

Prevalence and factors associated with adherence to Highly Active Antiretroviral Treatment at the Specialist Hospital Yola, Adamawa State, Nigeria

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Abstract

Adherence to Highly Active Antiretroviral Therapy (HAART) medication is an important predictor of a successful treatment and improvement of quality of life among People Living with Human Immunodeficiency Virus (HIV) / Acquired Immunodeficiency Syndrome (AIDS) (PLWHA). In the seven years before this study, several measures were taken to improve adherence to HAART among PLWHA at the study site, but no work has been published to establish the impact of the measures. We conducted a cross-sectional study among HIV-positive patients attending the antiretroviral clinic of State Specialist Hospital Yola, Adamawa State, Nigeria, in October-December 2019. Adherence was measured using self-report and was defined as taking at least $\geq 95\%$ of the prescribed doses of Antiretroviral Therapy (ART) in the seven days preceding the survey. A total of 431 PLWHA participated in the study. There was an 88.4% adherence rate, and forgetfulness (62.2%) was the most common reason for missing HAART dosages. Adherence was found to be 92.1% ($p=0.017$) among those who have been on HAART for >2 years, 92.3% ($p=0.01$) among those not afraid of stigma, and 92.9% ($p=0.002$) among those who practice Islamic faith. Other factors associated with higher adherence included age less than 34 years, 91.2% ($p=0.167$), income of $< \text{₦}30,000$ per month, 88.6% ($p=0.858$), and less educated, 90.5% ($p=0.852$). The study showed adherence prevalence was 88.4%. Forgetfulness was found to be the most common reason for missing HAART dosages. We therefore recommend the introduction of medication adherence reminders into the HIV programs.

Introduction

Survival and quality of life of People Living with Human Immunodeficiency Virus (HIV) / Acquired Immunodeficiency Syndrome (AIDS) (PLWHA) have been revolutionized since the introduction of the Highly Active Antiretroviral Therapy (HAART) in 1996.^{1,2} HAART is a combination of at least three or more antiretroviral drugs from at least two different classes of antiretroviral drugs.³ In the context of HIV care, medication adherence refers to $\geq 95\%$ compliance in taking HAART by people living with HIV (PLWH) at recommended dosages and at the right time.³⁻⁷ This threshold of $\geq 95\%$ has been scientifically proven to be a rate-limiting step in achieving sustained virologic suppression, which is the treatment goal in HIV medicine.^{4,8,9} Sustained virologic suppression critically depends on always maintaining

the plasma concentration of HAART.⁸ Increased CD4 cell counts, decreased/undetectable viral load, decreased probability of progression to AIDS, and death are the beneficial indices that optimal HAART adherence confers.¹⁰ Poor adherence, on the other hand, leads to the development of drug resistance and poor health outcomes such as recurrent opportunistic diseases.^{4,11} Additionally, non-adherence lowers the quality of life for HIV-positive people.^{3,6} Non-adherence potentially narrows the therapeutic options in the event drug resistance ensues to a particular regimen, especially in resource-limited settings.⁴ Mills *et al.*, in a systematic review, noted some barriers to adherence to HAART among PLWHA, including pill burden, drug side effects, adverse drug reactions, and fear of HIV status disclosure.⁸ Other factors include sleeping through the dosage time, changes in daily routines and, complex drug regimens and, taking HAART serves as a reminder of one's HIV-positive status.⁸ Cultural background and stigma have also been cited as factors mitigating optimal adherence.⁸ Suboptimal adherence gives room for rapid viral replication, generating resistant mutant strains. As a result, this mutant strain, which is no longer responsive to the HAART regimen, has detrimental effects on public health.¹² Traditionally, the self-reported adherence technique, pill counts, drug serum concentration, and medication refill rate have been utilized to measure adherence,¹³ although not without their inherent biases and pitfalls. However, due to cross-cultural differences and the dynamic nature of human behaviours, medication adherence should be periodically assessed. In addition, there is no local study on HAART adherence in Adamawa State, Nigeria, to the best of our knowledge; hence, this study is timely. Furthermore, since medication adherence has been well documented to have a strong association with mortality in PLWHA,⁴ it lays credence as to why adherence should be periodically evaluated through such research. Adamawa, one of the regions emerging from conflicts occasioned by the insurgency that has plagued it, has seen its social ecosystem, including the health system, distorted, resulting in mass displacement and forced migration of many, including PLWHA. Hence, using the self-reported adherence technique, we set out to assess HAART adherence and predictors of non-adherence among PLWHA in Adamawa State, Nigeria.

Materials and Methods

Study design, population, and area

A descriptive, cross-sectional study was conducted among HIV-positive patients attending the antiretroviral clinic of State Specialist Hospital Yola, Adamawa State, Nigeria, between October and December 2019. Established in 1975, the hospital is a tertiary healthcare centre, and one of the sites offering comprehensive HIV services in the state. Being in the state headquarters, the facility serves a diverse pool of clients from different ethnic, socio-cultural, and economic backgrounds, some of which come from across the 23 local government areas and the neighbouring Cameroon Republic. The study population comprised adult HIV-positive clients aged 18 years and above who had been on Antiretroviral Therapy (ART) for at least six months before the data collection period.

Sample size determination, sampling technique, data collection and management

The minimum sample size for the study was estimated at 430 using Cochran's formula for descriptive studies,¹⁴ $n = z^2pq/e^2$,

where n is minimum sample size, Z is standard normal deviate ($=1.96$), which corresponds to 95% confidence level, p taken as 50%, assumed to be the estimated proportion of the population that would be adherent to ART, q is $1-p$ and e is the margin of error, which was set at 5%. Participants' selection was done by systematic sampling using the list of clients attending the ART clinic each day as the sampling frame. A pre-tested, structured interviewer-administered questionnaire was used to collect data on participant's socio-demographic profile, treatment history, and ART drug adherence. Data was entered using an Excel spreadsheet and imported into IBM Statistical Package for the Social Sciences (SPSS) software version 28 (IBM Corp., Armonk, USA). Adherence was measured using self-reports and was defined as taking at least $\geq 95\%$ of the prescribed doses of ART in the seven days preceding the survey. Mean and Standard Deviation (SD), as well as frequencies and percentages, were used to summarize quantitative and qualitative variables, respectively. The Chi-square statistic was used to compare differences between proportions. Multivariable analysis using binary logistic regression was done to

Table 1. Socio-demographic characteristics of respondents (N=431).

Variable	Frequency (%)
Age group (years)	
<25	31 (7.2)
25-34	140 (32.5)
35-44	153 (35.5)
45-54	79 (18.3)
54-64	20 (4.6)
>65	8 (1.9)
Sex	
Male	132 (30.6)
Female	299 (69.4)
Religion	
Islam	225 (52.8)
Christianity	206 (47.8)
Marital status	
Single	49 (11.4)
Married	256 (59.4)
Divorced/Separated	53 (12.3)
Widowed	73 (16.9)
Ethnicity	
Fulani	97 (22.5)
Hausa	45 (10.4)
Bachama	22 (5.1)
Kilba	21 (4.9)
Higgi	19 (4.4)
Verre	19 (4.4)
Others e.g. Chamba, Yungur, etc.	208 (48.3)
Education	
None	99 (22.9)
Primary	105 (24.4)
Secondary	170 (39.4)
Tertiary	57 (13.2)
Occupation	
Petty trading	165 (38.3)
Civil servant	52 (12.1)
Others e.g. artisans	70 (16.2)
Unemployed	144 (33.4)
Average monthly income	
\leq ₦30,000	333 (77.3)
$>$ ₦30,000	98 (22.7)

determine predictors of ART adherence. A p-value of <0.05 was accepted as being statistically significant.

Ethical considerations

The Institutional Review Board of the Specialist Hospital Yola reviewed and approved the study. Informed consent was obtained from each participant before the start of the interview. The process included an explanation of the purpose of the study, the risks and benefits of participation, and the right to stop and withdraw at any time during the interview without any penalty or loss of privileges due to them. Privacy was ensured during interview sessions, and participants were assured confidentiality of the information collected. Data was kept secure in a password-protected personal computer to which only the researchers/data analysts had access. Participants were appreciated and compensated for their time at the end of interviews, with a bottle of soft drinks given at the end of the interview session.

Results

A total of 431 people living with HIV participated in the study. The mean \pm SD age of the participants was 37.63 \pm 10.22. The highest proportion of respondents were in the age group 35-44 years (35.5%), followed by 32.5% in the age group 25-34 years. The majority of the respondents were women (69.4%), married (59.4%), with a monthly income of <₦30,000 (77.3%) (Table 1). The proportion of respondents who had \geq 95% adherence was 88.4%. The most common reason for missing ART doses was forgetfulness, in more than one-half (62.2%) (Table 2). Most respondents (58.7%) were on Antiretrovirals (ARVs) for over two years. Almost all participants (99.8%) denied the use of herbal medications in addition to their ARVs and perceived their health status as good after the commencement of Antiretroviral Therapy (ART) (98.6%). Most respondents spent less than ₦1,000 for transport fare to and from the health facility to access treatment services (Table 3). The proportion of respondents who had attained \geq 95% adherence was higher among those who had been on ART for a longer duration (>2 years) than those who had been on ART for less than two years. This was statistically significant ($p=0.017$). Similarly, higher adherence was found in stigma in taking their drugs even in the presence of family members and friends ($p=0.001$). Both differences were statistically significant. The proportion of respondents who attained \geq 95% adherence was higher among those less than 34 years of age, the less educated, whose average monthly income was <₦30,000 compared to the other groups. However, the differences were not significant ($p>0.05$) (Table 4). Binary logistic regression analyses showed that religion ($p=0.004$), fear of stigma (0.046), and duration of ART (0.016) were significantly associated with adherence to ART at 95% Confidence Interval (CI). Respondents who were afraid of stigma (36%), had been on ART for more than two years (24%) had fewer odds of being adherent to ART than those who were not afraid of the stigma and were on ART for less than two years (Table 5).

Discussion

Optimal HAART compliance is now widely considered a critical health-promoting behavior in the HIV/AIDS response. Recognizing this critical role of optimal HAART adherence as an important factor in the survival of PLWHA, we, therefore, embarked on evaluating the predictors of HAART adherence

among PLHIV in a tertiary health facility in Yola, Adamawa State, Nigeria. Our study found an adherence of 88.4% using the self-report technique adherence of \geq 95% threshold. This is at variance with a similar study conducted in North Central Nigeria, Ilorin, which found an adherence of 70.8%.⁷ Abdulsamad *et al.* in Sokoto State, northwestern Nigeria, showed an adherence of 83.4%.⁵ A

Table 2. Prevalence of adherence to Highly Active Antiretroviral Treatment (HAART) among respondents (N=431).

Variable	Frequency (%)
Number of ARV dose(s) missed	
0	321 (74.5)
1	55 (12.8)
2-3	48 (11.1)
\geq 4	7 (1.6)
Adherence level	
\geq 95%	381 (88.4)
<95%	50 (11.6)
Reasons for missing ART dose(s)	N=111
Forgot	69 (62.2)
Away from home	27 (24.3)
Stock finished	5 (4.5)
Too busy	3 (2.7)
Too ill	3 (2.7)
Fear of stigma	1 (0.9)
Other	3 (2.7)

ARV, Antiretroviral; ART, Antiretroviral Therapy.

Table 3. Respondents' treatment profile (N=431).

Variable	Frequency (%)
Duration on ART (months)	
<12	46 (10.7)
12-24	132 (30.6)
>24	253 (58.7)
Number of pills taken per day	
One	410 (95.1)
Two	21 (4.9)
Use of alcohol	
Yes	25 (5.8)
No	406 (94.2)
Fear of stigma	
Yes	210 (48.7)
No	221 (51.3)
Use of herbal medication	
Yes	1 (0.2)
No	430 (99.8)
Other chronic medications besides ARVs (e.g. anti-TB)	
Yes	369 (85.6)
No	62 (14.4)
Perception of health before ART	
Good	294 (68.2)
Poor	137 (31.8)
Perception of health after ART	
Good	425 (98.6)
Poor	6 (1.4)
Transport cost to clinic (₦)	
<₦1000	375 (87.2)
>₦1000	55 (12.8)

ART, Antiretroviral Therapy; ARVs, Antiretrovirals.

study in southwestern Nigeria found that about 37.6% of respondents fell short of the $\geq 95\%$ adherence profile.³ In addition, our finding is also at variance with a study in Laos, Southeast Asia, which revealed an adherence rate of 60%.¹⁵ Consistent with our findings, a 2018 Chinese study by Yu *et al.* found an adherence of 85.5%.¹³ A Togolese study measured the adherence to be at 78.4%.² Another study in Ghana reported a very low adherence

rate of 44.6%.¹⁶ A plausible explanation for the high adherence in our study is the continuous education and adherence counseling that our case managers provide to our clients. Each HIV-positive individual is attached to a case manager who interfaces with them regularly at the individual level and offers support, including checking on them and emphasizing HAART adherence. Since the concept of case managers was introduced into our ART program

Table 4. Factors associated with adherence to Highly Active Antiretroviral Treatment (HAART) among respondents.

Variables	Adherence status		Test of significance χ^2 (p)
	Adherence frequency (%)	Non-adherence frequency (%)	
Age group (years)			
<34	156 (91.2)	15 (8.8)	2.21 (0.167)
≥ 34	225 (86.5)	35 (13.5)	
Sex			
Male	118 (89.4)	14 (10.6)	0.18 (0.746)
Female	225 (88.0)	36 (12.0)	
Marital status			
Single	44 (89.8)	5 (10.2)	1.93 (0.586)
Married	222 (86.7)	34 (13.3)	
Divorced/Separated	49 (92.5)	4 (7.5)	
Widowed	66 (90.4)	7 (9.6)	
Religion			
Islam	209 (92.9)	16 (7.1)	9.25 (0.002)
Christianity	172 (83.5)	34 (16.5)	
Education			
None	88 (88.9)	11 (11.1)	0.79 (0.852)
Primary	95 (90.5)	10 (9.5)	
Secondary	148 (87.1)	22 (12.9)	
Tertiary	50 (87.7)	7 (12.3)	
Occupation			
Petty trading	147 (89.1)	18 (10.9)	0.98 (0.805)
Unemployed	127 (88.2)	17 (11.8)	
Civil servants	44 (84.6)	8 (15.4)	
Others, <i>e.g.</i> artisans	63 (90.0)	7 (10.0)	
Average monthly income			
<₦30,000	295 (88.6)	38 (11.4)	0.05 (0.858)
\geq ₦30,000	86 (87.8)	12 (12.2)	
Duration on ART (months)			
<12	38 (82.6)	8 (17.4)	8.18 (0.017)
12-24	110 (83.3)	22 (16.7)	
>24	233 (92.1)	20 (7.9)	
Fear of stigma			
Yes	177 (84.3)	33 (15.7)	6.75 (0.01)
No	204 (92.3)	17 (7.7)	
Perception of health after ART			
Good	375 (88.2)	50 (11.8)	0.79 (1.000)
Poor	5 (100.0)	0 (0.0)	

ART, Antiretroviral Therapy.

Table 5. Logistic regression of independent variables with Antiretroviral Therapy (ART) adherence.

Variables	B	Exp (B)	95% CI Exp(B)		p
			Lower	Upper	
Religion	-0.927	0.396	0.209	0.748	0.004
Fear of stigma	-0.647	0.524	0.277	0.990	0.046
Duration on ART	-0.764	0.466	0.251	0.865	0.016

CI, Confidence Interval.

barely seven years ago, HAART adherence has been steadily optimized among our clients. In addition, with the introduction of the simple regimen of 1-pill a day, fixed-dose dolutegravir-based combination, which became the preferred regimen of the HIV program about seven years ago, HAART adherence has been greatly enhanced. The divergence in HAART adherence values in these studies can also be explained by the differences in the evaluation methods used. In addition, other possible scientific rationales behind this varied prevalence could be linked to demographics, differences in the year of study, and geographic peculiarities of the study sites alongside differences in the health system dynamics of the study areas.¹⁶ Our study has shown a strong association between adherence and duration on HAART. As the quality of life of PLWHA improves with optimal HAART adherence, it is only natural, based on the concept of the health belief model, to sustain the tide of adherence for added benefit.¹⁶ This finding is in consonance with a South African-based study that showed a progressive adherence with duration to HAART.¹⁷ Another study in southeastern Nigeria also corroborated the same phenomenon.¹⁸ However, this finding is inconsistent with those in some studies, including those in Laos,¹⁵ China,¹³ and India.⁶ These studies showed that the longer PLWHA stays on HAART, the less adherent they become, and they cited complacency and boredom as reasons. Treatment fatigue has been acknowledged as one of the predictors of suboptimal adherence with growing duration on HAART in an Indonesian study.¹⁹ Globally, the fear of stigma, an age-long and constant obstacle, has continued to be a formidable deterrent against the implementation of successful HIV intervention programs. Our study depicts a statistically significant relationship between the covariates of stigma and poor adherence, and this finding corroborates with several studies, including one in Ghana.¹⁶ Due to fear of being stigmatized and the scourge associated with the HIV disease, some PLWHA strive to maintain secrecy as regards their HIV status. They would rather skip their medications in the presence of others than disclose their status. Consequently, non-disclosure of their status denies them social or treatment support from close relatives and friends when the need arises, thereby eroding the gains already achieved. Ultimately, this sets the premise for treatment failure in the long run. Family support as a critical factor in HAART adherence is a well-documented fact.^{9,20} Though our study did not explore the dimension of disclosure of HIV status, several studies continue to show a positive association between adherence and HIV status disclosure.⁹ Disengagement from care and low quality of life may all be exacerbated by HIV-related stigma.²¹

A recent Cameroonian study found a positive association between Islam, Pentecostalism, and optimal adherence.²⁰ In an unexplained association, we also found a statistically significant relationship between religious inclination and HAART adherence. Adherents of the Islamic faith had more adherence than those of the Christian faith. More research may unveil the explanation for this association. In agreement with the majority of the studies on adherence, the most common reason accounting for missed doses of HAART in our study was forgetfulness in 62.2% of those who missed their medications.^{9,15,16,19} In an Iranian study, forgetfulness was found to be 26.7%.²² It measured 31.4% in a Thai study,⁹ and was reported to be 43.3% in an Ethiopian study.²³ An American study revealed that forgetfulness accounted for 63.1% of missed doses of HAART among Hispanic and Latino HIV-positive homosexuals.²⁴ While many studies have demonstrated an association between the covariates of education, gender, marital status, and perception of health after HAART commencement,^{2,20} our study found no such association.

Conclusions

The study showed an adherence prevalence of 88.4%. Forgetfulness was found to be the most common reason for missing HAART dosages. We therefore recommend the introduction of medication reminders into the ART programs to further enhance adherence. This concept, which involves the use of short text messages, SMS, phone alarms, and phone calls, has successfully worked in several climes.^{25,26}

Strength of the study

The strength of this study stems from the fact that it was conducted from one of the major HIV treatment centres in the region, drawing clients from the northeastern Nigerian states and even neighboring Cameroon, and hence its findings can be generalized.

Limitations

The lack of inclusion of some strong covariates, which have been widely acknowledged as some of the major factors affecting HAART adherence, such as depression and substance abuse, could have made the discussion more robust. The inclusion of viral load results would have been corroborated with adherence since it is largely objective in assessing ART adherence.

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