

Prevalence and Determinants of Undetectable Viremia among HIV/AIDS clients receiving care in Akwa Ibom state, Nigeria

Abstract

Background: Globally the benefits of undetectable viremia in preventing the transmission of HIV/AIDS have been established.

Objective: The study aimed to assess the prevalence and determinants of undetectable viral load amongst HIV/AIDS clients receiving care and treatment in RISE supported facilities in Akwa Ibom state, Nigeria.

Methods: A descriptive cross-sectional study was conducted using secondary data from a validated Retention and Audit Determination Tool (RADET) file generated in September, 2021. This was cleaned, imported into and analyzed using statistical package for social sciences (IBM SPSS) statistical package version 25. Prevalence of undetectable viremia was determined using descriptive statistics and factors associated with undetectable viremia were assessed using chi-square analysis. Binary logistic regression was used to identify the determinants of undetectable viremia at alpha level of <0.05 at 95% confidence interval.

Results: out of 47,575 recipients on care, 85.7% had undetectable viremia. Residing in rural areas ($p<0.001$, OR=1.3), respondents aged 15-19 years ($p=0.005$, OR=0.6), and 20 years and above ($p=0.027$, OR=0.784), those placed on MMD 6 ($p<0.001$, OR=0.696) were more likely to have undetectable viremia. While students ($p=0.026$, OR=1.2) and those employed ($p=0.002$, OR=1.096) were less likely to have undetectable viremia.

Conclusion: This study reported a high prevalence of undetectable viremia. The determinants were occupation, residing in rural areas, age and being on MMD 6. Multiple interventions that include phone reminders and behavioural models to support self-care amongst urban dwellers are imperative. Differentiated interventions that includes operation Triple Zero and plus (OTZ and OTZ plus) and Community Adherence Treatment Supports (CATs) targeting the pediatric age group are needed to support the adherence to ART and undetectable viremia.

Keywords: Undetectable viremia, HIV/AIDS, Antiretroviral therapy, RISE, Akwa Ibom state

Introduction

HIV/AIDS remains a pandemic in the world with about 38 million persons living with the disease of whom 70% of these persons reside in sub-Saharan Africa¹. Nigeria is one of the countries in the world with the highest number of people living with Human Immunodeficiency Virus (HIV)². There are about 1.9 million Nigerians living with HIV/AIDS and a prevalence of 1.4% amongst 15-64 years – 1.9% amongst females and 1.1% amongst males. Prevalence of HIV amongst children 0-14 years was 0.2%³. Akwa Ibom state remains the epicenter of the disease with 5.6% of its populace living the pandemic³.

In making HIV/AIDS ceases to being a disease of public health importance in 2030, in line with UNAIDS' vision 95-95-95 goals, every recipient on care should not only have seamless access to Antiretroviral therapy (ART) but have undetectable viral load (viral load <50 copies/ml of plasma)⁴. This is needed for the achievement of Undetectable equals to Untransmittable (U=U) an important determinant towards an HIV/AIDS free generation. Viral load is the only objective surrogate endpoint in measuring the progress of HIV/AIDS and treatment success and every recipient on care need to be supported with several strategies including behavioral model to improve adherence to ART aimed at achievement of this goal. Poor adherence to ART has serious consequences for HIV-infected patients, including failure to prevent viral replication, an increased likelihood of developing viral resistance, the development of clinical complications, and shortened survival⁵⁻⁷.

Human Immunodeficiency Virus Viral load suppression and undetectable viremia in particular, has been shown to improve the quality of lives of people living with HIV⁸. Studies have shown a strong correlation between poor adherence to ART (<95% adherence) and high viral load leading to poor clinical outcomes^{9, 10}. Other studies have shown significant associations between socio-demographic, psychosocial, behavioral and clinical factors and their influence on viral load suppression^{11, 12}. However, a study by Silveira and colleagues indicated that there were no significant association of sex, clinical status, current immune status and changes in treatment

regimen on undetectable viral load suppression at 80 copies/ml¹³. But rather, medication adherence had the greatest effect in ensuring undetectable viral suppression¹³.

Significant proportion of recipient on care in RISE supported facilities in Akwa Ibom state have undetectable viral after six months of adherence to ART medications. Considering viral load suppression as a key attribute in reducing significantly vertical and horizontal transmission of HIV in the populace and subsequently leading to HIV/AIDs free generation, this study aimed to assess the prevalence, associated factors and determinants of undetectable viremia amongst recipient of care in RISE supported facilities of Akwa Ibom state, Nigeria.

TMEC/RISE Support on HIV Epidemic Control in Nigeria

Meeting Targets Maintaining Epidemic Control, Reaching Impact Saturation and Epidemic Control of HIV/AIDS (TMEC/RISE) is a 5-year USAID funded project that commenced in October 2019. It is managed by a consortium that comprises of Jhpiego (programmatic and administrative lead) and ICAP (technical lead) and supports five states in Nigeria namely – Akwa Ibom, Adamawa, Niger Cross River and Taraba States in supporting the UNAIDS vision 95-95-95 aimed at preventing HIV/AIDS as a public health threat by 2030. Akwa Ibom state RISE supports sixty-two (including a quaternary facility)) health facilities located in the northern part of the state across ten (10) local government areas (LGAs).

Methodology

Akwa Ibom state, the study center, is located in South-southern Nigeria. The study utilized a descriptive cross-sectional design carried out in September, 2021. The study population comprised of recipients of care attending the ART clinic across 61 supported health facilities. A secondary data was generated from a validated Retention and Audit Determination Tool (RADET) file. All recipients on care in RISE supported facilities for at least six (6) months were included in the study.

The generated RADET file was cleaned and imported into and analyzed using statistical package for social sciences (IBM SPSS) statistical package version 25. Analysis of data included descriptive statistics of data using mean and standard deviation for quantitative variables like age, duration

on ART and viral load copies, counts and frequencies for qualitative variables like sociodemographic variables. Factors associated with undetectable viremia were assessed using chi-square analysis. Binary logistic regression was used to identify the determinants of undetectable viremia at alpha level of <0.05 at 95% confidence interval.

Results

Table 1: Sociodemographic characteristics of respondents

Sociodemographic Characteristics	Frequency (%)
Age (years)	
0-9	661 (1.4)
10-14	313 (0.7)
15-19	431 (0.9)
≥20	45,784 (97.0)
X ± SD	37.09 ± 11.3
Sex	
Male	17,146 (36.0)
Female	30,429 (64.0)
Marital status	
Single	17,506 (36.8)
Married	27,158 (57.1)
Separated	586 (1.2)
Divorced	315 (0.7)
Widowed	2,010 (4.2)
Population setting	
Rural	30,331 (63.8)
Urban	17,244 (36.2)
Education	
None	2,042 (4.5)
Primary	8,837 (19.3)
Quranic	73 (0.2)
Junior Secondary	865 (1.9)
Senior Secondary	31,092 (67.8)
Post Secondary	2,922 (6.4)
Occupation	
Unemployed	23,725 (51.4)
Student	2,133 (4.6)
Employed	20,131 (43.6)
Retired	143 (0.3)

Almost all 45,784 (97%) the respondents were 20 years and above majority of which majority were females 30,429 (64%). Over half 27, 158 (57.1 %) of them were married, and majority 30,331 (63.8%) of the respondents resides in rural settings. Majority 32,957 (69.7%) of the respondents had secondary education. Unemployed category 23,725 (51.4%) accounted for over half of the respondents (table 1).

Table 2: ART Parameters of respondents

Variables	Frequency (%)
ART regimen	
TDF-3TC-DTG	46,671 (98.1)
ABC-3TC-LPV/r	612 (1.3)
TDF-3TC-NVP	245 (0.5)
AZT-3TC-ABC	1 (0.0)
AZT-3TC-LPV/r	7 (0.0)
AZT-3TC-NVP	3 (0.0)
AZT-3TC-TDF	5 (0.0)
TDF-3TC-ATV/r	4 (0.0)
TDF-3TC-EFV	4 (0.0)
TDF-3TC-LPV/r	18 (0.0)
TDF-3TC-NVP	1 (0.0)
Others	3 (0.0)
MMD Status	
MMD<3	9,143 (19.2)
MMD3-5	37 (0.1)
MMD6	38,395 (80.7)
ART Enrolment Setting	
Clinical Platforms (Chemists/PMVs/Dispensary)	6,135 (12.9)
Clinical Platforms (Laboratories)	39 (0.1)
Clinical Platforms (PHCs/Private Clinics/Nursing Homes)	170 (0.4)
Community	24,101 (50.7)
Community Based Organisation	99 (0.2)
Facility	17,030 (35.8)
Viral load status (undetectable status)	
Undetectable (≤ 50 copies/ml)	35,996 (85.7)
Detectable (>50 copies/ml)	6,028 (14.3)
Viral load status (status of suppression)	
Suppressed ($<1,000$ copies/ml)	40,438 (96.2)
Unsuppressed ($\geq 1,000$ copies/ml)	1,586 (3.8)

Majority of the respondents had undetectable viremia 35,996 (85.7%) and are placed on MMD6 38,395 (80.7%). Half 24,101 (50.7%) of the respondents were enrolled at the Community and only 39 (0.1%) were enrolled through Laboratory Clinical Platform and almost all 46,671 (98.1%) the respondents were on TDF-3TC-DTG (table 2).

Over half of the respondents with undetectable viremia were unemployed ($\alpha^2 = 13.97$, $p = 0.003$) and those that reside in rural areas were 1.33 times more likely to have undetectable viremia ($\alpha^2 = 101.43$, OR = 1.33, $p < 0.001$). Almost 90% of the respondents between the age group 15-19 years had undetectable viremia ($\alpha^2 = 26.34$, $p < 0.001$). Almost 90% of the respondents with undetectable viremia were placed on MMD6 ($\alpha^2 = 156.17$, $p < 0.001$) table 3.

Students ($p=0.026$, $OR=1.2$) and those employed ($p=0.002$, $OR=1.096$) were more likely to have detectable viremia and this were statistically significant. Respondents that reside in rural areas were 1.26 times more likely to have undetectable viremia and this was statistically significant ($p < 0.0001$, $OR = 1.26$, $95\%CI [1.194 - 1.343]$). Similarly, those 15-19 years ($p=0.005$, $OR=0.6$) and 20 years and above ($p=0.027$, $OR=0.784$) were more likely to have undetectable viremia and this was statistically significant. Respondents on MMD 6 were 1.44 times more likely to have undetectable viremia and this was statistically significant ($p < 0.001$, $OR = 0.696$, $95\%CI [0.642 - 0.753]$) table 4.

Table 3: Factors associated with Undetectable Viremia amongst respondents

Variables	Viral load		Chi square statistics p value
	≤ 50 copies/mls Freq (%)	>50 copies/mls Freq. (%)	
Occupation of respondents			
Unemployed	18,640 (53.3)	2,963 (51.5)	$\alpha^2 = 13.97$ p = 0.003*
Student	1,641 (4.7%)	319 (5.5)	
Employed	14,576 (41.7)	2,456 (42.7)	
Retired	115 (0.3)	12 (0.2)	
Population Setting			
Rural	23,330 (87.0)	3,501 (13.0)	$\alpha^2 = 101.43$; $OR = 1.33$ p < 0.001*
Urban	12,666 (83.4)	2,527 (16.6)	
Age of respondents (years)			
0-9	487 (79.4)	126 (20.6)	$\alpha^2 = 26.34$ p < 0.001*
10-14	245 (82.5)	52 (17.5)	
15-19	346 (89.4)	41 (10.6)	
≥ 20	34,611 (85.7)	5,755 (14.3)	
MMD Status			
MMD<3	4,410 (12.3)	1,092 (18.1)	$\alpha^2 = 156.17$ p < 0.001*
MMD3-5	31 (0.1)	4 (0.1)	
MMD6	31,555 (87.7)	4,932 (81.8)	

* $p < 0.05$

Table 4: Determinants of Undetectable Viremia amongst respondents

Variables	Regression coefficient (B)	p value	OR	Lower	95% CI Upper
Occupation – unemployed ^a		0.002			
Student	0.155	0.026**	1.167	1.019	1.337
Employed	0.092	0.002**	1.096	1.033	1.163
Retired	-0.485	0.111	0.615	0.339	1.118
Population setting - Rural	-0.236	<0.001**	1.266	1.194	1.343
Age in categories- 0-9yrs ^a		0.032			
10 – 14 yrs	-0.228	0.249	0.796	0.541	1.173
15 – 19 yrs	-0.560	0.005**	0.571	0.388	0.841
≥20 yrs	-0.244	0.027**	0.784	0.631	0.972
MMD status - <MMD 3 ^a		<0.001			
MMD 3-5	-0.478	0.373	0.620	0.216	1.777
MMD 6	-0.363	<0.001**	0.696	0.642	0.753

*binary logistic regression; **p=0.05; a - reference categories

Discussion

WHO targets to end HIV/AIDS as a public health problem by 2030 with the introduction of the ambitious “95-95-95” strategy to attain this target and the third 95 (at least 95% of recipient on care are virally suppressed) being one of the key determinants towards this goal¹⁴. The quantification of the viral load in the plasma is a predictor of the progression of the disease¹⁵⁻¹⁷ and, along with CD4 lymphocyte counts, has been used to monitor therapeutic responses^{17, 18}. Viral load within the RISE project was measured using either Roche or Abott whose limit of detection is 20 copies/ml and 40 copies/ml respectively.

This study reported 96.2% of recipients on care had suppressed viral load (<1,000 copies/ml) with 85.7% having undetectable viremia six (6) months after ART initiation. This is significantly higher than 43.1% suppression reported by the Nigeria HIV/AIDS and Impact Survey (NAIIS)³. This is also significantly higher than undetectable viremia of 48.4% reported by Silveira and colleagues¹³ in Brazil but similar to 92% reported by a recent study by Mogosetsi and colleagues in South Africa⁸. This was possible since almost all the respondents were on TDF-3TC-DTG which is the recommended first line ART regimen that has been proven to be very effective with fewer side effects and pills.

The determinants of undetectable viremia were respondents 15-19 years and 20 years and above residing in rural areas and those place on MMD 6. This is consistent with previous studies that reported increasing age and adherence to ART as the predictor of undetectable viremia¹³.

Those residing in the rural areas were more likely to have undetectable viremia compared with those residing in the urban areas and this was statistically significant. On a contrary, students and the employed were more likely to have detectable viremia and this was statistically significant. Although this study did not assess adherence to ART, being busy is a determinant of forgetfulness, the commonest reason for poor adherence to ART. Those residing in rural areas are less likely to have drug holiday or forget their medications, stigma and discrimination and they are more likely to have better adherence to ART.

Almost all the respondents between the age group 15-19 years had undetectable viremia at bivariate analysis. Respondents within the age group 15-19 years and 20 years and above were more likely to have undetectable viremia and this was statistically significant at multivariate analysis. This is consistent with other studies that reported that prevalence of undetectable viral load increased with age^{19, 20}. Other more recent studies also corroborated that the older age group (> 40 years) was associated with better viral load suppression among patients on ART^{21, 22}. Adults are more likely to imbibe the right behavior needed for self-care to support good adherence to ART compared with pediatric clients whose care and treatment is more dependent on caregivers or their parents.

Respondents placed on MMD 6 were 1.44 times more likely to have undetectable viremia compared with those on MMD3-5 and MMD3. Multi-month dispensing 6 (MMD 6) is a type of Differential Service Delivery (DSD) Model where stable clients – adherent to ART with fewer or no signs and symptoms, are placed on antiretrovirals (ARVs) for six (6) months thereby reducing the clinic visits and burden on healthcare providers. This allows healthcare workers focus on newly enrolled and virally unsuppressed clients that will need more extensive and specific interventions to support their care and treatment. It is imperative to report that despite being placed on ARVs for six months with clinic visit limited to twice a year and virtual adherence support, significant number of them had undetectable viremia compared with other MMD status.

This study on undetectable viremia is the first to be conducted in Akwa Ibom state, Nigeria. Another strength of this study is the large sample size that gives it adequate power to detect a

difference if it exists. However, it utilized a secondary data and it did not assess adherence to ART – the most important determinant of undetectable viremia. Subsequent studies should preferably utilize primary data where several variables can be captured in the tools of data collection that can include an assessment of adherence to ART – both by self-report and the use of nonjudgmental method like Morisky Medication Adherence Assessment (MMAS 8).

Conclusion and recommendations

This study reported a high prevalence of undetectable viremia. The determinants of undetectable viremia were residing in rural areas, increasing age (15-19 years and 20 years and above) and being on MMD 6. Interventions to scale up undetectable viremia among recipient on care that are employed and residing in urban areas is highly imperative. These should include behavioural model aimed at improving client's self-care. Differentiated interventions that includes operation Triple Zero and plus (OTZ and OTZ plus) and Community Adherence Treatment Supports (CATs) targeting the pediatric age group are needed to support the adherence to ART and undetectable viremia. Subsequent studies should preferably utilize primary data where several variables can be captured in the tools of data collection that can include an assessment of adherence to ART – both by self-report and the use of nonjudgmental method like Morisky Medication Adherence Assessment (MMAS 8).

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