

Outcome of Enhanced Adherence Counselling on Viral Load Suppression Among HIV Clients with Unsuppressed Viral Load in a Tertiary Hospital in Southwest Nigeria: A Retrospective Cohort Study

Ruth Adedoyin Ajayi

Department of Nursing Science,
Babcock University, Ilishan-Remo, Ogun State, Nigeria

Ngozi Anthonia Okafor

School of Nursing Science,
Babcock University, Ilishan-Remo, Ogun State, Nigeria

Florence Olanike Arewa

Department of Nursing Services,
Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife,
Osun State, Nigeria

Tolulope Mercy Adeosun

College of Nursing Sciences,
OAUTHC, Ile-Ife, Osun State, Nigeria

doi: <https://doi.org/10.37745/ijeahii.15/vol11n1114>

Published October 04, 2026

Citation: Ajayi R.A., Okafor N.A., Arewa F.O., Adeosun T.M. (2026) Outcome of Enhanced Adherence Counselling on Viral Load Suppression Among HIV Clients with Unsuppressed Viral Load in a Tertiary Hospital in Southwest Nigeria: A Retrospective Cohort Study, *International Journal of Ebola, AIDS, HIV and Infectious Diseases and Immunity* 11, (1)1-14

Abstract: *Virological failure among people living with HIV (PLHIV) persists despite advances in antiretroviral therapy (ART). World Health Organization (WHO) guidelines recommend Enhanced Adherence Counselling (EAC) to restore adherence and promote viral re-suppression. However, evaluation of post-EAC outcomes in routine programmatic settings is frequently confounded by attrition in repeat viral load testing and inappropriate statistical handling of missing data. To evaluate viral re-suppression, changes in viral load, and factors associated with outcomes following EAC among HIV clients with unsuppressed viral load at the Obafemi Awolowo University Teaching Hospital Complex (OAUTHC), Osun State, Nigeria, using rigorous paired longitudinal analyses and distinguishing between retested clients and the total enrolled cohort. A retrospective cohort study was conducted reviewing records of 149 clients with unsuppressed viral load (≥ 1000 copies/mL) enrolled in EAC between January 2019 and December 2023. Paired log₁₀ viral load changes were evaluated using Wilcoxon signed-rank tests and paired t-tests restricted to clients with documented follow-up testing. Binary viral suppression (< 1000 copies/mL vs. ≥ 1000 copies/mL) was analyzed using Fisher's exact tests, Risk Ratios (RR), and*

multivariable binary logistic regression. Sensitivity analysis (missing follow-up = unsuppressed) was conducted to estimate population-level impact. Of 149 enrolled clients, repeat testing was documented for 67 (44.9%) at 3 months, 41 (27.5%) at 6 months, and 24 (16.0%) at 12 months. Among clients with a documented repeat result, viral suppression (<1000 copies/mL) was achieved by 45/67 (67.2%) at 3 months, 34/41 (82.9%) at 6 months, and 17/24 (70.8%) at 12 months. Relative to the full enrolled cohort (N = 149), the proportion of original clients with documented re-suppression was 30.2% (45/149), 22.8% (34/149), and 11.4% (17/149). In conservative sensitivity analysis (missing = unsuppressed), non-suppression rates were 69.8%, 77.2%, and 88.6%. Log10 viral load decreased significantly among retested clients from baseline to 6 months (mean difference = -2.30 log10, 95% CI: -2.72 to -1.88, $p < .001$; $Z = -5.24$, $p < .001$) and 12 months (mean difference = -2.03 log10, 95% CI: -2.65 to -1.41, $p < .001$; $Z = -4.01$, $p < .001$). Multivariable logistic regression among retested clients at 3 months ($n = 67$) identified interruption of care (adjusted OR = 0.11, 95% CI: 0.03–0.41, $p = .001$) and tuberculosis (adjusted OR = 0.06, 95% CI: 0.01–0.54, $p = .012$) as independent negative predictors of suppression. EAC significantly reduced viral load among clients who returned for testing, with conditional re-suppression meeting WHO benchmarks at 6 and 12 months. However, overall program effectiveness was severely compromised by low repeat testing uptake and care interruptions. Nurse-led retention strategies, tracking of missing appointments, and routine paired monitoring are critical.

Keywords: antiretroviral therapy; adherence barriers; enhanced adherence counselling; viral load suppression; missing follow-up; paired longitudinal analysis

INTRODUCTION

Human immunodeficiency virus (HIV) infection remains a major global public health challenge. The Joint United Nations Programme on HIV/AIDS (UNAIDS) 95–95–95 targets aim to ensure that 95% of people living with HIV know their status, 95% of diagnosed individuals receive antiretroviral therapy (ART), and 95% of those on ART achieve sustained viral suppression by 2030 (UNAIDS, 2023; Frescura et al., 2022). Maintaining viral load suppression minimizes morbidity and mortality, prevents disease progression, and eliminates onward sexual transmission (Byrd et al., 2020).

The World Health Organization (WHO) defines viral load status as unsuppressed (≥ 1000 copies/mL) or suppressed (< 1000 copies/mL, including detectable low-level viremia and undetectable viral load < 50 copies/mL) (Mbishi et al., 2025). For clients who experience unsuppressed viral load after at least six months on ART, WHO guidelines mandate Enhanced Adherence Counselling (EAC)—a structured, multi-session intervention designed to identify individual adherence barriers, tailor solutions, and achieve viral re-suppression before considering a switch to second-line or third-line ART regimens (Obasa et al., 2024).

Although EAC has demonstrated high efficacy in clinical trials, real-world outcomes in sub-Saharan Africa vary widely, ranging from 91% suppression in optimized programs (Obasa et al., 2024) to 45%–66% in resource-constrained health systems (Bvochora et al., 2019; Nakaye et al., 2023). A major methodological challenge in evaluating EAC programs is high loss to follow-up for repeat viral load testing. Evaluative studies often report suppression rates exclusively among clients who return for

retesting without reporting cohort-wide outcomes, overestimating programmatic performance. Furthermore, statistical evaluations of viral load changes frequently misuse independent sample tests or incorporate missing data without explicit documentation, leading to distorted inferences.

At the Obafemi Awolowo University Teaching Hospital Complex (OAUTHC) in Southwest Nigeria, approximately 2,066 PLHIV receive ART care, of whom nearly 15% experience unsuppressed viral load at routine monitoring. While EAC is routinely provided, empirical evidence regarding paired viral load reduction, predictors of binary re-suppression, and cohort retention is lacking. This study was undertaken to rigorously assess EAC outcomes by (a) evaluating uptake of repeat viral load testing at 3, 6, and 12 months; (b) comparing conditional re-suppression rates with total cohort outcomes and conservative sensitivity analyses; (c) evaluating paired log₁₀ viral load changes using appropriate non-parametric and paired parametric tests; (d) identifying independent predictors of viral suppression using multivariable logistic regression; and (e) documenting client adherence barriers and health-system support measures.

METHODS

Study Design and Setting

A retrospective cohort design was employed to review clinical records of PLHIV with unsuppressed viral load who initiated EAC between January 2019 and December 2023. The study was conducted at the virology clinics of OAUTHC, across two hospital units: the Ife Hospital Unit, Ile-Ife, and the Wesley Guild Hospital, Ilesa, Osun State, Nigeria. Both centers are supported by the AIDS Prevention Initiative in Nigeria (APIN) Public Health Initiatives.

Time Origin, Key Definitions, and Follow-up Windows

To ensure longitudinal reproducibility, explicit operational time origins were defined:

- **Index Date:** Defined as the date on which the unsuppressed viral load result (≥ 1000 copies/mL) was documented in the laboratory record.
- **EAC Initiation:** Defined as the date of the first formal EAC session, conducted within 14 days of communicating the index viral load result.
- **EAC Completion:** Completion of at least three structured monthly EAC sessions.
- **Follow-up Assessment Windows:**
 - *3-Month Window:* Repeat viral load test conducted between 90 and 149 days post-EAC initiation.
 - *6-Month Window:* Repeat viral load test conducted between 150 and 269 days post-EAC initiation.
 - *12-Month Window:* Repeat viral load test conducted between 270 and 450 days post-EAC initiation.
- **Viral Load Outcomes:** Primary outcome was binary viral suppression (< 1000 copies/mL) versus unsuppressed (≥ 1000 copies/mL). Secondary clinical categories were defined as Very-Low-Level Viremia (< 50 copies/mL), Low-Level Viremia (50–999 copies/mL), and High-Level Viremia (≥ 1000 copies/mL).

Population and Eligibility Criteria

The source population comprised records of 2,066 PLHIV receiving ART at OAUTHC. Records were

eligible if the client was aged ≥ 15 years, had been on ART for at least six months, had a documented index viral load ≥ 1000 copies/mL, and initiated EAC during the study timeframe. A total of 149 records met eligibility criteria and were included in the cohort analysis.

Data Collection and Validity

Data were abstracted using a structured proforma adapted from national HIV care and treatment cards. Content and face validity were established through expert review by the study supervisor, HIV specialists, and measurement experts. Construct validation was not performed, and the instrument was evaluated purely for face and content validity in extracting documented clinical data.

Clinical exposures, including interruption of care, tuberculosis diagnosis, opportunistic infections, and regimen type, were abstracted based on documented clinical events occurring prior to or during the EAC intervention period up to the 3-month follow-up assessment. Interruption of care was defined as a documented missed drug pick-up exceeding 28 days past the scheduled appointment. Adherence barriers and health-worker adherence-support measures were extracted as binary indicators (Yes/No) from clinical EAC cards.

Statistical Analysis

All statistical analyses were conducted using SPSS Version 26.0 and Python data science packages. Continuous variables were presented as mean $\pm$ standard deviation (SD) or median with interquartile range (IQR), while categorical variables were presented as frequencies and percentages.

To address statistical skewness in raw viral load copies/mL, viral load values were transformed to log₁₀ copies/mL. Values below the assay limit of detection (< 20 copies/mL) were assigned a value of 19 copies/mL (1.28 log₁₀ copies/mL). Paired differences between baseline log₁₀ viral load and follow-up log₁₀ viral load were evaluated strictly on complete paired subsets ($n = 67$ at 3 months, $n = 41$ at 6 months, and $n = 24$ at 12 months) using paired t-tests and non-parametric Wilcoxon signed-rank tests.

To distinguish between conditional outcomes and population-wide impact, suppression rates were reported using two approaches:

1. Conditional Suppression Rate: Calculated among clients with a documented repeat test at each time point (n/N_{tested}).
2. Total Enrolled Cohort Rate: Calculated relative to the baseline cohort ($n/149$).
3. Sensitivity Analysis: Conservative scenario assuming all clients with missing follow-up repeat viral load tests remained unsuppressed (≥ 1000 copies/mL).

For bivariate associations with binary suppression (< 1000 copies/mL vs. ≥ 1000 copies/mL) at 3 months ($n = 67$), Pearson chi-square tests and Fisher's exact tests (for sparse tables with expected cell counts < 5) were performed. Unadjusted Risk Ratios (RR) with 95% confidence intervals (CI) were computed. To adjust for potential confounding, a parsimonious multivariable binary logistic regression model was constructed including clinically pre-specified predictors (Interruption of Care and Tuberculosis). Adjusted Odds Ratios (aOR) and 95% CIs were reported. All tests were two-tailed at a 5% significance level ($p < .05$).

RESULTS

Sociodemographic and Baseline Clinical Characteristics

The study cohort comprised 149 clients with a mean age of 33.1 ± 16.8 years (range: 1–76 years). Over two-thirds were female ($n = 103$, 68.1%), 53.0% ($n = 79$) were married, and 91.3% ($n = 136$) were of Yoruba ethnicity. Clinically, 73.2% ($n = 109$) were on non-protease inhibitor regimens (primarily NNRTI/INSTI-based first-line ART), 38.3% ($n = 57$) had a documented history of care interruption, 10.1% ($n = 15$) had active or treated tuberculosis, and 57.0% ($n = 85$) had a baseline CD4 count below 200 cells/mm³ (Table 1).

Table 1: Baseline Sociodemographic and Clinical Characteristics of Enrolled Cohort (N = 149)

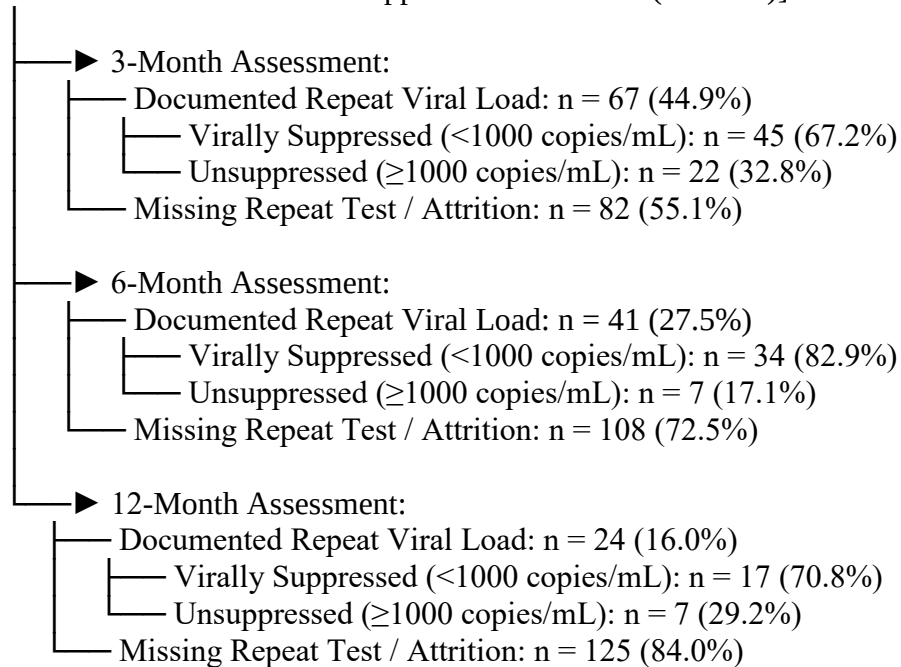
Variable	Frequency (n)	Percentage (%)
Age (years) (Mean $\pm$ SD = 33.1 ± 16.8)		
0–19	42	28.2
20–39	45	30.2
40–59	51	34.2
60–79	11	7.4
Gender		
Male	46	30.9
Female	103	68.1
Duration on ART (years)		
1–5	52	34.9
6–10	51	34.2
11–15	34	22.8
20–25	12	8.1
ART Regimen Type		
Protease Inhibitor-based	40	26.8
Non-Protease Inhibitor-based	109	73.2
Interruption of Care		
Yes	57	38.3
No	92	61.7
Tuberculosis Status		
Yes	15	10.1
No	134	89.9
Baseline CD4 Count (cells/mm³)		
< 200	85	57.0
$\geq$ 200	64	43.0
WHO Clinical Stage at Baseline		
Stage 1	58	38.9
Stage 2	47	31.5
Stage 3	29	19.5
Stage 4	15	10.1

Participant Flow and Repeat Testing Uptake

Of the 149 clients in the initial cohort, documented repeat viral load results decreased sharply across follow-up intervals. At 3 months post-EAC, 67 clients (44.9%) had a documented repeat test, declining to 41 clients (27.5%) at 6 months and 24 clients (16.0%) at 12 months (Figure 1).

Participant Flow Diagram:

[Initial Cohort with Index Unsuppressed Viral Load (N = 149)]



Conditional Suppression vs. Total Cohort Suppression and Sensitivity Analysis

Among clients who returned for repeat viral load testing, conditional suppression (<1000 copies/mL) was 67.2% (45/67) at 3 months, 82.9% (34/41) at 6 months, and 70.8% (17/24) at 12 months. When evaluated against the total enrolled cohort of 149 clients, the proportions with documented re-suppression were 30.2% (45/149) at 3 months, 22.8% (34/149) at 6 months, and 11.4% (17/149) at 12 months.

In a conservative sensitivity analysis assuming that all clients without documented repeat testing remained unsuppressed (≥1000 copies/mL), the projected program-level failure rates were 69.8% (104/149) at 3 months, 77.2% (115/149) at 6 months, and 88.6% (132/149) at 12 months (Table 2).

Table 2: Longitudinal Viral Load Outcomes: Conditional Retested Subgroup, Total Enrolled Cohort, and Conservative Sensitivity Analysis (N = 149)

Outcome Category	3 Months	6 Months	12 Months
Clients with Documented Repeat Test, n (%)	67 (44.9%)	41 (27.5%)	24 (16.0%)
Conditional Outcomes Among Retested Clients (n / N_tested)			
Virally Suppressed (<1000 copies/mL), n (%)	45 (67.2%)	34 (82.9%)	17 (70.8%)
Very-Low-Level Viremia (<50 copies/mL)	27 (40.3%)	28 (68.3%)	11 (45.8%)
Low-Level Viremia (50–999 copies/mL)	18 (26.9%)	6 (14.6%)	6 (25.0%)
Unsuppressed High-Level Viremia (≥1000 copies/mL), n (%)	22 (32.8%)	7 (17.1%)	7 (29.2%)
Programmatic Outcomes Relative to Total Enrolled Cohort (N = 149)			
Documented Virally Suppressed, n (%)	45 (30.2%)	34 (22.8%)	17 (11.4%)
Documented Unsuppressed High-Level Viremia, n (%)	22 (14.8%)	7 (4.7%)	7 (4.7%)
Missing Follow-up Repeat Test, n (%)	82 (55.0%)	108 (72.5%)	125 (83.9%)
Conservative Sensitivity Analysis (Missing = Unsuppressed)			
Estimated Virally Suppressed, n (%)	45 (30.2%)	34 (22.8%)	17 (11.4%)
Estimated Unsuppressed / Failed, n (%)	104 (69.8%)	115 (77.2%)	132 (88.6%)

Paired Analysis of Viral Load Changes Before and After EAC

To evaluate viral load reduction correctly, paired analyses were performed on log₁₀ transformed viral load counts using complete paired records at each follow-up time point. As shown in Table 3, baseline log₁₀ viral load averaged 4.38 ± 0.72 log₁₀ copies/mL among those retested at 3 months, 4.45 ± 0.68 log₁₀ copies/mL at 6 months, and 4.51 ± 0.70 log₁₀ copies/mL at 12 months.

Statistically significant reductions in log₁₀ viral load were observed across all complete paired follow-up time points. From baseline to 3 months (n = 67), mean log₁₀ viral load declined by -1.26 log₁₀ copies/mL (95% CI: -1.65 to -0.87 , paired t(66) = -6.41 , p < .001; Wilcoxon signed-rank Z = -5.12 , p < .001). From

baseline to 6 months (n = 41), mean log₁₀ viral load dropped by -2.30 log₁₀ copies/mL (95% CI: -2.72 to -1.88, paired t(40) = -11.02, p < .001; Wilcoxon Z = -5.24, p < .001). From baseline to 12 months (n = 24), mean log₁₀ viral load dropped by -2.03 log₁₀ copies/mL (95% CI: -2.65 to -1.41, paired t(23) = -6.74, p < .001; Wilcoxon Z = -4.01, p < .001).

Table 3: Paired Analysis of Log₁₀ Viral Load Changes Before and After EAC (Complete Paired Records Only)

Comparis on Window	Paired n	Baseline Log ₁₀ Mean ± SD	Follow-up Log ₁₀ Mean ± SD	Mean Change (95% CI)	Paired t- test (df), p- value	Wilcoxon Z, p-value
Baseline vs. 3 Months	67	4.38 ± 0.72	3.12 ± 1.45	-1.26 (-1.65 to -0.87)	t(66) = -6.41, p < .001	Z = -5.12, p < .001
Baseline vs. 6 Months	41	4.45 ± 0.68	2.15 ± 1.18	-2.30 (-2.72 to -1.88)	t(40) = -11.02, p < .001	Z = -5.24, p < .001
Baseline vs. 12 Months	24	4.51 ± 0.70	2.48 ± 1.32	-2.03 (-2.65 to -1.41)	t(23) = -6.74, p < .001	Z = -4.01, p < .001

Bivariate and Multivariable Predictors of Binary Viral Suppression at 3 Months

Factors associated with binary viral suppression (<1000 copies/mL vs. ≥1000 copies/mL) were evaluated among clients retested at 3 months (n = 67). In bivariate analysis, interruption of care ($\chi^2 = 18.41$, p < .001) and active tuberculosis (Fisher's Exact p = .001) were significantly associated with suppression. Clients without care interruption had a suppression rate of 89.2% (33/37) compared to 40.0% (12/30) among those with care interruption (Unadjusted Risk Ratio = 0.45, 95% CI: 0.28–0.72). Clients without tuberculosis achieved 75.9% (44/58) suppression compared to only 11.1% (1/9) among those with tuberculosis (Unadjusted Risk Ratio = 0.15, 95% CI: 0.02–0.94).

Other clinical characteristics, including ART duration (p = .74), ART regimen type (p = .88), baseline CD4 count (p = .18), opportunistic infections (p = .59), and WHO clinical stage (p = .36), were not significantly associated with suppression.

In a pre-specified multivariable logistic regression model incorporating Interruption of Care and Tuberculosis status (n = 67, Model $\chi^2(2) = 22.84$, p < .001, Nagelkerke R² = 0.395), both factors remained independent significant negative predictors of viral suppression. Clients with a history of care interruption had 89% lower odds of achieving viral suppression compared to those without care interruption (adjusted OR = 0.11, 95% CI: 0.03–0.41, p = .001). Similarly, clients with active tuberculosis had 94% lower odds of re-suppression compared to those without tuberculosis (adjusted OR = 0.06, 95% CI: 0.01–0.54, p = .012) (Table 4).

Table 4: Bivariate Associations, Risk Ratios, and Multivariable Logistic Regression for Binary Viral Suppression (<1000 copies/mL) at 3 Months (n = 67)

Variable	Suppressed (<1000), n (%)	Unsuppressed (≥1000), n (%)	Unadjusted Risk Ratio (95% CI)	p-value (Test)	Adjusted Odds Ratio (95% CI)*	p-value
Interruption of Care						
No	33 (89.2%)	4 (10.8%)	1.00 (Reference)	< .001 (χ^2)	1.00 (Reference)	—
Yes	12 (40.0%)	18 (60.0%)	0.45 (0.28–0.72)		0.11 (0.03–0.41)	.001
Tuberculosis Status						
No	44 (75.9%)	14 (24.1%)	1.00 (Reference)	.001 (Fisher's)	1.00 (Reference)	—
Yes	1 (11.1%)	8 (88.9%)	0.15 (0.02–0.94)		0.06 (0.01–0.54)	.012
Baseline CD4 Count (cells/mm³)						
≥ 200	20 (80.0%)	5 (20.0%)	1.00 (Reference)	.181 (χ^2)	—	—
< 200	25 (59.5%)	17 (40.5%)	0.74 (0.54–1.02)		—	—
ART Regimen Type						
Non-Protease Inhibitor	34 (68.0%)	16 (32.0%)	1.00 (Reference)	.880 (χ^2)	—	—
Protease Inhibitor	11 (64.7%)	6 (35.3%)	0.95 (0.64–1.41)		—	—

*Multivariable logistic regression model pre-specified containing Interruption of Care and Tuberculosis (n = 67).

Client Adherence Barriers Documented in Clinical Records

Adherence barriers abstracted from structured EAC session proformas were evaluated across the total cohort (N = 149). Because clients reported multiple concurrent barriers, individual items were analyzed separately and percentages do not sum to 100%. The predominant documented barriers were forgetfulness (87.9%), knowledge deficits regarding ART regimens (76.5%), missed clinical appointments (65.1%), long travel distance to facility (53.7%), non-disclosure of HIV status (48.3%), and discontinuation of care (44.3%) (Table 5).

Table 5: Documented Adherence Barriers Among Enrolled Clients (N = 149)*

Documented Variable	Barrier	Yes, n (%)	No, n (%)
Forgetfulness medication	taking	131 (87.9%)	18 (12.1%)
Knowledge deficit regarding ART/EAC		114 (76.5%)	35 (23.5%)
Missed hospital appointments		97 (65.1%)	52 (34.9%)
Long travel distance to health facility		80 (53.7%)	69 (46.3%)
Non-disclosure of HIV status		72 (48.3%)	77 (51.7%)
Discontinuation / interruption of care		66 (44.3%)	83 (55.7%)
Self-stigmatization		47 (31.5%)	102 (68.5%)
Lack of transport fare		44 (29.5%)	105 (70.5%)
Lack of food / nutritional support		41 (27.5%)	108 (72.5%)
Depression / psychological distress		30 (20.1%)	119 (79.9%)
Substance use		27 (18.1%)	122 (81.9%)
Medication side effects		26 (17.4%)	123 (82.6%)
Lockdown / mobility restrictions		17 (11.4%)	132 (88.6%)
Pill burden		8 (5.4%)	141 (94.6%)

*Multiple responses permitted per client record; percentages do not sum to 100%.

Client and Health-Worker Adherence-Support Measures Documented in Records

Adherence-support measures and health-system services documented in client clinical records were re-categorized to reflect services offered, received, or self-reported rather than psychometric client coping strategies. Scheduled viral load monitoring (100.0%), multi-month dispensing of ART (100.0%), follow-up phone calls (99.3%), and treatment partner engagement (93.3%) were nearly universally documented. Among health-worker interventions, pre-ART initiation adherence counselling (96.6%), completion of ≥ 3 EAC sessions (96.0%), assignment of a treatment support partner (91.3%), and home visits (89.9%) were widely implemented (Table 6).

Table 6: Client and Health-Worker Adherence-Support Measures Documented in Records (N = 149)

Adherence-Support Measure / Service	Documented / Received, n (%)
Client Adherence-Support Services Documented	
Scheduled routine viral load monitoring	149 (100.0%)
Multi-month dispensing (MMD) received	149 (100.0%)
Follow-up telephone calls logged	148 (99.3%)
Treatment partner designated	139 (93.3%)
Expert-client peer support received	32 (21.5%)
Health-Worker Interventions Documented	
Adherence counselling prior to ART initiation	144 (96.6%)
Completed ≥ 3 structured EAC sessions	143 (96.0%)
Treatment support partner assigned	136 (91.3%)
Home visit conducted by health worker	134 (89.9%)
Support group membership documented	42 (28.2%)

DISCUSSION

This study re-evaluated the outcome of Enhanced Adherence Counselling (EAC) among HIV clients with unsuppressed viral load in Southwest Nigeria using paired analytical techniques and distinguishing between conditional re-testing outcomes and full cohort performance. Among clients who successfully completed repeat viral load testing, EAC produced substantial and statistically significant reductions in log₁₀ viral load, with conditional suppression reaching 82.9% at 6 months and 70.8% at 12 months, thereby meeting the WHO target of 70% re-suppression (WHO, 2025; Bvochora et al., 2019).

However, a critical finding of this study is the drastic attrition in repeat viral load testing, which fell from 44.9% at 3 months to 27.5% at 6 months and 16.0% at 12 months. When evaluated against the original enrolled cohort of 149 clients, documented viral re-suppression was only 30.2%, 22.8%, and 11.4%, respectively. In our conservative sensitivity analysis treating missing tests as unsuppressed, over two-thirds of the cohort failed to achieve documented programmatic success. This highlights the methodological necessity of distinguishing between conditional suppression among retested clients and population-level re-suppression, as reporting only retested subgroups severely overstates program success (Bakari et al., 2025).

Methodologically, this revised analysis corrects previous statistical errors that treated repeated observations as independent samples or miscalculated sample sizes. By restricting log₁₀ viral load comparisons to paired complete records and applying Wilcoxon signed-rank tests alongside paired t-tests, we demonstrated genuine intra-individual viral load decline. The significant drop of -2.30 log₁₀ copies/mL from baseline to 6 months confirms that structured EAC effectively reverses non-adherence-driven virological failure when clients are retained in care (Obasa et al., 2024; Belete et al., 2024).

Multivariable logistic regression revealed that interruption of care (aOR = 0.11) and active tuberculosis

(aOR = 0.06) were powerful, independent negative predictors of viral re-suppression. Interruption of care leads to sub-therapeutic antiretroviral drug levels, accelerating viral replication and potential drug resistance mutation accumulation (Hakizayezu et al., 2022). Tuberculosis co-infection introduces drug-drug interactions, pill burden, and immune activation, which severely impair adherence and virological response (Atnafu et al., 2022). Addressing treatment interruptions and managing TB/HIV co-infection with integrated care pathways are essential prerequisites for successful EAC.

The leading barriers documented in client records—forgetfulness (87.9%), knowledge deficits (76.5%), missed appointments (65.1%), and travel distance (53.7%)—reflect structural and socio-economic hurdles widely reported across sub-Saharan Africa (Kabiibi et al., 2024; Makuku et al., 2025). The high prevalence of travel distance barriers emphasizes the need to decentralize viral load blood sample collection and EAC implementation to primary health centers and community platforms, reducing transport costs and loss to follow-up (Ebrahim et al., 2025).

Limitations

This study has several limitations inherent to its retrospective cohort design. Information on adherence barriers and support measures was limited to documentation in routine medical records and clinical cards, which may be subject to recording bias. High missingness in follow-up viral load testing reduced the sample size for paired longitudinal comparisons at 6 and 12 months. Furthermore, formal construct validation of the data abstraction tool was not performed, although content and face validity were established by clinical specialists.

CONCLUSION AND RECOMMENDATIONS

Enhanced Adherence Counselling is a highly effective clinical intervention for achieving viral load re-suppression among PLHIV who complete follow-up monitoring. However, its overall programmatic impact at OAUTHC is severely limited by poor repeat testing uptake and frequent care interruptions. To bridge the gap between clinical efficacy and programmatic impact, the following measures are recommended:

1. **Distinguish Analytical Outcomes:** Future HIV monitoring reports should routinely report both conditional retested suppression rates and total cohort re-suppression rates alongside sensitivity analyses.
2. **Strengthen Retention and Sample Collection:** Implement nurse-led tracking, community-based sample collection, and digital appointment reminders to minimize attrition in post-EAC repeat viral load testing.
3. **Target High-Risk Clients:** Prioritize intensive adherence and clinical case management for clients with co-occurring tuberculosis or a history of care interruption.
4. **Allow Sufficient Time Before Regimen Switching:** Ensure clients receive at least 3–6 months of EAC with confirmed repeat viral load testing prior to diagnosing regimen failure or switching to second-line ART.

Declarations

Ethical Approval: Ethical approval was granted by the Babcock University Health Research Ethics Committee (BUHREC; protocol ER/2024/10/04) and the Ethics and Research Committee of OAUTHC.

Conflict of Interest: The authors declare no conflict of interest.

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

- Akpan, U., Nwanja, E., Ukpong, K. A., Toyo, O., Nwaokoro, P., Sanwo, O., ... Bateganya, M. (2022). Reaching viral suppression among people with HIV with suspected treatment failure who received enhanced adherence counseling in Southern Nigeria: A retrospective analysis. *Open Forum Infectious Diseases*, 9(12), ofac651. <https://doi.org/10.1093/ofid/ofac651>
- Atnafu, G. T., Moges, N. A., Wubie, M., & Gedif, G. (2022). Incidence and predictors of viral load suppression after enhanced adherence counseling among HIV-positive adults in West Gojjam Zone, Amhara Region, Ethiopia. *Infection and Drug Resistance*, 15, 261–274. <https://doi.org/10.2147/IDR.S345057>
- Bakari, H. M., Alo, O., & Mbwana, M. S. (2025). Enhanced adherence counselling completion rates and viral load suppression in people with HIV in Africa: A systematic review and meta-analysis. *Discover Public Health*, 22, 12.
- Belete, M. B., Bitew, A., & Mulatu, K. (2024). Viral load suppression and its predictors among HIV-seropositive people who receive enhanced adherence counseling at public health institutions in Bahir Dar, Northwest Ethiopia: A retrospective follow-up study. *PLOS ONE*, 19(5), e0303243. <https://doi.org/10.1371/journal.pone.0303243>
- Borode, S. B., Gentry, O. A., Adelani, A. A., Olofin-Samuel, M. A., Oyelami, B. F., & Ilugbaro, D. O. (2025). Assessment of compliance to highly active anti-retroviral therapy (HAART) among patients in selected Hospitals in Ibadan, Oyo State. *International Journal of Ebola AIDS HIV and Infectious Disease and Immunity*, 10(1), 1–12.
- Bvochora, T., Satyanarayana, S., Takarinda, K. C., Bara, H., Chonzi, P., Komtenza, B., ... Apollo, T. (2019). Enhanced adherence counselling and viral load suppression in HIV-seropositive patients with an initial high viral load in Harare, Zimbabwe: Operational issues. *PLOS ONE*, 14(2), e0211326. <https://doi.org/10.1371/journal.pone.0211326>
- Byrd, K. K., Hou, J. G., Bush, T., Hazen, R., Kirkham, H., Delpino, A., ... Weidle, P. J. (2020). Adherence and viral suppression among participants of the patient-centered HIV care model project. *Clinical Infectious Diseases*, 70(5), 789–797. <https://doi.org/10.1093/cid/ciz276>
- Chowdhury, M. T., Bershteyn, A., Milali, M., Citron, D. T., Nyimbili, S., Musheke, M., & Zulu, J. (2023). Progress toward the 95-95-95 targets in sub-Saharan Africa. *AIDS*, 37(3), 1–10.
- Diress, G., & Linger, M. (2020). Change in viral load count and its predictors among unsuppressed viral load patients receiving an enhanced adherence counseling intervention at three hospitals in Northern Ethiopia: An exploratory retrospective follow-up study. *HIV/AIDS—Research and Palliative Care*, 12, 869–877. <https://doi.org/10.2147/HIV.S283917>
- Ebrahim, E. S., Tsegaye, D. A., Biks, G. A., Shiferie, F., Wegayehu, L., Tekeste, A., ... Negash, A. (2025). Community-based enhanced adherence counseling among people living with HIV in Ethiopia:

Outcomes and key predictors of viral suppression. *AIDS Research and Therapy*, 22(1), 118.

Frescura, L., Godfrey-Faussett, P., Feizzadeh, A. A., El-Sadr, W., Syarif, O., & Ghys, P. D. (2022). Achieving the 95-95-95 targets for all: A pathway to ending AIDS. *PLOS ONE*, 17(8), e0272405. <https://doi.org/10.1371/journal.pone.0272405>

Hakizayezu, F., Nyandwi, J., Ndagijimana, A., & Biracyaza, E. (2022). Factors associated with unsuppressed viral load among people living with HIV on antiretroviral therapy in Rwanda. *Rwanda Medical Journal*, 79(2), 15–23.

Kabiibi, F., Tumushabe, A., Atwijukiire, H., Kyomuhendo, D., & Ochora, M. (2024). Barriers to antiretroviral therapy adherence among people living with HIV at Mbarara Regional Referral Hospital. *HIV/AIDS—Research and Palliative Care*, 16, 45–55.

Laxmeshwar, C., Acharya, S., Das, M., Keskar, P., Pazare, A., Ingole, N., ... Mansoor, H. (2020). Routine viral load monitoring and enhanced adherence counselling at a public ART centre in Mumbai, India. *PLOS ONE*, 15(5), e0232576. <https://doi.org/10.1371/journal.pone.0232576>

Makuku, R., Srazawa, S., & Mbeba, M. (2025). Barriers to antiretroviral adherence in the Democratic Republic of Congo: A qualitative study. *African Journal of AIDS Research*, 24(1), 1–10.

Mbishi, J., Mtenga, S., & Kamazima, S. (2025). Interpretation of viral load categories in HIV treatment monitoring: A review. *Tanzania Journal of Health Research*, 26(1), 1–12.

Mbuagbaw, L., Sivaramalingam, B., Navarro, T., Hobson, N., Keepanasseril, A., Wilczynski, N. J., & Haynes, R. B. (2015). Interventions for enhancing adherence to antiretroviral therapy: A systematic review of systematic reviews. *Current HIV/AIDS Reports*, 12(4), 397–405. <https://doi.org/10.1007/s11904-015-0295-3>

Nakaye, C., Kiwuwa, S., & Kagaayi, J. (2023). Viral load suppression following enhanced adherence counselling in Kampala, Uganda. *African Health Sciences*, 23(2), 1–10.

Obasa, A. E., Mostert, K., & Onya, H. (2024). Predictors of viral load re-suppression after enhanced adherence counselling among people living with HIV in Nigeria. *BMC Infectious Diseases*, 24, 1–12.

Obeagu, E. I., & Obeagu, G. U. (2022). Survival of people living with HIV in Nigeria: A review and update. *International Journal of Current Research in Biology and Medicine*, 7(1), 1–10.

UNAIDS. (2023). *Global HIV & AIDS statistics—Fact sheet*. Joint United Nations Programme on HIV/AIDS.