



JOURNAL OF COMMUNITY MEDICINE AND PRIMARY HEALTH CARE

ORIGINAL ARTICLE

IS ANTIRETROVIRAL MEDICATION ADHERENCE RELATED TO CARE FACILITY? COMPARATIVE STUDY BETWEEN HIV CLIENTS IN COMMUNITY PHARMACIES AND SPECIALTY CLINICS IN RIVERS STATE, NIGERIA.

Worgu GO,^{1,3} Ogaji DS,^{1,2,3}

¹Department of Community Medicine, University of Port Harcourt Teaching Hospital, Rivers State, Nigeria.

²Department of Preventive & Social Medicine, University of Port Harcourt.

³Health Services Research Group, University of Port Harcourt Teaching Hospital, Alakahia, Nigeria

Keywords

Anti-Retroviral
therapy,
Community
Pharmacies,
HIV Infections,
Medication
Adherence,
Specialty Clinics

Abstract

Background

This study compared antiretroviral adherence among stable adult HIV clients receiving care at community pharmacies (CP)—licensed private facilities supervised by pharmacists—and specialty clinics (SC), which are ART clinics in tertiary hospitals. The objective was to assess differences in adherence outcomes between CP AND SC in Rivers State, Nigeria, following the decentralization of HIV care for stable ART clients.

Methods

A comparative cross-sectional study involving 165 SC clients and 166 CP clients was conducted using systematic random sampling. Stable adults (viral load <1,000 copies/mL and no complications) on ART for at least 1 year were interviewed by phone between February and April 2021. Adherence, the primary outcome, was measured using the Morisky Medication Adherence Scale-8 and classified as adherent or non-adherent. Data were analysed with SPSS 25. Ethical approval was obtained from the University of Port Harcourt Teaching Hospital and Rivers State University Teaching Hospital.

Results

Community pharmacies (CP) served slightly older, more urban, and more employed clients than specialty clinics (SC). ART adherence was higher in CP (77.7%) than SC (64.2%), a significant 13.8% difference ($\chi^2=7.29$; $p=0.007$). CP clients had nearly twice the odds of adherence compared to SC [OR=1.94; 95% CI: 1.19–3.15; $p=0.007$].

Conclusion

The study demonstrated that clients receiving ART through CP had higher adherence rates than those in SC. In view of these findings, it is recommended that the CP ART program be scaled up to other LGAs, as outcomes in CP are comparable to those observed in SC settings.

Article History:

Date received: 04/08/2025,

Date accepted: 30/11/2025

Correspondence to:

Worgu GO

drglory_worgu@yahoo.co.uk

INTRODUCTION

Community pharmacies (CP) are privately operated pharmaceutical establishments licensed by the Pharmacists Council of Nigeria (PCN) to dispense prescription and over-the-counter medications under the supervision of qualified community pharmacists. They play a central role in the Nigerian pharmaceutical sector by providing accessible medication services within communities. CPs differ significantly from Patent Medicine Vendors (PMVs), who are also regulated by the PCN but are authorized to sell only over-the-counter medicines and operate without direct pharmacist supervision.¹ This distinction positions community pharmacies as more structured and professionally regulated service points capable of supporting expanded healthcare functions, including antimicrobial stewardship, chronic disease management, and, more recently, HIV care.

In response to growing HIV treatment needs, Nigeria implemented a major policy shift in 2016 by decentralizing antiretroviral therapy (ART) services to include community pharmacies nationwide. This followed the successful pilot of the Community Pharmacy Antiretroviral Refill Programme (CPARP) in Abuja, which demonstrated the feasibility of integrating CPs into community-based HIV service delivery.¹ The decentralization initiative was designed to extend ART access beyond traditional hospital-based specialty clinics by providing stable HIV clients with multiple service delivery options, including community pharmacies, tertiary hospital HIV specialty clinics, secondary healthcare facilities, and primary healthcare centers. Through this strategy, stable clients on first-line ART—those with viral loads <1,000 copies/mL, good clinical stability, and no opportunistic infections—were considered suitable for ART refills at CPs. Early

evaluations of the decentralization model produced promising results. Studies from the Abuja pilot indicated high retention in care, low loss to follow-up, and excellent prescription refill rates among clients receiving ART through community pharmacies. These outcomes were comparable to, and in some instances better than, those observed in established health facilities, underscoring the potential of community pharmacies to support differentiated care models.¹ Additionally, geographical accessibility has been consistently shown to influence ART adherence. Evidence from Nigeria and other sub-Saharan African countries demonstrates that shorter distances to treatment sites, reduced transportation costs, and lower opportunity costs—such as time spent away from work—positively impact adherence and retention.^{2,3} For many clients, community pharmacies are geographically closer and easier to access than tertiary hospital clinics, which may partly explain the high adherence outcomes reported in decentralized programs. Within Nigeria's differentiated service delivery (DSD) framework, community pharmacies and HIV specialty clinics represent two important nodes for delivering ART to stable clients. HIV specialty clinics, typically located in tertiary hospitals, provide comprehensive HIV care services supported by multidisciplinary teams, specialized laboratory facilities, and structured follow-up systems. Conversely, community pharmacies offer a more decentralized, patient-centered approach, characterized by shorter wait times, flexible operating hours, and a familiar community-based environment.

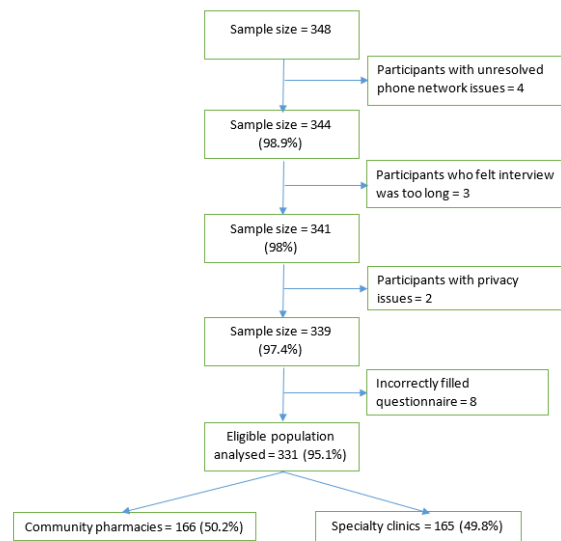


Figure 1: Flow Chart of Sampling Procedure

The coexistence of these two service points provides an opportunity to evaluate how variations in service delivery models influence clinical outcomes, particularly medication adherence, which remains a cornerstone of effective HIV treatment. Despite the scale-up of community pharmacy-based ART programs, comparative evidence on patient outcomes between CPs and specialty clinics (SCs) remains limited. Most available studies have either focused on pilot phases, examined operational feasibility, or compared outcomes between public hospitals and private clinics rather than between community pharmacies and other settings.^{4, 5} As such, there is a gap in the literature regarding how adherence differs between clients receiving ART in CPs versus those in tertiary hospital specialty clinics within the context of full national decentralization. Understanding adherence patterns across these service points is crucial for several reasons. First, medication adherence is directly linked to viral suppression, reduced HIV transmission, decreased risk of drug resistance, and improved long-term quality of life. Second, Nigeria continues to record substantial numbers of new

HIV infections annually, making optimized treatment models essential for epidemic control. Third, the sustainability of the decentralized ART model depends on robust evidence demonstrating that community pharmacies can maintain or even enhance key outcomes such as adherence. Poor adherence among clients receiving ART in CPs could threaten the validity of decentralization efforts, whereas superior adherence could justify further expansion and investment. Rivers State, located in the South-South region of Nigeria, is among the states with a high HIV burden. Its urban-rural distribution, concentration of tertiary hospitals, and increasing number of licensed community pharmacies make it an ideal setting for evaluating decentralized ART service delivery. However, no study in the state has directly compared ART adherence between stable adult HIV clients receiving care at CPs and those managed through hospital-based specialty clinics. This study, therefore, aimed to compare antiretroviral therapy (ART) adherence among stable adult HIV clients receiving care in community pharmacies and specialty clinics in Rivers State, Nigeria.

Table1: Background Characteristics of Respondents

Variable	SC (n=165) Frequency (%)	CP (n=166) Frequency (%)	Chi Square	p-value
Age (in years):				
Young (≤30yrs)	22 (78.6)	6 (21.4)	12.557	0.014*
Middle (>30 to <60yrs)	133 (47.0)	150 (53.0)		
Elderly (≥60yrs)	10 (50.0)	10 (50.0)		
Age in years (Mean ± SD)	(41.1 ± 10.8)	(43.8 ± 9.1)	t= 1.91	0.057
Gender				
Male	45 (42.9)	60 (57.1)	3.007	0.830
Female	120 (53.1)	106 (46.9)		
Residence				
Urban	84 (45.4)	101 (54.6)	3.313	0.044*
Rural	81 (55.5)	65 (44.5)		
Educational level				
Post-Secondary	108 (51.2)	103 (48.8)	2.600	0.460
Secondary	31 (52.5)	28 (47.5)		
JSS and Primary	17 (38.6)	27 (61.4)		
No Formal Education	9 (52.9)	8 (47.1)		
Occupational Group				
Lower	75 (49.7)	76 (50.3)	0.854	0.652
Middle	59 (52.7)	53 (47.3)		
Higher	31 (45.6)	37 (54.4)		
Employment Status				
Currently Employed	105 (43.6)	136 (56.4)	13.985	<0.001*
Currently Unemployed	60 (66.7)	30 (33.3)		
Socio-economic Status (SES)				
High SES	69 (46.9)	78 (53.1)	3.284	0.195
Medium SES	40 (59.7)	27 (40.3)		
Low SES	56 (47.9)	61 (52.1)		

* $p \leq 0.05$; #: Fishers exact

By determining whether the type of care facility influences medication adherence, this study contributes evidence to guide policy decisions on the optimization, expansion, and sustainability of decentralized ART models in Nigeria.

METHODS

Study Setting

Rivers State is in Nigeria's South-South geopolitical zone and is divided into 23 Local Government Areas (LGAs). The two specialty (antiretroviral) clinics available in the state are located in tertiary hospitals that also serve as

referral facilities for lower levels of care, such as public health facilities, private hospitals, and community pharmacies. Only five LGAs are involved in the HIV community pharmacies program, with 76 community pharmacies spread across the state.

Study Design

Clients' adherence to antiretroviral medication was studied in community pharmacies and specialty clinics in Rivers State, Nigeria, using a comparative cross-sectional study design.

Eligibility Criteria

Clients who are stable (category 4: clients with Viral Load <1,000 copies/ml and absence of complication), have been on treatment for at least one year, and are receiving treatment in community pharmacies or specialty clinics were included in the study. Clients with other chronic health conditions such as hypertension and diabetes mellitus were excluded from the study.

Sample Size and Sampling Technique

The sample size was determined using the formula for comparative studies based on two proportions. After applying a design effect of 2 and accounting for a 10% non-response rate, a total of 348 participants were included in the study—174 from community pharmacies and 174 from specialty clinics. Participants in the community pharmacy (CP) group were recruited using a multi-stage sampling technique. In the first stage, each of the five participating LGAs was treated as a stratum and included in the study. In the second stage, 12 community pharmacies were selected from the LGA strata using simple random sampling with proportionate allocation. The third stage involved systematic random sampling. The case load across the 12 participating pharmacies was 124, 84, 83, 25, 48, 50, 96, 97, 81, 89, 33, and 200, yielding a total sampling frame of 1,010 clients. Proportionate allocation of the total group sample size ($n = 174$) to the respective pharmacies resulted in sample quotas of 21, 15, 14, 4, 8, 9, 17, 17, 14, 15, 6, and 34 participants, respectively. Based on these allocations, a uniform sampling interval ($k = 6$) was applied across all pharmacies; thus, after the first randomly selected client, every sixth client was subsequently recruited from each CP. To recruit participants for the specialty clinic (SC) group, a proportional allocation was applied based on facility client load. The University of Port Harcourt Teaching Hospital (UPTH) was assigned 102 participants ($4,450/7,604 \times 174$), while the Rivers State University Teaching Hospital (RSUTH) received 72 participants ($3,154/7,604 \times 174$). The average daily client attendance was 62 at UPTH and 42 at RSUTH. Accordingly, two participants were recruited per day from each facility. The sampling interval (k) was calculated as the average daily client attendance divided by the number of participants

to be recruited daily, yielding $k = 31$ for UPTH and $k = 36$ for RSUTH. Thus, after randomly selecting the first participant, every 31st client at UPTH and every 36th client at RSUTH were subsequently enrolled.

Data Collection

Data were collected via phone interviews over a three-month period (February–April 2021) for both CP and SC participants. Participants signed a paper-based informed consent form that also specified a private, convenient time for the research to be conducted by phone. These circumstances are consistent with those reported in earlier research using telephone interviews.⁷⁻⁹

Exit interviews were conducted over the phone for each consenting and eligible participant within 48 hours of contact with the facility to reduce recall bias. A semi-structured questionnaire comprising two sections—client socio-demographic and clinical characteristics, and the Morisky Medication Adherence Scale (MMAS-8)—was used for data collection.

The MMAS-8 is a widely validated tool across diverse populations and disease conditions and demonstrates strong correlation with direct adherence assessment methods.¹⁰

It is inexpensive, non-invasive, and brief, consisting of only eight items.

The tool was administered during exit interviews to minimize recall bias, while its question sequencing helps reduce social desirability and reporting bias, making it particularly suitable for this study.

Study Tool

Adherence to ART was measured using the Morisky Medication Adherence Scale 8 (MMAS-8). The MMAS-8 tool measures patients' medication-taking behaviour and contains 8 items.¹⁰ The first 7 questions require “yes” or “no” answers and are scored 1 for “yes” and 0 for “no.”

The 8th question uses a Likert scale where the “never” response is scored as 1, “once in a while” and “sometimes” are scored 0.75 each, “usually” is scored as 0.25, and “all the time” is scored as 0.10.

Table 2: Adherence to ART between Specialty Clinics and Community Pharmacies

MMAS 8 Items	Yes Responses – Freq. (%)		Chi Square	p-value
	SC (n=165)	CP (n=166)		
Forgets to Take Medications Sometimes (Q1)	61 (37.0)	72 (43.4)	1.412	0.141
Missed Taking Medicine Last 2 Weeks (Q2)	45 (27.3)	12 (7.2)	23.321	<0.001*
Stopped Pills Without Notifying Provider (Q3)	31 (18.8)	5 (3.0)	21.246 [#]	<0.001*
Forgets to Bring Pills Along on Travels (Q4)	47 (28.5)	33 (19.9)	3.343	0.044*
Took Pills Yesterday (Q5)	149 (90.3)	159 (95.8)	3.843	0.040*
Stops Medicine When Health Condition Improves (Q6)	25 (15.2)	4 (2.4)	16.807 [#]	<0.001*
Feels Hassled Sticking Treatment Plan (Q7)	28 (17.0)	2 (1.2)	24.952 [#]	<0.001*
Difficulty Remembering to Take All Your Medications (Never Or Rarely Responses) (Q8)	83 (50.3)	88 (53)	2.952	0.420

p≤0.05; SC=Specialty Clinics; CP = Community Pharmacies; # = Fisher's Exact

The MMAS total score ranges from 0 to 8, with scores below 6 indicating poor adherence, scores between 6 and 7 indicating medium adherence, and a score of 8 indicating the highest adherence.¹¹ This was adjusted to a binary scale for ease of analysis, categorizing patients as adherent with scores of 6 to 8 and poor adherence with scores below 6.¹²

Statistical Analysis

Statistical Package and Social Sciences (SPSS) version 25 was used for data analysis. Categorical data were summarized in frequencies and proportions, and charts, while quantitative data were summarized using the appropriate measures of central tendency. was conducted for each MMAS item on “yes” responses between community pharmacies and specialty clinics. Adherence was dichotomized into adherent and non-adherent categories and compared between the two groups to determine a difference using the Chi-Square test and binary logistic regression, with alpha set at 5%.

Differences in the distribution of clients' characteristics (socio-demographic and socio-economic) and treatment factors between community pharmacies and specialty clinics were analysed using the Chi-Square test, with alpha set at 5% ($p \leq 0.05$).

RESULTS

Data were analysed for the 331 correctly completed questionnaires, giving an overall data completion rate of 95.1 per cent, with specialty clinics accounting for 49.8% (165) and community pharmacies for 50.2% (166) (see Figure 1 for the flow chart of the sampling procedure). The community pharmacies (CP) had older clients compared to the specialty clinics (SC) (mean age: CP = 43.8 ± 9.1 ; SC = 41.1 ± 10.8 ; $p = 0.057$), with a greater proportion of those below 30 years of age in the specialty clinics (SC = 78.6%; CP = 21.4%; $p = 0.014$). A greater proportion of CP clients live in urban areas (CP = 54.6%; SC = 45.4%; $p = 0.044$) and are employed (CP = 56.4%; SC = 43.6 %;

Table 3: Association between Facility Type and Medication Adherence

Facility type	Adherent	Non-adherent	OR	95% CI	p value
Community pharmacies	129 (77.7%)	37 (22.3%)	1.941	1.195-3.151	0.007*
Specialty clinics	106 (64.2%)	59 (35.8%)	1		

p≤0.05

p < 0.001) compared to those in the specialty clinics (see Table 1). Adherence was better among CP clients compared to SC clients in items Q2-7, as a greater proportion of specialty clinic clients missed taking their medicine in the last two weeks, stopped taking pills without notifying their provider, forgot to bring their pills while traveling, stopped taking medicine when their health condition improved, and felt hassled by sticking to the treatment plan. These differences were statistically significant (p < 0.05) (see Table 2).

Regarding clients' adherence to ART, a 13.8% difference was observed between CP and SC, with CP (77.7%) showing higher adherence than SC (64.2%). Clients who received HIV care from community pharmacies reported a significantly higher level of adherence to ART ($\chi^2 = 7.290$; p = 0.007), with those utilizing CP having almost 2 times higher odds of being adherent compared to SC (OR (95% CI) = 1.941 (1.191-3.151), p = 0.007) (see Table 3). Forgetfulness, running out of medications, and being away from home accounted for 91.7% of the reasons why most clients missed their medications (see Table 4).

DISCUSSION

In this study, levels of adherence to ART recorded were 64.2% in specialty clinics (SC) and 77.7% in community pharmacies, respectively, which is in line with other studies.¹³⁻¹⁷ The margin of difference in adherence between specialty clinics and community pharmacies is high, with those using community pharmacies being 2 times more likely to be adherent.

This finding is surprising, as one would expect that those who attended community pharmacies in terms of structural sophistication and the

presence of highly skilled manpower. This findings aligns with other studies comparing higher and lower levels of the 'Hub and Spoke' decentralization model.

A study in Anambra State on adherence to HIV and AIDS treatment among adult HIV/AIDS patients found a similar high margin of difference in adherence between facilities as in this study, with clients in private hospitals being more adherent to ART than clients in secondary health facilities.⁵ The findings of a cross-sectional study among HIV patients accessing care in central hospitals and decentralized health units in Manaus, Brazil, also agree with the findings of the Anambra study and those of this study, recording a similar high margin of difference in adherence between different levels of facilities.

The Brazilian study found that clients visiting decentralized health facilities were more adherent to ART compared to those attending the central hospital.¹⁸ Although this Brazilian study used the client's latest viral load as a proxy for adherence, the findings of a high margin of difference in adherence to ART in favour of the lower-level facility are similar to the findings of our study.

Meanwhile, the level of adherence to ART recorded in this study at community pharmacies and specialty clinics is far higher than the adherence levels recorded for the South-South region (59.9%) in a previous study.¹⁹ This may be ascribed to improvements in geographical and economic access to ART and possibly better commitment to self-care. In a study conducted in selected counselling centers in Benin City, ART adherence as low as 78 percent among HIV patients was found.²⁰

Table 4: Reasons for Missed Doses

Reasons for Missed Dose(s)	No. of Responses (n=109)	Percent
Forgot	50	45.9
Ran out of drugs	26	23.9
Away from home	24	22
Difficulty taking pills at specified time	3	2.8
Could not find drug	2	1.8
Drug side effects	1	0.9
Confusion about how to take pills	1	0.9
Too many drugs to take	1	0.9
Others	1	0.9

A cross-sectional national adherence study employing national health insurance (NHI) claim data in Asia over ten years (2007-2016) found 70.4 percent adherence to ART. Although their study used the medication possession ratio (MPR) to assess adherence to ART, the results are similar to those from the MMAS-8 tool used in this study. The finding of a large gap in favour of community pharmacies over specialty clinics recorded in this study also correlates with other studies.^{17,21} The evidence from previous studies corroborates the findings from the present study that forgetfulness and traveling without drugs are the leading causes of non-adherence.^{5,20-23} However, the findings of this study differed from those of a cross-sectional study of 550 HIV/AIDS patients in a tertiary hospital in Ilorin, Nigeria, which found 92.6 percent adherence.²⁴ This is consistent with a comparative study of HIV patients in Sub-Saharan Africa and Asia, which found overall adherence rates of 93.6 percent and 95.2 percent in Asians compared to 92.7 percent in Africans,²² and agrees with other studies.²³ The reasons offered in these studies for suboptimal adherence include forgetfulness and travel; however, the main difference between these studies and our study may be the population. While our study compared adherence between two levels of care, these other studies focused on only one level of care (tertiary hospital clinics). The gap in ART adherence between SC and CP clients in this study is significant, with CP

clients having twice the odds of adherence as SC clients. The higher odds may be due to demographic variation, which aligns with earlier studies indicating that older individuals are more adherent to medication, while younger age is a factor associated with poor adherence.^{20,21} In comparison to SC, CP had a higher proportion of males, which may have contributed to CP's higher adherence rate, though another Nigerian study⁵ and an international study²⁵ have recorded that male gender is not a factor for optimal adherence. Finally, the CP had more clients of higher socio-economic status compared to the SC. A combination of no formal education, as seen among SC clients, and the income needed to fund the direct non-medical costs of treatment—especially with a higher proportion of SC clients not being employed and living farther away from the facility—could contribute to a lower level of adherence among SC clients compared to CP clients. This is in line with the findings from previous studies with HIV-infected patients in Nigeria²⁶ and elsewhere.²¹ The pattern of responses to items on the Morisky Medication Adherence Scale provides important clues to potential causes of the high

non-adherence observed in this study, as well as to the differences in adherence between the two groups studied. Compared to the CP group, more clients in the SC group forgot to take their medications the day before and two weeks prior to the study, forgot to take their pills while

traveling, stopped taking medications when they felt better, failed to notify their providers before stopping their medication, and had difficulty adhering to their prescriptions. In contrast to the clients of specialty clinics, more clients from CP had trouble remembering to take their ART medications and occasionally forgot to take their medications. However, these differences were not significant, which agrees with other studies.

¹⁸ This is consistent with the findings of this study. This study indicated that forgetfulness was the most common reason for missing doses, followed by clients running out of pills and skipping doses due to failure to take medications at prescribed times (see Table 3), findings that align with other studies.^{5,17,20,21} A study in South-Eastern Nigeria had disclosed that the most common causes for missed doses were forgetfulness, being away from home, running out of pills, difficulty taking the medication at the prescribed times, and drug side effects, in that order.⁵ This is consistent with the findings of this study.

The study findings have significant public health implications both in the care of PLHIV as well as other chronic diseases. Community pharmacies reported higher medication adherence than specialty clinics. This aligns with an Abuja pilot study on the rollout of HIV community pharmacies nationwide² and supports the need to operationalize community pharmacies in all LGAs in Rivers State.

STRENGTHS AND LIMITATIONS OF THE STUDY

Limitations encountered included the flexible operating hours of community pharmacies (CPs), which lacked fixed clinic schedules, making participant aggregation difficult. Additional issues were stigma among clients and security concerns faced by research assistants when accessing participants during irregular hours. To address these challenges, telephone interviews were conducted for participants in both the CP and SC groups.

CONCLUSION

The study revealed that clients in community pharmacies are more likely to adhere to ART than those in specialty clinics. This suggests the need to confirm this hypothesis using an analytic design to inform the cascading of the ART decentralization program to the remaining local government areas.

Programme managers and health authorities should consider strengthening the community pharmacy delivery mechanism for HIV care as well as explore the implications of this delivery mechanism for other chronic non-communicable diseases, such as diabetes and hypertension, as has been canvassed in some other studies. Providers should be regularly trained in adherence counselling, given the implications of forgetfulness among clients, especially in specialty clinic clients.

AUTHORS' CONTRIBUTIONS

All authors were involved in conceptualization, planning and implementation of the study. The data collection team was led by WGO. Data analysis was carried out by WGO. All authors contributed to the interpretation of the results, read and approved the final manuscript.

CONFLICT OF INTEREST

The authors have no conflicts of interest associated with the material presented in this paper.

FUNDING

None

ACKNOWLEDGEMENT

We are grateful to the staff and patients of the HIV specialty clinics and community pharmacies for their participation during the period of data collection in this study.

REFERENCES

1. Avong YK, Aliyu GG, Jatau B, Gurumnaan R, Danat N, Kayode GA, et al. Integrating Community Pharmacy into Community-Based Anti-Retroviral Therapy Program: A Pilot Implementation In Abuja, Nigeria. Fernandez-LLimos F, editor. PLoS One. 2018;13(1): e0190286. Available from: <https://dx.plos.org/10.1371/journal.pone.0190286>

2. Syed ST, Sharp LK, Kim Y, Jentleson A, Lora CM, Touchette DR, et al. Relationship between Medication Adherence and Distance to Dispensing Pharmacies and Prescribers Among an Urban Medicaid Population with Diabetes Mellitus. *Pharmacotherapy*. 2016; 36 (6): 590. Available from: <https://doi.org/10.1002/phar.1757>
3. WHO. Adherence to Long-term Therapies: Evidence for Action [Internet]. WHO. Geneva: World Health Organization; 2015 [cited 2019 Jun 4]. Available from: https://www.who.int/chp/knowledge/publications/adherence_report/en/
4. Wang H, Chow S-C. Sample Size for Comparing Proportions. In: *Methods and Applications of Statistics in Clinical Trials*. Hoboken, NJ, USA: John Wiley & Sons, Inc.; 2014: 653–63. Available from: <http://doi.wiley.com/10.1002/9781118596333.ch40>
5. Umeokonkwo CD, Onoka CA, Agu PA, Ossai EN, Balogun MS, Ogbonnaya LU. Retention In Care and Adherence to HIV And AIDS Treatment In Anambra State, Nigeria. *BMC Infect Dis*. 2019; 19 (1): 654. Available from: <https://doi.org/10.1371/journal.pone.0206499>
6. UN Joint Programme on HIV/AIDS (UNAIDS). 2017 Global HIV Statistics. Fact Sheet. 2018. UNAIDS 2018. [cited 2021 Aug 4]. Available from: <https://www.unaids.org/en/resources/fact-sheet>
7. Vogl S. Telephone Versus Face-to-Face Interviews. *Sociol Methodol*. 2013; 43 (1): 133–77. Available from: <http://journals.sagepub.com/doi/10.1177/0081175012465967>
8. Oltmann SM. Qualitative Interviews: A Methodological Discussion of the Interviewer and Respondent Contexts. *Forum Qual Sozialforsch*. 2016; 17 (2). <https://doi.org/10.17169/fqs-17.2.2551>
9. Block ES, Erskine L. Interviewing by Telephone: Specific Considerations, Opportunities, and Challenges. *Int J Qual Methods*. 2012; 11 (4): 428–45. <https://doi.org/10.1177/160940691201100409>
10. De las Cuevas C, Peñate W. Psychometric Properties of the Eight-Item Morisky Medication Adherence Scale (MMAS-8) In A Psychiatric Outpatient Setting. *Int J Clin Heal Psychol*. 2015; 15 (2): 121–9. <https://doi.org/10.1016/j.ijchp.2014.11.003>
11. Okello S, Nasasira B, Muir ANW, Muyingo A. Validity and Reliability of a Self-Reported Measure of Antihypertensive Medication Adherence in Uganda. Reboldi G, editor. *PLoS One*. 2016; 11 (7): e0158499. Available from: <https://dx.plos.org/10.1371/journal.pone.0158499>
12. Gube AA, Debalkie M, Seid K, Bisete K, Mengesha A, Zeynu A, et al. Assessment of Anti-TB Drug Nonadherence and Associated Factors among TB Patients Attending TB Clinics in Arba Minch Governmental Health Institutions, Southern Ethiopia. *Tuberc Res Treat*. 2018; 1–7. <https://doi.org/10.1155/2018/3705812>
13. FMOH. National Guidelines for HIV Prevention Treatment and Care (2016). FMOH; 2016: 181–6. [cited 2021 Sep 16]. Available from: https://www.prepwatch.org/wp-content/uploads/2017/08/nigeria_national_guidelines_2016.pdf
14. Günthard HF, Saag MS, Benson CA, Del Rio C, Eron JJ, Gallant JE, et al. Antiretroviral Drugs for Treatment and Prevention of HIV Infection in Adults: 2016 Recommendations of The International Antiviral Society-USA Panel. *JAMA - J Am Med Assoc*. 2016; 316 (2): 191–210. Available from: <https://doi.org/10.1001/jama.2016.8900>
15. UNAIDS. Undetectable = Untransmittable: Public Health and HIV Viral Load Suppression [Internet]. Geneva; 2018 [cited 2019 Jun 5]. Available from: https://www.unaids.org/sites/default/files/media_asset/undetectable-untransmittable_en.pdf
16. Iacob SA, Iacob DG, Jugulete G. Improving the Adherence to Antiretroviral Therapy, a Difficult but Essential Task For A Successful HIV Treatment-Clinical Points Of View And Practical Considerations. *Frontiers in Pharmacology*. Frontiers Media S.A. 2017; 8: 1–12. Available from: <https://doi.org/10.3389/fphar.2017.0083>
17. Heestermaans T, Browne JL, Aitken SC, Vervoort SC, Klipstein-Grobusch K. Determinants of Adherence to Antiretroviral Therapy Among HIV-Positive Adults in Sub-Saharan Africa: A Systematic Review. Vol. 1, *BMJ Global Health*. BMJ Publishing Group; 2016. e000125. <https://doi.org/10.1136/bmjgh-2016-000125>
18. Leon C, Koosed T, Philibert B, Raposo C, Benzaken AS. HIV/AIDS Health Services In Manaus, Brazil: Patient Perception of Quality and its Influence on

- Adherence to Antiretroviral Treatment. *BMC Health Serv Res.* 2019; 19 (1). <https://doi.org/10.1186/s12913-019-4062-9>
19. Oku AO, Owoaje ET, Oku OO, Monjok E. Prevalence and Determinants Of Adherence to Highly Active Antiretroviral Therapy Amongst People Living with HIV/AIDS In A Rural Setting In South-South Nigeria. *Afr J Reprod Health.* 2014; 18 (1): 133–43. <https://doi.org/10.1186/1471-2334-13-401>
 20. Timothy EA, Joy UK. Adherence To Antiretroviral Therapy Among HIV Patients Visiting HIV Counselling Centers in Selected Hospitals, Benin City, Edo State. *Int J Nursing, Midwife Heal Relat Cases.* 2020; 6 (1): 20–34.
 21. Kim J, Lee E, Park BJ, Bang JH, Lee JY. Adherence To Antiretroviral Therapy and Factors Affecting Low Medication Adherence Among Incident HIV-Infected Individuals During 2009-2016: A Nationwide Study. *Sci Rep.* 2018; 8 (1). <https://doi.org/10.1038/s41598-018-21081-x>
 22. Bijker R, Jiamsakul A, Kityo C, Kiertiburanakul S, Siwale M, Phanuphak P, et al. Adherence to Antiretroviral Therapy for HIV in Sub-Saharan Africa and Asia: A Comparative Analysis of Two Regional Cohorts. *J Int AIDS Soc.* 2017; 20 (1). <https://doi.org/10.7448/IAS.20.1.21218>.
 23. Afe AJ, Motunrayo O, Ogungbade GO. Factors Influencing Adherence to HAART Among Patients Living With HIV Infection in Southwest Nigeria: A Cross-Sectional Analysis. *J HIV Retrovir.* 2018; 4 (1): 1. Available from: <https://doi.org/10.21767/2471-9676.100033>
 24. Anyaike C, Atoyebei OA, Musa OI, Bolarinwa OA, Durowade KA, Ogundiran A, et al. Adherence to Combined Antiretroviral Therapy (cART) Among People Living With HIV/AIDS In a Tertiary Hospital in Ilorin, Nigeria. *Pan Afr Med J.* 2019; 32. <https://doi.org/10.11604/pamj.2019.32.10.7508>
 25. Ahmed SI, Ramach A, Ahmadi K, Hasan SS, Lee CK. Evaluation of Patient Satisfaction With HIV/AIDS Care and Treatment: A Cross-Sectional Study. *Eur J Pers Centered Healthc.* 2017; 5 (1): 138–44. <http://dx.doi.org/10.5750/ejpc.v5i1.1250>
 26. Oche MO, Raji MO, Kaoje AU, Gana G, Oladigbolu RA, Umar AS. Clients' Satisfaction with Anti-Retroviral Therapy Services in a Tertiary Hospital in Sokoto, Nigeria. *Journal of AIDS and HIV Research.* 2013; 5 (9): 328–33. Available from: <https://doi.org/10.5897/JAHR2013.0247>

