The progress towards achieving the UNAIDS ambitious viral suppression target among adults living with HIV in South-Western Nigeria

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Abstract—BACKGROUND: In sub-Saharan Africa where genotypic drug resistance testing is rarely performed and poor adherence is blamed for the inability to achieve viral suppression and treatment failure, programmatic approaches to preventing & handling these are thus essential. Hypothesis tested was antiretroviral therapy adherence effect on viral load outcome. This study was aimed at determining and monitoring HIV/AIDS disease progression using viral load to provide prognostic information and evaluate patients for viral suppression using the World Health Organization (WHO) guideline strategies. METHODS: This study was an observational study of subjects living with HIV already initiated on antiretroviral therapy for at least six months, enrolled in health facilities across Ondo State, South-Western Nigeria, during a 12-month observation period starting October 2018 till September 2019. Quantitative viral load analysis was done using Polymerase Chain Reaction, Roche Cobas Taqman 96 Analyzer. All data were statistically analyzed, using Statistical Package for the Social Sciences (SPSS), with multiple comparisons done using Post Hoc Bonferonni test. RESULTS: A total of 8124 (1947 males & 6177 females) subjects eligible for the study were recruited. Most of them are in the age range of 35 – 39 years, with a mean age of 42.02 ± 10.88 years. 7162 (88.2%) & 1771 (21.8%) of the subjects had viral suppression of <1000 RNA copies per ml and <20 RNA copies per ml respectively. The unsuppressed subjects went through enhanced adherence counselling (EAC) for three months and viral load test repeated thereafter. 192 patients who had completed the three sessions of EAC and repeated viral load increased the entire suppression numbers to 7339 (90.3%) & 1824 (22.5%) <1000 RNA copies per ml and <20 RNA copies per ml respectively during the period of observation. ART adherence has significant effect on viral load outcome from the study hypothesis tested. CONCLUSION: Current ART regimen & HIV treatment enhanced adherence counseling are key to the achieving viral suppression, thus, routine viral load monitoring will ultimately help in HIV/AIDS disease progression follow up and reduce treatment failure tendencies. This will help more patients stay on first line regimen and prolong their life expectancy, indicating that the UNAIDS last 90 target is achievable.

Keywords — Adult, Nigeria, suppression, viral load

I. Introduction

In resource-limited settings, where genotypic drug resistance testing is rarely performed and poor adherence is regarded as the most common reason for treatment failure, programmatic approaches to handling treatment failure are essential. HIV viral load is a virological marker of antiretroviral treatment (ART) response and HIV/AIDS disease progression used to manage and monitor the infection in patients living with virus. The magnitude of the viral load after ART initiation provides prognostic information about the disease progression. The key goal of ART is to achieve and maintain durable viral suppression. Optimal viral suppression is defined generally as a viral load persistently below the level of detection [1, 2, 3]. The guidelines of the World Health Organization (WHO) for the treatment of Human Immunodeficiency Virus (HIV) infection recommend that, where possible, the viral load of individuals receiving ART be measured every month to detect viral replication and confirm treatment failure whenever it occurs [4]. According to the WHO's strategy for the surveillance and monitoring of HIV drug resistance in Low & Middle Income Countries (LMICs), a viral load of <1000 RNA copies per ml should be taken as evidence of viral suppression [5].

According to a study in Botswana from Harvard T.H Chan school of Public Health & Colleagues, Botswana was reported to have achieved very high rates of HIV diagnosis, treatment and viral suppression, even much better than most Western Nations. The country was reported to achieve have 3596 (29%) infected with HIV and 2995 (83.3%) of these individuals already have their HIV status known. Among them, 2617 (87.4%) were receiving ART and out of the 2609 people receiving ART who had their viral load checked, 2517 (96.5%) had viral suppression [6]. In another 2016 research, 78.5% of HIV patients in care are reported to have a suppressed viral load based on a single test while 65.9% were virally suppressed based on a minimum of two or more rounds of test done [7]. In a 2015 study carried out on the scale- up of HIV viral load monitoring across seven Sub-Saharan African countries revealed that South Africa, for instance, initiated viral load monitoring in 2004 and scale up for routine viral load monitoring in 2014 on the basis of the 2013 WHO HIV treatment recommendations, while countries such as Kenya, Malawi, Namibia and Uganda, had their scale-up mostly between 2014 to 2015. Cote d'voire and Tanzania had theirs in 2015. Thus, the proportion of viral load monitoring scale up was 78% in South Africa, 83% in Kenya, 84% in Malawi, 86% in Namibia, 94% in Uganda, 53% in Cote d'voire and 72% in Tanzania [8]. In another Uganda study, 6% of the patients were reported to have experienced virological failure, which was defined as two consecutive viral loads >500 copies/ml occurring more than three months after the start of ART [9]. A 2017 study on the 90-90-90

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ambitious targets in Western Nigeria revealed that 787 (86.5%) of the subjects had viral suppression of < 1000 RNA copies per ml during the period of observation after extensive adherence counselling [10]. This study was aimed at determining and monitoring HIV/AIDS disease progression using viral load to provide prognostic information and evaluate adult patients living with HIV for viral suppression using the World Health Organization (WHO) guideline strategies.

II. RESEARCH HYPOTHESIS

Antiretroviral (ARV) therapy adherence does not significantly have impact on viral load outcome.

III. METHODS

This study was an observational study of adult patients living with HIV already initiated on antiretroviral (ARV) therapy for at least six months enrolled at various primary, secondary and tertiary level hospitals across Ondo State in South-Western Nigeria, during a 12-month observation period starting October 2018 to September 2019. The study population was adult patients living with HIV already initiated on antiretroviral (ARV) therapy for at least six months. The viral load samples were analysed with an automated real-time amplification and detection of RNA using a quantitative RNA polymerase chain reaction (PCR) analyser by (Roche Molecular Diagnostics, Basel, Switzerland). Relevant data such as age, sex, functional status, WHO clinical staging, ARV regimen at start and current, ARV adherence level, among others were obtained and analysed.

Ethical approval was sought and obtained from the Ethics & Research Committee, Federal Teaching Hospital, Ido Ekiti, Nigeria. The data analysis was done using statistical package for the social sciences (SPSS) for windows version 23.0 software (SPSS Inc; Chicago, IL, USA). Frequency counts were generated for all variables and statistical test of significance was performed with chi-square test. Other data were expressed as Mean ± Standard Deviation and analysed with chi square test. Significance was fixed at $P < 0.05$.

IV. RESULTS

SOCIO-DEMOGRAPHIC DATA

A total of 8124 subjects eligible for the study were recruited. Most of them are in the age range of 35 – 39 years, with a mean age ± SD of 42.02 ± 10.88 years. The mean number of years the patients have been on ART regimen is 4.94 ± 2.93 years. 4109 (50.6%) were recruited from tertiary hospitals, 3412 (42.0%) were from secondary facilities while 603 (7.4%) were recruited from primary healthcare facilities.

All the subjects are active on antiretroviral treatment. Using the WHO strategy, those having viral load <1000 RNA copies per ml, were 7162 (88.2%), out of which 1771 (21.8%) had viral load <20 RNA copies per ml. The unsuppressed subjects went through enhanced adherence counselling (EAC) for three months and viral load test repeated thereafter. 192 patients who had completed the three sessions of EAC and repeated viral load increased the entire suppression numbers to 7339 (90.3%) & 1824 (22.5%) <1000 RNA copies per ml and <20 RNA copies per ml respectively during the period of observation.

At the commencement of ART, 5338 (65.7%) patients that commenced tenofovir, lamivudine & efavirenz (TLE) regimen, 3424 (64.1%) transitioned to tenofovir, lamivudine & dolutegravir (TLD), with 1182 (34.5%) being male and 2242 (65.5%) being female. 2200 (98.1%) of the patients are not pregnant while 42 (1.9%) are pregnant. In viral suppression comparison, 1757 patients who commenced on tenofovir, lamivudine & efavirenz (TLE) regimen and are still on that regimen, had 1546 (88.0%) virally suppressed while 339 patients that commenced on tenofovir, lamivudine & dolutegravir (TLD) and still on the regimen, had 293 (86.4%) virally suppressed.

SOCIO-DEMOGRAPHIC & TREATMENT DATA

VARIABLES	Frequency (%)
Age Group (years)	
15 – 19	102 (1.3)
20 - 24	208 (2.6)
25 – 29	524 (6.5)
30 – 34	1172 (14.4)
35 – 39	1602 (19.7)
40 – 44	1516 (18.7)
45 – 49	1159 (14.3)
50 – 54	777 (9.6)
55 – 60	507 (6.2)
≥ 60	557 (6.9)
Sex	
Male	1947 (24.0)
Female	6177 (76.0)
Hospital Facility	
Tertiary	4109 (50.6)
Secondary	3412 (42.0)
Primary	603 (7.4)
Antiretroviral Therapy (ART) taken at start of treatment	
Tenofovir, Lamivudine & Efavirenz	5338 (65.7)
Tenofovir, Lamivudine & Dolutegravir	339 (4.2)
Zidovudine, Lamivudine & Efavirenz	17 (0.2)
Zidovudine, Lamivudine & Nevirapine	2373 (29.2)
Abacavir, Lamivudine & Efavirenz	6 (0.1)
Tenofovir, Lamivudine & Atazanavir/Ritonavir	10 (0.1)
Tenofovir, Lamivudine & Lopinavir/Ritonavir	28 (0.3)
Zidovudine, Lamivudine & Lopinavir/Ritonavir	13 (0.2)

SOCIO-DEMOGRAPHIC & TREATMENT DATA

VARIABLES	Frequency (%)
Antiretroviral Therapy (ART) currently used	
Tenofovir, Lamivudine & Efavirenz	2482 (30.6)
Tenofovir, Lamivudine & Dolutegravir	5241 (64.5)
Zidovudine, Lamivudine & Nevirapine	17 (0.2)
Abacavir, Lamivudine & Efavirenz	13 (0.2)
Tenofovir, Lamivudine & Atazanavir/Ritonavir	74 (0.9)
Tenofovir, Lamivudine & Lopinavir/Ritonavir	170 (2.1)
Zidovudine, Lamivudine & Atazanavir/Ritonavir	8 (0.1)
Zidovudine, Lamivudine & Lopinavir/Ritonavir	119 (1.5)
Antiretroviral Therapy (ART) Adherence	
Fair (85 – 94%) / (4 – 8 doses missed per month)	697 (8.6)
Good (≥ 95%) / (≤ 3 doses missed per month)	7427 (91.4)
Number of years active on treatment	
1 year	891 (11.0)
2 years	1210 (14.9)
3 years	1126 (13.9)
4 years	830 (10.2)
5 years	798 (9.8)
6 years	836 (10.3)
7 years	811 (10.0)
8 years	418 (5.1)
9 years	453 (5.6)
10 years	403 (5.0)
11 years	234 (2.9)

12 years	98 (1.2)
13 years	10 (0.1)
14 years	6 (0.1)

Chi square result showing influence of ARV therapy adherence on viral load outcome

VARIABLES	χ^2	df	Critical value	Decision
ARV therapy adherence influence on viral load outcome	7.63	1	3.84	Rejected

The null hypothesis is rejected when the test statistic (χ^2) is greater than the critical value.

FIGURE 1 - GENDER

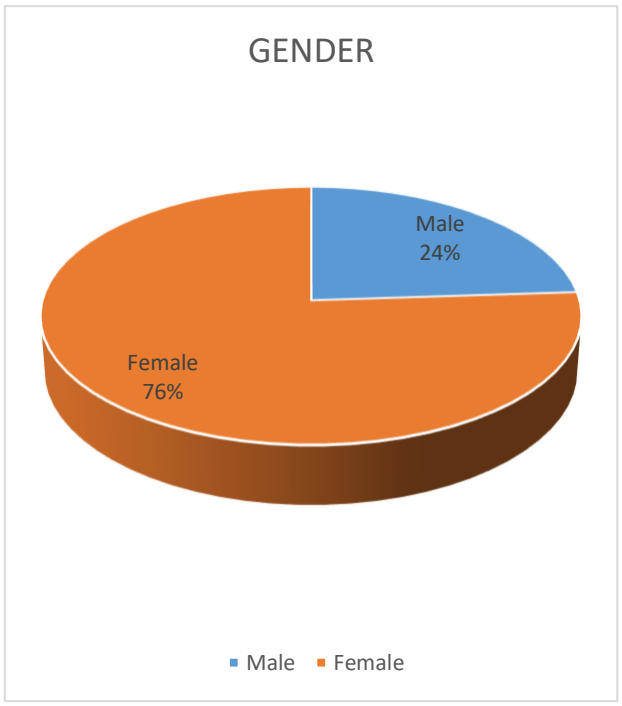


FIGURE 1I – VIRAL LOAD OUTCOME

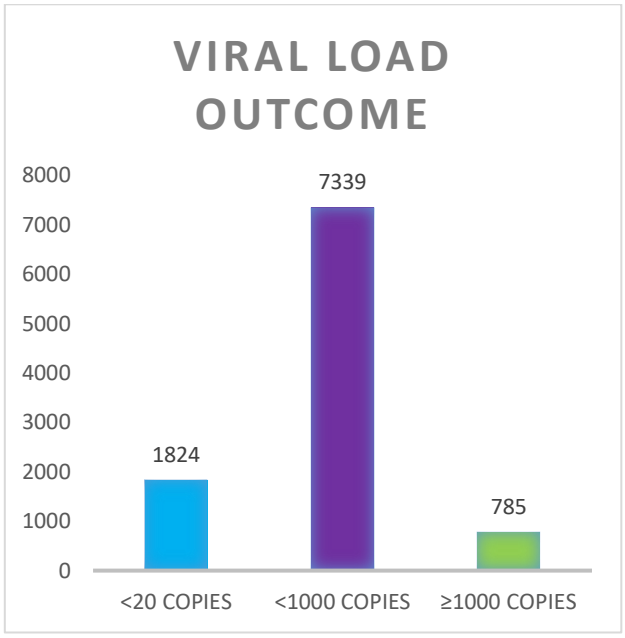


FIGURE 1II – COMPARISON OF SUPPRESSION RATE BEFORE AND AFTER EAC

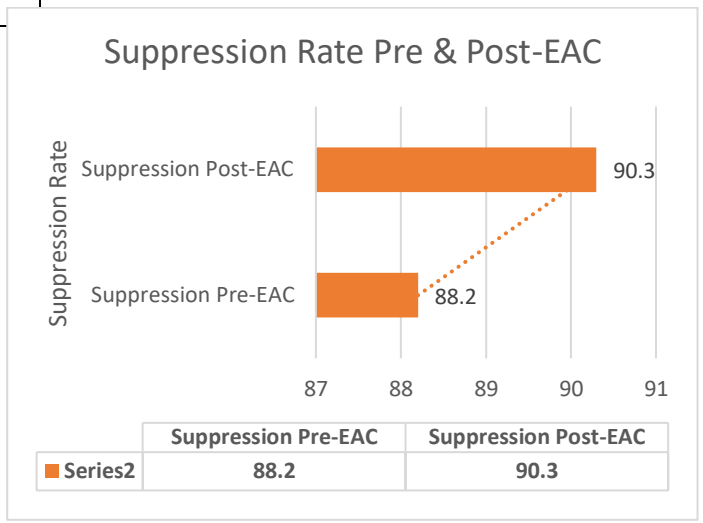


FIGURE 1V – PREGNANCY STATUS OF FEMALE SUBJECTS

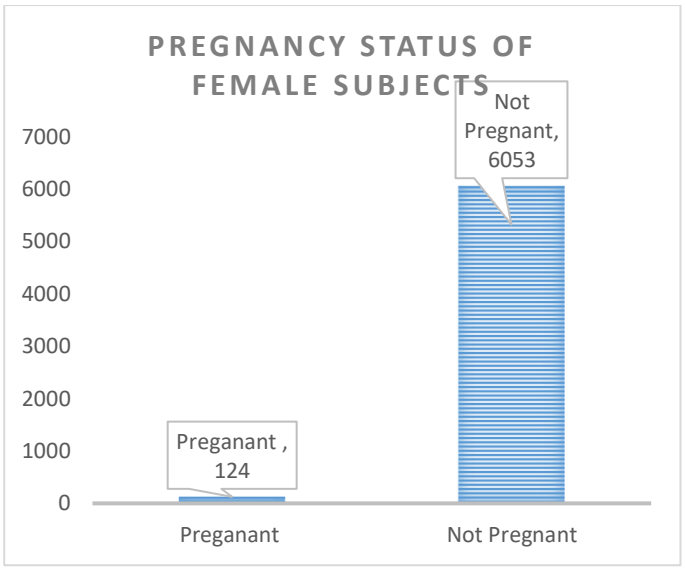
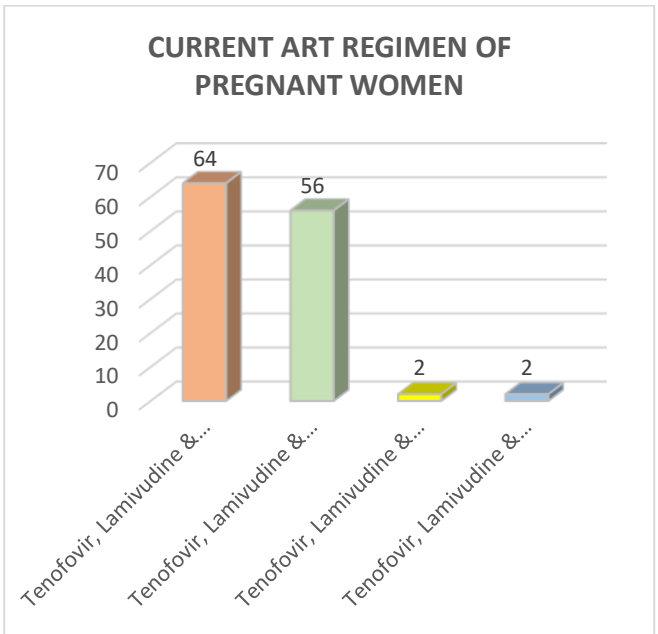


FIGURE V – CURRENT ART REGIMEN OF PREGNANT WOMEN



V. DISCUSSION

The outcome of this research reveals that 88.2% of the patients had suppressed viral load based on the viral load outcome using the WHO's strategy for surveillance and monitoring of HIV drug resistance in Low & Middle Income Countries (LMICs), which indicated that a viral load of <1000 RNA copies per ml should be taken as evidence of viral suppression [5]. The unsuppressed viral load went through three sessions of enhanced adherence counseling (EAC) for three months and viral load test repeated thereafter. This adherence counselling process increased the virally suppressed to 90.3% based on all tests done during the period of observation. Meanwhile, in comparison with high-income countries where the guidelines stipulate that a viral load of <50 RNA copies per ml or a load below the limit of detection of the most sensitive assay available, be taken as evidence of viral suppression [11,12,13]. These outcomes are slightly similar to a study that reported 78.5% viral suppression [7], 86.5% viral suppression report in Western Nigeria [10] but differ slightly from a Botswana study that reported 96.5% viral suppression [6]. This generally however shows that more subjects exhibited improvement, as they went from unsuppressed to suppressed status, within a short period of adequate drug adherence. The enhanced adherence counselling is thus essential in ART and the accessibility to every unsuppressed patient is key, which include adherence assessments and documentation at every clinic visit, with emphasis on the importance of continued adherence and involvement of support systems, adverse drug reactions, among others.

At the commencement of ART, 5338 (65.7%) patients that commenced tenofovir, lamivudine & efavirenz (TLE) regimen, 3424 (64.1%) transitioned to tenofovir, lamivudine & dolutegravir (TLD), which is in line with the new direction of patient management in the country, with TLD being the first line regimen of choice. In viral suppression comparison, 1757 patients who commenced on tenofovir, lamivudine & efavirenz (TLE) regimen and are still on that regimen, had 1546 (88.0%) virally suppressed while 339 patients that commenced on tenofovir, lamivudine & dolutegravir (TLD) and still on the regimen, had 293 (86.4%) virally suppressed. This shows no significant difference in viral suppression strength in both regimen, though, the number of patients compared are not commensurate.

Meanwhile, with majority of the patients currently on first line regimen, mainly of the combinations Tenofovir, Lamivudine & Dolutegravir (TLD), having < 1000 RNA copies per ml, may be an indication for treatment success for this particular regimen in majority of the patients on the regimen. Moreover, the rejection of the tested hypothesis on the influence of ARV therapy adherence on viral load outcome, indicates that drug adherence significantly determines outcome of viral load, evident by the ART adherence of all subjects with <1000 RNA copies per ml having ≥ 95% (good) drug adherence, which shows that they have either not missed any dose or few missed ≤ 3 doses, also indicating treatment success. This is a positive development with the TLD regimen being adhered to better as it is also being taken once daily at typically convenient time, with possible fewer side effects felt by the patients.

VI. CONCLUSION

HIV treatment enhanced adherence counseling is key to the achieving viral suppression and determine infection prognosis, thus, routine viral load monitoring will ultimately help in HIV/AIDS disease progression follow up and reduce treatment failure tendencies. This will help more patients stay on first line regimen and prolong their life expectancy, indicating that the UNAIDS last 90 target is achievable.

VII. ACKNOWLEDGEMENTS

Our sincere appreciation goes to all participants that took part in this study.

VIII. FINANCIAL & NON-FINANCIAL COMPETING INTEREST

The authors declare no financial or non-financial competing interest.

IX. CONFLICT OF INTEREST

Authors declare they have no conflict of interest.

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