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Viral Load Pattern of HIV Positive Children and Adolescents Attending a Paediatric Infectious Diseases Clinic in Owerri, Nigeria

Emeka Charles Nwolisa [a++*], Udochukwuka Ikejiaku [a++], Joseph Ezeogu [a++], Kingsley Asinobi [a#], Franklin Chime Emerenini [b#†], Kawa Alaoma [a‡] and Emmanuel Ezenwa [a^]

[a] Department of Paediatrics, Federal University Teaching Hospital, Owerri, Nigeria.
[b] Paediatrics PMTCT LEAD, ICAP@Columbia University, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. Authors ECN involved in study concept, writing and editing of the paper. Author JE involved in study concept, writing and editing of the paper. Author UI involved in study concept, writing and editing of the paper. Author FE data analysis and overview of statistical postulations. Author KA involved in study concept, writing and editing of the paper. Author EE data extraction and analysis. All authors read and approved the final manuscript.

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[++] *FWACP (Paed);*
[#] *FMC (Paed);*
[†] *MSC (Public Health);*
[‡] *MWACP (Paed);*
[^] *(MBBS);*
**Corresponding author: E-mail: nwolisaemeka@yahoo.com;*

ABSTRACT

Background: The Viral load (VL) test measures the number of copies of HIV RNA in one milliliter of blood and is the preferred antiretroviral therapy (ART) monitoring strategy. Viral suppression is defined as patients having ≤ 1000 copies of viral RNA/ml of blood.
Methods/Materials: This study involved the retrospective review of viral load test result of patients aged 2-19years living with HIV/AIDS and enrolled in the treatment programme of the Paediatric infectious diseases clinic of the Federal University Teaching hospital Owerri.
Results: 117 patients met the inclusion criteria and 103 were virally suppressed giving a suppression rate of 88%. Majority of those virally suppressed were in the 15-19 age group. A logistic regression analysis to ascertain the impact of age, gender, drug regimen, and duration on ARTs on the likelihood of viral suppression showed that age, gender, and drug regimen were not significant predictors of viral suppression ($p > 0.05$). However, duration on ARTs was a significant predictor ($p < 0.01$), with patients who had been on ARTs for greater than 24 months having higher odds of viral suppression (OR = 5.42, 95% CI = 1.84-15.93) compared to those who had been on ARTs for 0-6 months.
Conclusion: Our study provides important insights into the viral load pattern of children and adolescents living with HIV/AIDS in Owerri. It highlights the importance of early initiation of ART, adherence to ART regimen, and routine viral load monitoring to achieve and maintain viral suppression.

Keywords: Viral load; viral suppression; children; adolescents.

ABBREVIATIONS

TLD : Tenofovir disoproxil fumarate
ABC : Abacavir
DTG : Dolutegravir
3TC : Lamivudine

1. INTRODUCTION

HIV infection remains a disease of public health importance and a significant cause of mortality and morbidity in Low - and Middle-Income countries (LMIC) of the world [1]. Scaling up of HIV care and treatment programme in Nigeria improved access to Antiretroviral Therapy (ART) for more children and adolescents [2]**.** ART helps suppress viral replication within the patient as well as strengthening the immune system but it does not as yet offer a cure. This viral suppression also strengthens the capacity of the immune system to protect against opportunistic infections [1].

Evidence suggests that early initiation of ART reduces HIV related mortality, morbidity and overall HIV transmission [3]. The UNAIDS "test and start" strategy recommends that all people living with HIV be provided with lifelong ART including children and regardless of clinical status or CD4 cell count [1]**.** Additionally, the World Health Organization recommends viral load testing as the preferred antiretroviral therapy (ART) monitoring strategy [4].

Viral load (VL) test measures the number of copies of HIV RNA in one milliliter of blood. It provides a direct measure of the efficacy of antiretroviral therapy (ART), predicting immunological and clinical outcomes and the risk of transmission [4]. Ideally, VL testing should be carried out 6 and 12 months after ART initiation and routinely every year thereafter [1]. A VL count of ≤ 1000 copies of viral RNA/ml of blood is considered viral suppression. VL needs to be reduced below 1000–1500 copies /mL for the likelihood of transmission to approach zero [5].

Nigeria accounts for 26.7% of the Paediatric HIV/AIDS globally and it is estimated that only 35% of children living with HIV in Nigeria are receiving ART with viral load monitoring as a means of assessing outcome [6,7]. The national viral load implementation strategy and plan was launched in 2016 [8], and the reported national viral load suppression rate in children is 34% [9].

It is of utmost importance to determine viral load status or virological suppression status of children enrolled on ART as it allows for timely detection of treatment failures, identification of patients in need of more intensive adherence counseling and support and minimizes development of drug resistance [10].

This study set out to document viral load pattern in children and adolescents living with HIV/AIDS and attending the Paediatric infectious disease

clinic of Federal University Teaching hospital Owerri, Imo State.

2. MATERIALS AND METHODS

The study involved the review of medical records of patients aged 2-19 years living with HIV and receiving treatment at the Paediatric infectious diseases clinic of the Federal University Teaching hospital Owerri and who have had a viral load test within the 6 months' period of January to June 2022. These medical records are electronically stored in the clinic using the Nigeria Medical Record System (NMRS) Version 1.6.2.2.

Deidentified data was extracted from NMRS and information on age, gender, duration on ART, ART Regimen, and the current Viral load were obtained. Virological suppression is defined as having ≤1000 copies of viral RNA/ml of blood , in line with the National Guideline for HIV Prevention, Treatment and care 2020.

Data was analyzed using R Statistical Package, descriptive findings were presented in tables, Chi Square was used to test for association. A p-value of less than 0.05 was considered statistically significant.

3. RESULT

117 patients met the inclusion criteria, 55 were females and 62 males; giving a ratio of 1:1.12, The median age of patients was 15 years.

Table 1 shows the general characteristics of the patients. 53 (45%) of patients were in the 15-19 age group and this group also had the highest number of female 29 (55%). The 10-14 age group had the highest number of male patients 41 (63%).

It also shows that all the patients were on Dolutegravir based regimens The most widely used drug combinations was TDF/3TC/DTG drug regimen with 84 (71.7%) of patients on it.

Table 2 shows that amongst the total 117 patients, 103 were virally suppressed giving a rate of 88%. Majority of the virally suppressed patients were in the 15-19 age group, with an almost equal distribution between males and females. All the patients between in the 1-4 years age group were virally suppressed while only 33(80%) of those in the 10-14 years group were virally suppressed.

Table 1. General characteristics of patients

Variable	Frequency	Proportion
Gender		
Male	62	53.0
Female	55	47.0
Age Band (years)		
1 – 4	7	6.0
5 – 9	16	13.7
10 – 14	41	35.0
15 – 19	53	45.3
ART Regimen		
ABC/3TC/DTG	33	28.2
TDF/3TC/DTG	84	71.8

The TDF/3TC/DTG drug regimen had a higher proportion of virally suppressed patients. 76 % of patients who had been on ARTs for greater than 24 months were also virally suppressed.

More male subjects were virally suppressed but there was no statistically significant difference in viral suppression rates between males and females. (P value =0.9142). There was a

Table 2. Pattern of viral load amongst patients

Variable	Frequency (%)		OR	p-value
	Suppressed	Unsuppressed		
Gender				
Male	56 (54.4)	6 (42.9)		
Female	47 (45.6)	8 (57.1)	1.13 (0.51 -2.49)	0.914
Age Band (years)				
1 – 4	7 (6.8)	0		
5 – 9	15 (14.6)	1 (7.1)	0.96 (0.92-1.00)	
10 – 14	33 (32.0)	8 (57.1)		
15 – 19	48 (46.6)	5 (35.7)		
ART Regimen				
ABC/3TC/DTG	28 (27.2)	5 (35.7)	2.45 (1.02-5.88)	0.004
TDF/3TC/DTG	75 (72.8)	9 (64.3)		
Duration on ART				
0 – 6	8 (7.8)			0.001
7 – 24	19 (18.4)			
>24	76 (73.8)			

statistically significant relationship between duration on ART and viral suppression as well as between drug regimen and viral suppression, with P-values of 0.001 and 0.004 respectively.

Logistic regression analysis showed that patients on TDF/3TC/DTG based regimen were more likely to be virally suppressed when compared to those on ABC/3TC/DTG (AOR: 2.45; 95%CI: 1.02–5.88).

4. DISCUSSION

In this study, we retrospectively reviewed the viral load pattern of children and adolescents attending the Paediatric infectious diseases clinic of the Federal University Teaching hospital Owerri. Our study found that the majority of the patients, 103 (88%) had viral load levels of 1000 copies Viral RNA/ml of blood and below, indicating viral suppression. This is consistent with the goal of ART which is to suppress viral replication and reduce morbidity and mortality associated with HIV infection.

This viral suppression rate is higher than 48.7% reported by Elon et al [11] following a review of viral suppression rate in children and adolescents enrolled in the national ART programme in four states in Northern Nigeria and 34% in a Nigerian country wide review [6]. It is also higher than national viral suppression rates in children in Uganda and Cameroun [12,13].

It involves ramping up health care services to identify 95% of all people living with HIV (PLWH) through testing, providing antiretroviral therapy (ART) for 95% of those who are diagnosed, and achieving viral suppression of 95% of those in treatment by 2025 [1]. We can only intensify our efforts to reach this milestone.

Majority of the patients were between 10-19 years old (71.8%). However, there were more females (55, 47.0%) than males (62, 53.0%) in the study population, suggesting that HIV/AIDS is affecting girls and young women disproportionately. This is corroborated by an early study in Northern Nigeria [11].

The study also found that the most commonly prescribed ART regimen was TDF/3TC/DTG (72.0%), followed by ABC/3TC/DTG (28.0%). Although both regimens are recommended by the National guidelines for the treatment and control of HIV/AIDS in Nigeria, the TDF/3TC/DTG regimen has been shown to have better efficacy and tolerability compared to other regimens, and it is thus encouraging to see that it is the most commonly used regimen in our study population [14].

While 95% of patients between 1-9 years were virally suppressed only 86% of those 10-19 years were. However, it is concerning to note that 92.9% of those who were not virally suppressed were between 10-19years old, suggesting that adherence to treatment may be more challenging in this age group. This agrees with the report by Elon et al that adolescents had lower rates of viral suppression than children 0 - 9 years. Similar findings were also documented in Cameroon by Fokam et al [15]. It is crucial to identify and address the factors contributing to treatment failure, such as poor adherence or drug resistance, to improve the clinical outcomes of these patients.

The relationship between gender and viral load suppression was not statistically significant. This agrees with early findings in Northern Nigeria [11]. We found a significant association between viral suppression and age, Viral suppression and duration on ART as well as viral suppression and drug regimen. Other studies have also documented the impact of age on viral load suppression. Elo *et al* [11] found that Adolescents had lower rates of viral suppression than children 0 - 9 years. Similar findings were documented by Fokam et al [15].

A logistic regression analysis to investigate the impact of age, gender, drug regimen, and duration on ARTs on the likelihood of viral suppression showed that age, gender, and drug regimen were not significant predictors of viral suppression ($p > 0.05$). However, duration on ARTs was a significant predictor ($p < 0.01$), with patients who had been on ARTs for greater than 24 months having higher odds of viral suppression (OR = 5.42, 95% CI = 1.84-15.93) compared to those who had been on ARTs for 0-6 months.

5. CONCLUSION

This study provides important insights into the viral load patterns of HIV-infected children and adolescents attending the Paediatric infectious diseases clinic of the Federal University

Teaching hospital Owerri. It highlights the importance of early initiation of ART, adherence to ART regimen, and routine viral load monitoring to achieve and maintain viral suppression.

These findings suggest that targeted interventions may be needed to improve adherence to ART, especially among older patients. Targeted interventions such as peer support groups, youth-friendly services, and involvement of caregivers in adolescent care could be implemented to improve adherence to ART.

6. LIMITATION

We only assessed viral load status within a six-month period, limiting its generalizability. The study population were patients attending a single clinic in a specific region in Nigeria, which may not fully represent the general population.

CONSENT

It is not applicable.

ETHICAL APPROVAL

Permission to use the data was sought and received from management of the Federal University Teaching hospital Owerri through the supervising authority over the clinic. The data was not shared with any third party.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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