A STUDY ON THE OUTCOME OF ENHANCED ADHRENECE COUNSELING AMONG UNSUPPRESSED HIV CLIENTS IN BENUE STATE.

Comment [DEM1]: A STUDY ON THE OUTCOME OF ENHANCED ADHRENECE COUNSELING AMONG UNSUPPRESSED HIV CLIENTS IN BENUE STATE: RETROSPECTIVE MEDICAL RECORD REVIEW.

ABSTRACT

Background:According to the WHO estimation, up to 70 % of patients with an initial high viral load will be virally suppressed following an adherence intervention. In Benue State, very limited studies has been done that show the viral load suppression following enhanced adherence counselling (EAC). This study assesses viral suppression after enhanced adherence counselling and its predictors among unsuppressed HIV seropositive people in the State.

Method:This was across-sectional descriptive study of all HIV-infected people with a viral load greater than 1000 copies/ml after 6 months on HAART as of December 2022, in Benue State. Patients with VL ≥ 1000 copies/ml were expected to receive EAC and have a repeat VL after three months of good adherence. Six months following the documented unsuppressed result, we determined the viral load suppression rate after EAC, the time to commencement of EAC, the time to repeat the viral load test after EAC, and the predictors of viral load suppression among high viral load HIV seropositive people on ART.

Result:Of the 234,185 PLHIV on ART between December 2022 and July 2023, 210, 514 (89.9%) did viral load testing and 9194 (3.9%) had VL >1000 copies/ml. Of these 9,194unsuppressed PLHIV, EAC uptake was 90.3% (n=8,307), EAC completion rate was 62.5% (n=5,220), and viral suppression rate following EAC was 93.8% (4897/5220). The probability of viral load suppression was higher among PLHIV who have been on treatment for less than 5 years.

***Conclusion*:** This study showed that the full potential of EAC to achieve viral load suppression has not been fully utilized. There were major gaps in EAC enrolment and completion of EAC. The reasons for his gaps need to be identified and addressed to optimize the benefits of EAC.

Keywords:People living with HIV, Enhanced adherence counselling, unsuppressed viral load

1.0 INTRODUCTION

Nigeria currently ranks fourth in the world regarding the HIV burden.[1] Nigeria has a generalized HIV epidemic with the highest HIV burden in the West and Central African sub-region.[1]The country has an estimated 1.8 million people living with HIV (PLHIV).[1] However, only 81% of PLHIV on treatment were virally suppressed.[2]Benue State has the second highest prevalence and burden of HIV in Nigeria with an HIV prevalence of 4.8% givingan estimated burden of 184,745 people living with HIV.[2]

The Joint United Nations Program on HIV/AIDS (UNAIDS) targets for 2025 aim for 95% of those living with HIV to know their status, 95% of those who know their status to be on treatment, and 95% of those on treatment to be virally suppressed- popularly referred to as the 95-95-95 target.[3] Monitoring people on ART is essential to ensure successful treatment, identify adherence challenges, and diagnose treatment failure.[4,5] The World Health Organization (WHO) recommended as the gold standard, the use of viral load testing to evaluate patient's responses to ART.[4]

The FederalMinistry of Health of Nigeria (FMOH) recommended that all HIV/AIDS clients initiating ART should have viral load determined 6 months following initiation of therapy and every 12 months after that.[5] If the VL is ≥ 1000 copies/ml, the patient should receive enhanced adherence counselling (EAC) and have a repeat VL only after three months of good

adherence.[5] Unsuppressed viral load is inimical to the epidemiologic control of HIV/AIDS as it aids transmission, and has been associated with increased morbidity due to opportunistic infections (OIs) thus resulting in a rise in mortality. [6,7]Poor adherence is a common reason for treatment failure [8–10]and as such, the WHO recommends enhanced adherence counselling sessions for 3–6 months for people with high viral load.

Enhanced adherence counseling (EAC) involves a structured assessment of the current level of adherence, exploration of specific barriers contributing to poor adherence, identification of potential solutions to address barriers, and jointdevelopment of an individualized adherence interventional plan. [5] According to the WHO estimation, up to 70 % of patients with an initial high viral load (greater than 1000 copies/ml) will be virally suppressed following an adherence intervention.[4] Enhanced adherence counsellingis effective in achieving viral load resuppression in virally unsuppressed clients and thus prevents antiretroviral drug switch.[11,12]

A retrospective cross-sectional study to evaluate the virologic suppression rate among patients on ART for $\geq$ 6 months in five hospitals in Haiti, obtained a viral load suppression rate of 25.1% following intensified adherence counseling.[13] The study identified that patients with poor adherence, males, and those having been on ART for 24- 35 months were all significantly less likely to achieve virologic suppression. Compared with a descriptive study of patients on antiretroviral therapy in Swaziland, it obtained a viral load suppression rate after EAC of 54%.[14] The study identified that children, adolescents, and those with advanced disease were most likely to have high viral loads and least likely to achieve viral suppression at retesting. However, an institutional-based retrospective study among people living with HIV in Zimbabwe obtained a viral load suppression rate of 31.2% among 489 enrolled in EAC which is similar to the study in Haiti.[15] The viral load suppression rate was low despite 83% of the patients attending three EAC sessions. The study ascribed the

low rate to several gaps in routine viral load testing, enrolment into EAC, and repeat viral load testing. A retrospective follow-up study among 346 HIV-positive adults enrolled in EAC in a high caseload facility in the West Gojjam zone, Ethiopia, obtained a viral load suppression rate of 51.73%.[16] The study identified that the average time to commence EAC and to complete EAC following a high viral load result is 8 weeks and 13 weeks respectively. Gender, educational status, residence, baseline CD4 count, first viral load count, and baseline adherence level were significantly associated with viral load suppression.

A similar study among 235 randomly selected HIV seropositive people in public hospitals in the North Wollo Zone of Ethiopia obtained a viral load suppression rate of 66.4%.[17] The study found that being female; CD4 count $\geq$ 350 cells/mm^3 and absence of recurrent opportunistic infections were independent predictors of viral load suppression after enhanced adherence counseling.

In Nigeria, very limited studies have been done that show viral load suppression following EAC.[12,18]A retrospective review of the electronic medical record of people living with HIV across 22 comprehensive health facilities in Akwa Ibom, Nigeria, obtained a viral load suppression rate after EAC of 73.8% from 3088 patients enrolled in EAC.[19]

In this study, 94.8% (3088/3257) of the unsuppressed clients were enrolled in EAC of whom 53.1% (1728/3257) started EAC within one month of the documented unsuppressed results and 81.5% (2517/3088) completed their EAC sessions. Overall, 75.9% (2344/3088) of the patients enrolled in EAC received post-EAC VL tests within 6 months from the documented results.[12]

Those on antiretroviral therapy for less than 12 months and those who completed EAC within 3 months were less likely to have persistent viremia. The study identified that a major gap in the EAC cascade is the low completion of EAC.

A descriptive cross-sectional study of patient records carried out among patients on highly active antiretroviral therapy (HAART), at the Infectious Disease Institute, College of Medicine, University of Ibadan, revealed a viral load suppression rate of 51.0% following EAC among 400 unsuppressed patients.[18] The study identified that adolescents and young adults have a greater risk of virologic failure as they face multiple social, psychological, and adherence challenges that increase their susceptibility to failure to suppress.

No research has been done in Benue state that assessed viral load suppression following EAC and its predictors among unsuppressed HIV seropositive people. The findings of this research will help the Federal Ministry of Health of Nigeria and other stakeholders assess the progress in the implementation of the national guidelines on EAC and improve the patient's health outcomes.This study aims to determine the viral load suppression rate after enhanced adherence counseling and its predictors among unsuppressed HIV seropositive people in Benue state, the time to commence EAC after the unsuppressed VL result, and to estimate the time to repeat the viral load test after EAC.

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2.0 METHODOLOGY

2.1. STUDY SETTING

Benue State lies within the lower river Benue Trough in Nigeria's North-central region. The state has 23 local government areas (LGAs).[20]It shares boundaries with five other States: Nassarawa to the north, Taraba to the east, Cross-River to the south, Enugu to the southwest, and Kogi to the west. The State shares a common boundary with the Republic of Cameroon

on the southeast. Benue State has a population of 4,253,641 people [21] and occupies a landmass of 33,955 square kilometers.[20]

AIDS Prevention Initiative in Nigeria (APIN), supported by the US President's Emergency Plan for AIDS Relief (PEPFAR) through the Centers for Disease Control and Prevention (CDC)supportsthe government of Nigeria to address HIV/AIDS and other diseases of public health importance. In Benue State, APIN supports the provision of HIV/AIDS services to over 250 health facilities across 23 local government areas (LGAs).

2.2. STUDY POPULATION

All HIV-infected people who have a viral load greater than 1000 copies/ml after 6 monthsof antiretroviral therapy in December 2022in Benue state, Nigeria.

2.3. ELIGIBILITY CRITERIA

2.3.1 INCLUSION CRITERIA

All HIV-infected people with a viral load greater than 1000 copies/ml with repeat viral load results after complete enhanced adherence counselling sessions in Benue state, Nigeria.

2.3.2. EXCLUSION CRITERIA

All HIV-infected people who were on antiretroviral therapy for less than 6 months and those who did not start EAC sessions.

Patients with missing ART information.

Patients with erroneous viral load data or conflicting information.

2.4STUDY DESIGN

Cross-sectional descriptive study.

2.5DATA COLLECTION

Comment [DEM2]: The inclusion criteria need to show that files were reviewed and should read as follows:
All files of HIV-infected people with a viral load greater than 1000 copies/ml with repeat viral load results after complete enhanced adherence counselling sessions in Benue state, Nigeria.
The exclusion criteria need to show that it was files that were reviewed as follows:
All files of HIV-infected people who were on antiretroviral therapy for less than 6 months and those who did not start EAC sessions
Files of patients with missing ART information.
Files of patients with erroneous viral load data or conflicting information.

A total sampling of medical records of all those with VL ≥ 1000cp/ml who are currently alive and receiving ART from the Laboratory Information Management System (LIMS). Relevant individual patient sociodemographic and clinic data were abstracted from the ART, individual patient folders, and EAC registers. Sociodemographic characteristics consist of sex and age. The clinical characteristics analyzed include the duration of ART (calculated as the difference between the ART start date and the date of the last clinic visit), EAC enrolment,and time to EAC completion as "within 3 months" and "after 3 months" based on the national ART treatment guidelines.[5]

2.6DATA MANAGEMENT

Data were cleaned and consistency checks were done severally to ensure accuracy and completeness.The data were analyzed using Statistical Package for Social Science version 20.0 for Windows (SPSS Inc., Chicago, Illinois). Descriptive statistics and frequencies were used to describe the characteristics of the study participants. Multivariable logistic regression analysis was employed to determine factors associated with EAC enrolment, EAC completion, and persistent VL unsuppression (post-EAC VL >1000 copies/mL). Adjusted odds ratios and 95% CIs were reported. The statistically significant differences for qualitative data will be evaluated by chi-squared statistics with significant association (P>.05).

2.7ETHICAL CONSIDERATION

The Research Ethics Committee (REC) of the Benue State Ministry of Health approved this study. (Approval Ref #: MOH/STA/204/1/279). As the study will require no direct contact with the human participants and will utilize de-identified program data, the ethics gave a waiver from obtaining informed consent from the study participants. All data collected in this study were kept confidential and only the study investigators had access to the individual patient data.

3.0 RESULTS

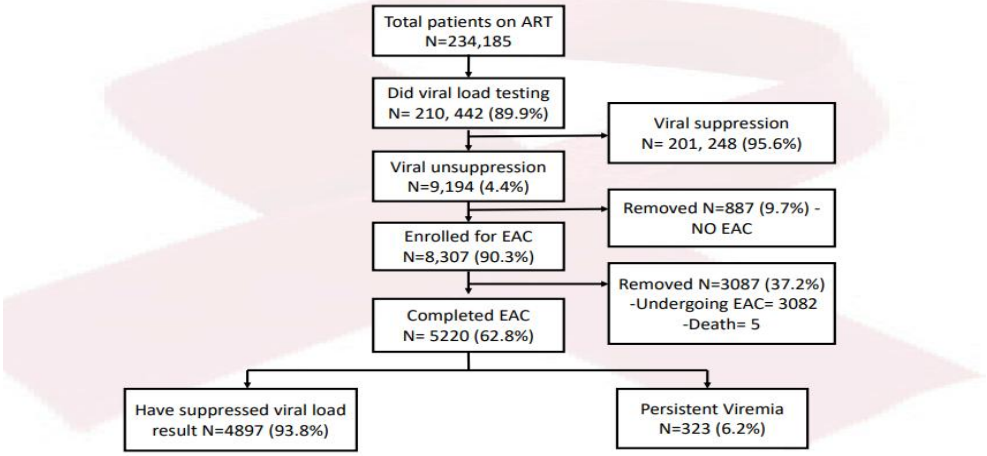

Figure 1. Analytical results

Baseline characteristics of study participants: A total of 234,185 PLHIV were receiving ART care in Benue State as of December 2022. Of these, 210,442 (89.9%) had undergone viral load testing and of those tested, 9,194 (3.9%) had unsuppressed viral load at the start of the study. 6,203 (67.5%) are females. The mean age of the study participants was 34.6 (±34.55SD). The majority 4,861 (52.9%) of the participants receive treatment in health facilities with less than 1000 people on ART, and 5753 (62.6%) have been treated for less than 5 years. 5,223 (56.8%) commence EAC within 1 month. At baseline, most, 8168 (77.1%) participants were staged in WHO clinical stage 1, and 2472 (26.9%) had a CD4 count above 200 cells/µl. (Table 1).

Outcomes for patients with unsuppressed viral load

EAC enrolment

Of the 9,194 (3.9%) with unsuppressed viral load, 8,307 (90.3%) were enrolled for EAC "Figure 1". EAC enrolment was 90.7% among males and 96.3% among the age group 0- 9

years. EAC enrolment across the facilities is 91.6% in facilities with more than 1000 people on ART and 91.5% among clients that have been on ART for over 5 years. EAC enrolment is 90.4% among participants who are staged in WHO clinical stage 1. Inmultivariable analysis to determine factors associated with EAC enrolment, those above 20 years were more likely to be enrolled in EAC (20-29years, aOR= 4.46; 95%CI, 1.05-18.85; *P*= .04; 30-39 years, aOR=5.22; 95% CI, 1.26-21.65; *P*= .02; 40-50 years, aOR=5.27; 95%CI, 1.27-21.85; *P*= .02; >50 years, aOR=4.37, 95% CI,1.03-18.53; *P*= .04). EAC enrolment is also more likely in those from the low-volume facilities (aOR=1.36; 95%CL, 1.05-1.76; *P*= .02) than those from the high-volume facilities. (Table 2)

EAC Completion

Of those enrolled for EAC, 5220 (62.8%) completed their EAC sessions during the review period, 3082 (37.1%) were still undergoing EAC and 5 (0.1%) died. EAC completion differs across age, facility status, WHO status, and sex categories. In multivariable analysis to determine factors associated with completion of EAC, those above 20 years were less likely to complete EAC (20-29years, aOR= 0.19; 95%CI, 0.11-0.32; $P \leq 0.001$; 30-39 years, aOR=0.28; 95% CI, 0.14-0.38; $P \leq 0.001$; 40-50 years, aOR=0.26; 95%CI, 0.15-0.42; $P \leq 0.001$; >50 years, aOR=0.17, 95% CI,0.10-0.29; $P \leq 0.001$). EAC completion is also more likely in those who have been on ART for more than 4 years. (Table 3)

Post EAC VL Characteristics

A repeat viral load test was done for all those who completed EAC. 4897 (93.8%) had suppressed viral load (60% in those who were enrolled in EAC and 0% in those who were not enrolled in EAC, Chi-square test *P*-value <0.001).

In the multivariate analysis to determine factors associated with VL suppression following EAC (Table 4), those who have been on ART for 5 years or more are less likely to be virally

suppressed following EAC (aOR=0.84; 95% CI, 0.53-1.35; *P*=0.03) than those who have been on ART for less than 5 years.

Table 1. SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE PATIENTS

Variables	Frequency N= 9,194	Percentage (%)
Sex		
Male	2991	32.5
Female	6203	67.5
Age (years)		
0-9	401	4.4
10-19	1016	11.1
20-29	1624	17.7
30-39	2890	31.4
40-50	2196	23.9
>50	1067	11.6
Facility Status		
High volume	4333	47.1
Low volume	4861	52.9
Duration on ART (years)		
<5	4790	52.1
≥5	4404	47.9
WHO Stage		
1	8168	88.8
2	675	7.3
3	326	3.5
4	25	0.3
Baseline CD4 count (cells/mm^3)		
<200	527	5.7
≥200	2506	27.3
Missing	6161	67.0
Commencement of EAC (months)		
<1	5225	56.8
≥1	3082	33.5
No EAC	888	9.7

Table 2. Results show the relationship between baseline characteristics and enrolment into EAC among study participants.

Variables	EAC		Total N= 9,194 (%)	Test statistics	*P*-value	OR (95%CI)	*P* value	AOR (95%CI)	*P* value
	Enrolled for EAC N=8307 (90.3%)	Not Enrolled for EAC N=887 (9.7%)							
Sex									
Male	2715 (90.7%)	276 (9.3%)	2991 (32.5%)	0.90	0.344	Reference			

Female	5592 (90.1%)	611 (9.9%)	6203 (67.5%)			0.93 (0.80-1.08)	0.34	1.03(0.81-1.33)	0.78
Age (years)									
0-9	386 (96.3%)	15 (3.7%)	401 (4.4%)	40.45	≤0.001	Reference			
10-19	955 (94.0%)	61 (6.0%)	1016 (11.1%)			1.64(0.92-2.93)	0.10	2.65(0.61-11.50)	0.19
20-29	1436 (88.4%)	188 (11.6%)	1624(17.7%)			3.37(1.97-5.77)	≤0.001	4.46(1.05-18.85)	0.04*
30	2592 (89.7%)	298 (10.3%)	2890 (31.4%)			2.96(1.74-5.02)	≤0.001	5.22(1.26-21.65)	0.02*
40-50	1974 (89.9%)	222 (10.1%)	2196 (23.9%)			2.89(1.70-4.94)	≤0.001	5.27(1.27-21.85)	0.02*
>50	964 (90.4%)	103 (9.6%)	1067 (11.6%)			2.75(1.58-4.79)	≤0.001	4.37(1.03-18.53)	0.04*
Facility Status									
High volume	3968 (91.6%)	365 (8.4%)	4333 (47.1%)	14.08	≤0.001	Reference			
Low volume	4339 (89.2%)	522 (10.8%)	4861 (52.9%)			1.31(1.14-1.51)	≤0.001	1.36(1.05-1.76)	0.02*
Duration on ART (years)									
<5	4294 (89.7%)	496 (10.3%)	4790 (52.1%)	5.74	0.017	Reference			
≥5	4013 (91.1%)	391 (8.9%)	4404 (47.9%)			1.19 (1.03-1.36)	0.017	0.85(0.64-1.12)	0.26
WHO Stage									
1	7387 (90.4%)	781 (9.6%)	8168 (88.8%)	1.83	0.61	Reference			
2	605 (89.6%)	70 (10.4%)	675 (7.3%)			1.09 (0.85-1.42)	0.49	0.87(0.59-1.29)	0.50
3	291 (89.3%)	35 (10.7%)	326 (3.5%)			1.14(0.80-1.63)	0.48	1.02(0.562-1.67)	0.95
4	24 (96.0%)	1 (4.0%)	25(0.3%)			0.40(0.05-2.92)	0.36	0.62(0,08-4.80)	0.65
Baseline CD4 count (cells/mm^3)									
<200	461 (87.5%)	66 (12.5%)	527 (17.4%)	9.53	0.009	Reference			
≥200	2243 (89.5%)	263 (10.5%)	2506 (82.6%)			0.82(0.62-1.09)	0.17	0.87(0.65-1.17)	0.38
Missing	5603 (90.9%)	558 (9.1%)	6161 (67.0%)						
Commencement of EAC (months)									
<1	5225 (100.0%)	0 (0.0%)	5223 (56.8%)	**					
≥1	3082 (100.0%)	0 (0.0%)	3082 (33.5%)						
No EAC	0 (0.0%)	0 (0.0%)	887 (9.7%)						

****Test statistics not done**

Table 3:Results show the relationship between baseline characteristics and completion of EAC among study participants

Variables	Completion of EAC		Total N= 8,307 (%)	Test Statistics	*P*-value	OR (95%CI)	*P* value	AOR (95%CI)	*P* value
	EAC Completed N=5,220 (62.8%)	EAC Not completed N= 3087 (37.2%)							
Sex									
Male	1673 (61.6%)	1042 (38.4%)	2715 (32.7%)	2.56	0.109	Reference			
Female	3547 (63.4%)	2045 (36.6%)	5592 (67.3%)			1.08(0.98-1.18)	0.11	0.91(0.76-1.08)	0.28
Age (years)									

0-9	167 (43.3%)	219 (56.7%)	386 (4.6%)	231.54	≤0.001	Reference			
10-19	430 (45.0%)	525 (55.0%))	955 (11.5%)			1.07(0.85-1.36)	0.56	0.65(0.38-1.10)	0.11
20-29	959 (66.8%)	477 (33.2%)	1436(17.3%)			2.64(2.10-3.32)	≤0.001	0.19(0.11-0.32)	≤0.001*
30-39	1730 (66.7%)	862 (33.3%)	2592 (31.2%)			2.63(2.11-3.27)	≤0.001	0.28(0.14-0.38)	≤0.001*
40-50	1289 (65.3%)	685 (34.7%)	1974 (23.8%)			2.47(1.98-3.08)	≤0.001	026(0.15-0.42)	≤0.001*
>50	645 (66.9%)	319 (33.1%)	964 (11.6%)			2.65(2.08-3.38)	≤0.001	0.17(0.10-0.29)	≤0.001*
Facility Status									
High volume	2479 (62.5%)	1489 (37.5%)	3968 (47.8%)	0.43	0.512	Reference			
Low volume	2741 (63.2%)	1598 (36.8%)	4339 (52.2%)			1.03(0.94-1.13)	0.51	0.88(0.73-1.07)	0.21
Duration on ART (years)									
<5	2793 (65.0%)	1501 (35.0%)	4294 (51.7%)	18.52	≤0.001	Reference			
≥5	2427 (60.5%)	1586 (39.5%)	4013 (48.7%)			1.22(1.11-1.33)	≤0.001	1.26(1.02-1.57)	0.04*
WHO Stage									
1	4638 (62.8%)	2749 (37.2%)	7387 (88.9%)	4.17	0.244	Reference			
2	395 (65.3%)	210 (34.7%)	605 (7.3%)			1.11(0.94-1.33)	0.22	0.87(0.67-1.14)	0.32
3	175 (60.1%)	116 (39.1%)	291 (3.5%)			0.89(0.70-1.14)	0.36	1.28(0.91-1.81)	0.15
4	12 (50.0%)	12 (50.0%)	24 (0.3%)			0.59(0.27-1.30)	0.20	1.93(0.61-6.05)	0.26
Baseline CD4 count (cells/mm^3)									
<200	298 (64.6%)	163 (35.4%)	461 (5.6%)	3.75	0.153	Reference			
≥200	1441 (64.2%)	802 (35.8%)	2243 (27.0%)			1.029(0.83-1.26)	0.87	0.89(0.72-1.11)	0.31
Missing	3481 (62.1%)	2122 (37.9%)	5603 (67.5%)						
Commencement of EAC (months)									
<1	5219 (99.9%)	5 (0.1%)	5224 (62.9%)						
≥1	1 (0.03%)	3082 (99.97%)	3083 (37.1%)						
No EAC									

Table 4. Results show the relationship between baseline characteristics and viral load re-suppression among study participants.

Variables	**Viral Load Suppression**		**Total N=5220**	**Test Statistics**	***P* value**	**OR (95%CI)**	***P* value**	**AOR (95%CI)**	***P* value**
	Suppressed N=4897(93.8%)	**Unsuppressed N=323(3.9%)**							
Sex									
Male	1550 (92.7%)	123 (7.3%)	1673 (32.0%)	5.75	0.016	Reference			
Female	3347 (94.4%)	200 (5.6%)	3547 (68.0%)			1.33(1.05-1.68)	0.02	1.22(0.83-1.80)	0.31
Age (years)									
0-9	153 (91.6%)	14 (8.4%)	167 (3.2%)	72.20	≤0.001	Reference			

10-19	364 (84.7%)	66 (15.3%)	430 (8.2%)			1.98(1.08-3.64)	0.03	3.76(0.48-29.60)	0.21
20-29	912 (95.1%)	47 (4.9%)	959 (18.4%)			0.56(0.30-1.05)	0.07	1.49(0.19-11.93)	0.71
30-39	1632 (94.3%	98 (5.7%)	1730 (33.1%)			0.66(0.37-1.18)	0.16	1.96(0.25-15.02)	0.52
40-50	1218 (94.5%)	71 (5.5%)	1289 (24.5%)			0.64(0.35-1.16)	0.14	1.81(0.24-13.98)	0.57
>50	618 (95.8%)	27 (4.2%)	645 (12.4%)			0.48(0.24-0.93)	0.03	1.69(0.21-13.34)	0.62
Facility Status									
High volume	2295(92.6%)	184 (7.4%)	2479 (47.5%)	12.40	≤0.001	Reference			
Low volume	2602 (94.9%)	139 (5.1%)	2741 (52.5%)			0.67(0.53-0.84)	≤0.001	0.72(0.46-1.14)	0.16
Duration on ART (years)									
<5	2645 (94.7%)	148 (5.3%)	2793 (53.5%)	8.16	0.004	Reference			
≥5	2252 (92.8%)	175 (7.2%)	2427 (46.5%)			1.40(1.11-1.74)	0.004	0.84(0.53-0.79)	0.03*
WHO Stage									
1	4358(94.0%)	280 (6.0%)	4638 (88.9%)	15.97	0.001	Reference			
2	367(92.9%)	28 (7.1%)	395 (7.7%)			1.19(0.79-1.78)	0.40	1.31(0.77-2.23)	0.33
3	164(93.7%)	11 (6.3%)	175 (3.4%)			1.04(0.56-1.95)	0.89	1.38(0.64-2.95)	0.41
4	8(66.7%)	4 (33.3%)	12 (0.23%)			7.78(2.33-26.00))	≤0.001	6.58(1.16-37.21)	0.45
Baseline CD4 count (cells/mm^3)									
<200	273(91.6%)	25 (8.4%)	298 (5.7%)	56.84	0.033	Reference			
>200	1338(92.9%)	103 (7.1%)	1441 (27.6%)			0.84(0.53-1.33)	0.46	0.83(0.53-1.35)	0.48
Missing	3286(94.4%)	195 (5.6%)	3481 (66.7%)						
Commencement of EAC (months)									
<1	4897 (93.8%)	323 (6.2%)	5220 (100%)						
≥1	0 (0.0%)	0 (0.0%)	(0.0%)						
No EAC									

4.0. DISCUSSION

In this study, 89.9% of PLHIV on ART in Benue State had undergone viral load tests, and 4.4% of those who underwent viral load tests had high viral loads, this is lower than values in other similar studies.[15]Of those with high viral load, 90.3% of these had enrolled in EAC and 62.8% completed EAC per the national guidelines.[5] 93.8% of those who completed

EAC achieved viral load < 1000 copies/ml. This is higher than both the WHO target (70%)[4]and values found in other studies.[13,15,17–19]It is however slightly lower than the 95% target for viral load suppression captured under the UNAIDS 95-95-95 targets.[3] The high post-EAC viral load suppression rate in this study compared to other studies reflects the huge investment by APIN in the continuous training of adherence counsellors to educate PLHIV on the importance of adherence to ART. In addition, APINencourages in-patient EAC in addition to phone EAC, this is particularly significant given that many clients have to travel long distances to reach the health facilities. Studies have shown that long travel distances and lack of money fortraveling to health institutions affect ART adherence and follow-up visits within the recommended time.[22,23] The result from this study further highlights the role of enhanced adherence counsellingin achieving viral load resuppression in virally unsuppressed clients and thus prevents antiretroviral drug switch.[11,12]

In this study, the analysis showed a delay in commencing clients on EAC and a delay in completing EAC within the recommended time. 33.5% of PLHIV with VL >1000 copies/ml did not initiate EAC until after one month and only 62.8% of PLHIV who were enrolled in EAC completed EAC within the recommended time. This delay may lead to delayed identification of ART resistance and delayed switch to the alternative line of ART regimen. Failure to switch to the appropriate regimen for PLHIV with resistance due to the delay increases the risk of sexual transmission of ART-resistant strains as well as the potential failure of other lines of ART.[24–28] In Benue state, fear of stigma and discrimination has a significant influence on the health-seeking behavior of PLHIV and this is consistent with findings from previous studies.[29–32]Due to this fear, many PLHIV travel long distances far from where they reside to receive ART, in addition, a lack of means of reaching them such as via telephone and ill-defined physical address, results in delay in enrolment in EAC. Within many health facilities delay also results from the failure of adherence counsellors to receive

VL results >1000 copies/ml as soon as they are available from the laboratory. To achieve optimal treatment outcomes it is important to address the factors associated with timely EAC enrollment and completion.

Duration on ART was significantly associated with viral load suppression following EAC. Patients who have taken ART for 5 years or more were less likely to have viral suppression compared to those who have taken ART drugs for less than 5 years. This is similar to findings reported in other studies.[15,29]This could be associated with the build-up of multiple drug-resistant mutations.

The major strength of this study was the usage of routine program data overone year, with information collected on all PLHIV who were on ART and had viral load >1000 copies/ml in Benue State.

The major limitation of our study isthat our study methodology involved review of records, and hence our analysis and interpretation of the data are limited to only those variables that are routinely collected from patients/caregivers and captured in the patient records.Some of the important variables like the education status of the patient, distance of the patient's residence to the ART centers, patient's clinical condition, and so on, could have played amajor role in initial viral load testing, enrolment for EAC, repeat viral load testing and viral suppression, were not available. Thus, we were unable to account for the influence of these factors in our analysis.

5.0 CONCLUSION

In this study, 93.8% of the patients achieved a viral load result of < 1000 copies/ml following EAC. Duration on ART is statistically associated with viral load suppression following EAC. The study showed a major gap in the EAC cascade, that is enrollment in EAC and completion of EAC. These gapsimpair the role of EAC in achieving optimal viral load suppression. The reasons for this gap need to be assessed and addressed by HIV program managers and healthcare providers. This study therefore recommends further studies to identify possible reasons for gaps in the EAC cascade in Benue State.

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Comment [DEM5]: Include conclusions for the following objective: to determine the predictors among unsuppressed HIV seropositive people in Benue state

REFERENCES

1. UNAIDS. Global AIDS Monitoring 2020 [Internet]. 2019. Available from: https://www.unaids.org/sites/default/files/country/documents/NGA_2020_countryreport.pdf

2. Federal Ministry of Health (Nigeria). Nigeria HIV/AIDS indicator and impact survey (NAIIS) 2018: technical report. Abuja, Nigeria: Federal Ministry of Health; 2019.

3. UNAIDS. Fast-Track Targets [Internet]. 2020. Available from: https://www.unaids.org/sites/default/files/media_asset/201506_JC2743_Understanding_FastTrack_en.pdf

4. World Health Organization. Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection: recommendations for a public health approach [Internet]. 2nd ed. Geneva: World Health Organization; 2016 [cited 2023 Jun 6]. 429 p. Available from: https://apps.who.int/iris/handle/10665/208825

5. National AIDS and STI's Control Programme (NASCP), Federal Ministry of Health (Nigeria). National Guidelines for HIV prevention treatment and care. [Internet]. 2020. Available from: https://nascp.gov.ng/resources/get_resource_doc/17 Source

6. Pan Y, Metsch LR, Gooden LK, Philbin MM, Daar ES, Douaihy A, et al. Viral suppression and HIV transmission behaviors among hospitalized patients living with HIV. Int J STD AIDS [Internet]. 2019 Aug [cited 2023 Oct 22];30(9):891–901. Available from: http://journals.sagepub.com/doi/10.1177/0956462419846726

7. Hladik W, Stupp P, McCracken SD, Justman J, Ndongmo C, Shang J, et al. The epidemiology of HIV population viral load in twelve sub-Saharan African countries. Ortega JA, editor. PLoS ONE [Internet]. 2023 Jun 26 [cited 2023 Oct 22];18(6):e0275560. Available from: https://dx.plos.org/10.1371/journal.pone.0275560

8. B. Nachega J, C. Marconi V, U. Van Zyl G, M. Gardner E, Preiser W, Y. Hong S, et al. HIV Treatment Adherence, Drug Resistance, Virologic Failure: Evolving Concepts. IDDT [Internet]. 2011 Apr 1 [cited 2023 Jun 6];11(2):167–74. Available from: http://www.eurekaselect.com/openurl/content.php?genre=article&issn=1871-5265&volume=11&issue=2&spage=167

9. Fox MP, Cutsem GV, Giddy J, Maskew M, Keiser O, Prozesky H, et al. Rates and Predictors of Failure of First-line Antiretroviral Therapy and Switch to Second-line ART in South Africa. JAIDS Journal of Acquired Immune Deficiency Syndromes [Internet]. 2012 Aug 1 [cited 2023 Jun 6];60(4):428–37. Available from: https://journals.lww.com/00126334-201208010-00013

10. Telele NF, Kalu AW, Marrone G, Gebre-Selassie S, Fekade D, Tegbaru B, et al. Baseline predictors of antiretroviral treatment failure and lost to follow up in a multicenter countrywide HIV-1 cohort study in Ethiopia. Wang S, editor. PLoS ONE

[Internet]. 2018 Jul 11 [cited 2023 Jun 6];13(7):e0200505. Available from: https://dx.plos.org/10.1371/journal.pone.0200505

11. Etoori D, Ciglenecki I, Ndlangamandla M, Edwards CG, Jobanputra K, Pasipamire M, et al. Successes and challenges in optimizing the viral load cascade to improve antiretroviral therapy adherence and rationalize second- line switches in Swaziland. J Intern AIDS Soc [Internet]. 2018 Oct [cited 2023 Oct 22];21(10):e25194. Available from: https://onlinelibrary.wiley.com/doi/10.1002/jia2.25194

12. Akpan U, Nwanja E, Ukpong KA, Toyo O, Nwaokoro P, Sanwo O, et al. 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 [Internet]. 2022 Dec 2 [cited 2023 Oct 22];9(12):ofac651. Available from: https://academic.oup.com/ofid/article/doi/10.1093/ofid/ofac651/6908022

13. Jean Louis F, Buteau J, François K, Hulland E, Domerçant JW, Yang C, et al. Virologic outcome among patients receiving antiretroviral therapy at five hospitals in Haiti. Paraskevis D, editor. PLoS ONE [Internet]. 2018 Jan 30 [cited 2023 Oct 24];13(1):e0192077. Available from: https://dx.plos.org/10.1371/journal.pone.0192077

14. Jobanputra K, Parker LA, Azih C, Okello V, Maphalala G, Kershberger B, et al. Factors Associated with Virological Failure and Suppression after Enhanced Adherence Counselling, in Children, Adolescents and Adults on Antiretroviral Therapy for HIV in Swaziland. Paraskevis D, editor. PLoS ONE [Internet]. 2015 Feb 19 [cited 2023 Oct 23];10(2):e0116144. Available from: https://dx.plos.org/10.1371/journal.pone.0116144

15. Bvochora T, Satyanarayana S, Takarinda KC, Bara H, Chonzi P, Komtenza B, et al. Enhanced adherence counselling and viral load suppression in HIV seropositive patients with an initial high viral load in Harare, Zimbabwe: Operational issues. Mor O, editor. PLoS ONE [Internet]. 2019 Feb 5 [cited 2023 Jun 7];14(2):e0211326. Available from: https://dx.plos.org/10.1371/journal.pone.0211326

16. Atnafu GT, Moges NA, Wubie M, Gedif G. Incidence and Predictors of Viral Load Suppression After Enhanced Adherence Counseling Among HIV-Positive Adults in West Gojjam Zone, Amhara Region, Ethiopia. IDR [Internet]. 2022 Jan [cited 2023 Jun 8];Volume 15:261–74. Available from: https://www.dovepress.com/incidence-and-predictors-of-viral-load-suppression-after-enhanced-adhe-peer-reviewed-fulltext-article-IDR

17. Diress G, Dagne S, Alemnew B, Adane S, Addisu A. Viral Load Suppression after Enhanced Adherence Counseling and Its Predictors among High Viral Load HIV Seropositive People in North Wollo Zone Public Hospitals, Northeast Ethiopia, 2019: Retrospective Cohort Study. AIDS Research and Treatment [Internet]. 2020 Apr 21 [cited 2023 Jun 7];2020:1–9. Available from: https://www.hindawi.com/journals/art/2020/8909232/

18. Awolude OA, Olaniyi O, Moradeyo M, Abiolu J. Virologic Outcomes Following Enhanced Adherence Counselling among Treatment Experienced HIV Positive Patients at University College Hospital, Ibadan, Nigeria. I-SRR [Internet]. 2021 Mar 2 [cited

2023 Oct 23];53–65. Available from: https://journali-srr.com/index.php/I-SRR/article/view/131

19. Akpan U, Nwanja E, Ukpong KA, Toyo O, Nwaokoro P, Sanwo O, et al. 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 [Internet]. 2022 Dec 2 [cited 2023 Jun 7];9(12):ofac651. Available from: https://academic.oup.com/ofid/article/doi/10.1093/ofid/ofac651/6908022

20. Benue State Ministry of Finance and Economic Planning. History of Benue State [Internet]. Available from: https://www.mofep.be.gov.ng/explore_benue

21. Federal Republic of Nigeria Official Gazette [Internet]. Vol. 96. the Federal Government Printer, Abuja,Nigera; 2009. Available from: https://gazettes.africa/archive/ng/2009/ng-government-gazette-dated-2009-02-02-no-2.pdf

22. Azia IN, Mukumbang FC, Van Wyk B. Barriers to adherence to antiretroviral treatment in a regional hospital in Vredenburg, Western Cape, South Africa. South Afr j HIV med [Internet]. 2016 Sep 30 [cited 2024 Mar 24];17(1). Available from: https://sajhivmed.org.za/index.php/hivmed/article/view/476

23. Mukumbang FC, Mwale JC, Van Wyk B. Conceptualising the Factors Affecting Retention in Care of Patients on Antiretroviral Treatment in Kabwe District, Zambia, Using the Ecological Framework. AIDS Research and Treatment [Internet]. 2017 [cited 2024 Mar 24];2017:1–11. Available from: https://www.hindawi.com/journals/art/2017/7356362/

24. Nasuuna E, Kigozi J, Babirye L, Muganzi A, Sewankambo NK, Nakanjako D. Low HIV viral suppression rates following the intensive adherence counseling (IAC) program for children and adolescents with viral failure in public health facilities in Uganda. BMC Public Health [Internet]. 2018 Dec [cited 2024 Mar 24];18(1):1048. Available from: https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-018-5964-x

25. Mhango M, Chitungo I, Dzinamarira T. COVID-19 Lockdowns: Impact on Facility-Based HIV Testing and the Case for the Scaling Up of Home-Based Testing Services in Sub-Saharan Africa. AIDS Behav [Internet]. 2020 Nov [cited 2024 Mar 24];24(11):3014–6. Available from: https://link.springer.com/10.1007/s10461-020-02939-6

26. Hailu GG, Hagos DG, Hagos AK, Wasihun AG, Dejene TA. Virological and immunological failure of HAART and associated risk factors among adults and adolescents in the Tigray region of Northern Ethiopia. Paraskevis D, editor. PLoS ONE [Internet]. 2018 May 1 [cited 2024 Mar 24];13(5):e0196259. Available from: https://dx.plos.org/10.1371/journal.pone.0196259

27. Hosseinipour MC, Van Oosterhout JJ, Weigel R, Phiri S, Kamwendo D, Parkin N, et al. The public health approach to identify antiretroviral therapy failure: high-level nucleoside reverse transcriptase inhibitor resistance among Malawians failing first-line

antiretroviral therapy. AIDS [Internet]. 2009 Jun 1 [cited 2024 Mar 24];23(9):1127–34. Available from: https://journals.lww.com/00002030-200906010-00010

28. Kumarasamy N, Venkatesh KK, Devaleenal B, Poongulali S, Yepthomi T, Solomon S, et al. Safety, Tolerability, and Efficacy of Second-Line Generic Protease Inhibitor Containing HAART after First-Line Failure among South Indian HIV-Infected Patients. Journal of the International Association of Physicians in AIDS Care [Internet]. 2011 Mar [cited 2024 Mar 24];10(2):71–5. Available from: http://journals.sagepub.com/doi/10.1177/1545109710382780

29. Diress GA, Ahmed M, Linger M. Factors associated with discriminatory attitudes towards people living with HIV among adult population in Ethiopia: analysis on Ethiopian demographic and health survey. SAHARA-J: Journal of Social Aspects of HIV/AIDS [Internet]. 2020 Jan 1 [cited 2024 Mar 24];17(1):38–44. Available from: https://www.tandfonline.com/doi/full/10.1080/17290376.2020.1857300

30. Egbe TO, Nge CA, Ngouekam H, Asonganyi E, Nsagha DS. Stigmatization among People Living with HIV/AIDS at the Kumba Health District, Cameroon. J Int Assoc Provid AIDS Care [Internet]. 2020 Jan 1 [cited 2024 Mar 24];19:232595821989930. Available from: http://journals.sagepub.com/doi/10.1177/2325958219899305

31. Oladunni AA, Sina-Odunsi AB, Nuga BB, Adebisi YA, Bolarinwa OA, Adeola AA, et al. Psychosocial factors of stigma and relationship to healthcare services among adolescents living with HIV/AIDS in Kano state, Nigeria. Heliyon [Internet]. 2021 Apr [cited 2024 Mar 24];7(4):e06687. Available from: https://linkinghub.elsevier.com/retrieve/pii/S2405844021007908

32. Saki M, Mohammad Khan Kermanshahi S, Mohammadi E, Mohraz M. Perception of Patients With HIV/AIDS From Stigma and Discrimination. Iran Red Crescent Med J [Internet]. 2015 Jun 23 [cited 2024 Mar 24];17(6). Available from: https://archive.ircmj.com/article/17/6/16524-pdf.pdf