factors militating against adherence to ART. These findings were corroborated by Monjok *et al.* [4], Okoronkwo *et al.* [8], Odili *et al.* [9], and Suileman and Momo [6]. Importantly, 'forgot' factor seemed to be a prominent reason militating against PLWHA's adherence to ART, which cut across many of these studies including the current study. Reflecting on these findings brings to the fore fundamental issues related to ART (such as side effects and the size of the drug), health behavior of PLWHA (reluctance to take their drugs, forgetfulness, fasting and disruption by spiritual/religious issues), and issues in culture and political economy (inadequate meal, no money for transport, long journey and family responsibility).

Considering this result from the health belief model's position that perceived seriousness, perceived susceptibility,

perceived barrier, and perceived benefit of driving people's adherence levels did not show any sign that PLWHA in this study perceived HIV as a serious issue. Also, PLWHA did not show that they considered ART as very beneficial. If they had taken HIV infection as a serious issue and had seen ART as very beneficial, forgetfulness, reluctance to take their drugs, and fasting and spiritual disruption of drug taking would not have occurred. Furthermore, the results of this study have exposed important issues in political economy. For instance, inadequate meal, no money for transport, and long journey exposed the level of poverty among the people. Inadequate meal was enough to increase the side effects of the drug and this was enough to debar PLWHA from taking their medication. Also, if PLWHA did not have money for transport to go to clinic, how then were they expected to adhere to ART. Importantly, long journey indicates long distance to access ART therapy by PLWHA.

These issues could militate against PLWHA adherence to ART and continue to keep it low, as corroborated by Monjok *et al.* [4] that adherence continues to be low even when ART is heavily subsidized. Also, 18.6% of PLWHA who were using alternative drugs indicated that they continued to use this kind of treatment any time ART was not available. This confirmed that there were times ART was not available. All these issues were related to political economy of Nigeria, which is food for thought for the Nigerian Government. If the Government truly intend to fight HIV/AIDS and improve levels of adherence to ART in Nigeria, the problems raised above must be addressed.

Moreover, the paper examined the association between socio-demographic characteristics of PLWHA and adherence to ART. The result showed that though differences in many socio-demographic characteristics were not statistically significant, many socio-demographic characteristics exerted influence on PLWHA's adherence to ART. For instance, females adhere more to ART than males, which is supported by Okoronkwo *et al.* [8]. This result could be because women have been known to attend clinic more often than men, as men's socialization and issues of masculinity make them see themselves as weaklings if they are always taking drugs. The study also found that married people adhere to ART more than other categories, which was verified by Odili *et al.* [9]. This could be as a result of support from their spouses. Also, people within the age of 26-45 years adhere less to ART than other age groups. This may be due to the busy (as noted by Okoronkwo *et al.* [8]) and mobile nature of this age group, which may make it difficult for them to remember their medication.

The result further showed that people in polygamous relationships adhere more than those in monogamous relationships, and the unemployed and artisans adhere more than civil servants, and people with lower education adhere more than people with higher education. The reasons for these results could be that in polygamous relationships, there may be that need to fight fervently for one's life especially for the women, so that other women would not turn one's children to slaves if she dies. Moreover, the civil servants not

adhering may be due to fear of stigma in their offices and their busy schedule. Also, people with higher education not adhering to ART in the study may be due to the fact that they are the civil servants who may be very busy and who fear stigma a lot. Also, their ability to afford alternative therapies, which they combine with ART, could be a factor in their low adherence levels.

The implication of this study was that the ability of Nigeria to achieving improved/ optimal level of adherence to ART lies in the socio-demographic and political economic factors. Practically, the Government of Nigeria has to address the issues of poverty, and unavailability and inaccessibility of ART. Furthermore, the implication for health practice in the study area is that health practitioners should dedicate more time to educate PLWHA on the importance of adherence and the consequences of non-adherence.

The limitation of this study was that the roles of medical personnel in adherence or non-adherence to ART were not investigated. Further research should examine this issue to have a holistic view of problems associated with adherence to ART. This would engender effective intervention program towards improving life of PLWHA and towards the containment of the epidemic.

## Conclusions

This paper ascertained adherence level to ART, examined reasons for non-adherence, and the association between adherence and socio-demographic factors. The study found adherence level of 69% and reasons for non-adherence were forgetfulness, reluctance to take the drugs, fasting and spiritual interruption, inadequate meal, side effects of the drugs, size of the drug being too big, and fear of stigma. Also, factors like sex, age, marital status, and occupation influence the adherence to ART. The paper concluded that socio-economic and demographic factors influence PLWHA's adherence to ART in the study area.

## Conflict of interest

The author declares no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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