

THE RETENTION IN ANTIRETROVIRAL THERAPY AND ITS ASSOCIATED FACTORS AMONG PREGNANT WOMEN

ABSTRACT

Background: Despite several interventions and efforts to reduce the rate of transmission of HIV infection to newborns, it has been observed that there are growing cases of HIV occurrence in Nigeria especially in the northern part of the country. One of the identified causes is the failure of HIV-positive pregnant women to continue their life-long ART therapy. Therefore, this study investigates the factors responsible for pregnant women opting out of their ART procedures.

Methods: This is a quantitative study based on the analysis of secondary data from the medical records of 235 pregnant women who were enrolled in the HIV program between 2015 and 2019 in Gaboru Maternal and Child Health Clinic, Maiduguri, Nigeria. The characteristics of the patients and the prevalence of the factors and the retention rate were presented using frequencies and percentages. The predicting factors influencing ART retention were investigated using multiple logistic regression.

Results: The age of the participants ranged between 15 and 45 years. The average age of the sample was 28.9 ± 5.74 . The retention rate of the patients was low (40%). In the final logistic model, the study found phone ownership (aOR, 0.075, 95% CI 0.071 – 0.336, $p=0.001$) as the significant factor for retention. The model explained 9.2% of the variability in retention.

Conclusion: This study highlights the critical issue of low retention in antiretroviral therapy (ART) among HIV-positive pregnant women in Maiduguri, Nigeria, with a retention rate of only 40%. Despite ongoing interventions to prevent mother-to-child transmission (PMTCT) of HIV, challenges persist, particularly regarding the continuous adherence to ART during pregnancy. One of the most significant findings from this research is the association between phone ownership and improved ART retention, suggesting that access to communication tools may play a pivotal role in ensuring adherence to therapy.

The study emphasizes the importance of implementing focused strategies to overcome barriers to ART retention. Prioritizing the use of technology and improving access to communication tools, such as ensuring that pregnant women enrolled in ART programs have access to mobile phones, is crucial. Additionally, incorporating mobile health solutions, offering reminder systems, and promoting peer support through digital platforms could significantly improve adherence.

To achieve sustained ART retention and prevent HIV transmission to newborns, it is essential to adopt a multifaceted approach that addresses socioeconomic, educational, and systemic barriers. Future research should explore additional predictive factors and evaluate the effectiveness of tailored interventions aimed at improving retention rates in resource-constrained settings. By addressing these gaps, it will be possible to advance Nigeria's progress in combating HIV/AIDS and safeguarding maternal and child health.

Keywords: Antiretroviral, Retention, Pregnant women, Maiduguri

INTRODUCTION

According to a recent report by the United Nation Children Emergency Fund (UNICEF), there has been a global increase in the rate of the number of people living with HIV in which the adolescent and young people constitute a larger share and in 2018 alone, 510,000 newly infected young people were recorded of whom adolescent between the ages of 10 – 19 years amounted to 190,000.

Early pregnancy, HIV, and gender-based violence are significant challenges in the Eastern and Southern Africa region. With 20% of babies born to mothers under the age of 20, adolescent pregnancy rates are among the highest in the world. The region also bears the brunt of the global HIV crisis, with two-thirds of all adolescents living with HIV residing here. Alarming, adolescent girls are six times more likely to contract HIV compared to boys their age (UNICEF Eastern and Southern Africa, 2023)

The report also revealed that by this trend, the data projected that an estimated 183,000 new HIV infections will be recorded annually among adolescents by 2030. These national and subnational programmatic data on a set of indicators to the Global AIDS Monitoring (GAM) system are submitted by countries and are used to monitor the progress of the vast HIV/AIDS program aimed at attaining set global goals (Coffey et al., 2019; Rubin & Maki, 2019). UNAIDS set targets of 95-95-95 – 95% of PLHIV know their HIV status, 95% of people who know their status are on ART and 95% of the people on treatment have a suppressed viral load by 2030 serves as a guide in many implementing countries.

During pregnancy, delivery, and breastfeeding, HIV may be transmitted from an HIV-infected woman to the child (Boyd et al., 2019, Kumar et al., 2020). The majority of infections in children are caused by mother-to-child transmission (MTCT), which is also known as vertical transmission. Mother-Child Transmission is one of the important methods of HIV spread (Georges et al., 2024).

Around 40 million people globally were living with HIV, including an estimated 2.38 million children aged 0-19. Sadly, each day saw about 685 new infections among children and approximately 250 deaths caused by AIDS-related complications. These tragic numbers are largely a result of limited access to essential HIV prevention, treatment, and care services for many children and families (UNICEF, 2023)

The national prevalence of HIV pathogen found in the blood of Nigerians was about 4.1% (Federal Ministry of Health Nigeria, 2011). Parent-to-Child Transmission (PTCT) of HIV/AIDS needs to be prevented and the risk of these vertical and horizontal transmissions should be decreased to below 5 percent. Globally, a significant proportion of the 180,000 child new infections occurred during the postnatal period in 2017 (UNICEF, 2019). The postnatal phase is considered as a stage with a high potential for vertical transmission. The identification and engagement of tolerable ART seem to be an important strategy that may positively influence medication adherence.

Option B+ is an HIV/AIDS intervention approach designed to prevent the vertical transmission of HIV from an infected pregnant woman to her baby. This is achieved through the immediate initiation of lifelong antiretroviral therapy (ART), irrespective of the woman's CD4 count.

According to WHO recommendations, lifelong ART provides significant health benefits for all expectant and nursing mothers living with HIV. An effective transition from maternal and newborn

care to Option B+ services, coupled with a lifelong commitment to ART, is essential for achieving optimal outcomes (Sangwan et al., 2022; Uloeme et al., 2022).

The commitment to treatment is essential in achieving an optimal health outcome and plays a critical role in reducing HIV-related opportunistic infections, comorbidities, and mortalities. In a study by Olakunde et al. (2019) published in the *International Health* article, Nigeria has contributed the highest number of HIV-infected infants globally, despite remarkable health system-related achievements in the Prevention of mother-to-child transmission of HIV (PMTCT) over the last decade. The outcome also suggests that reducing vertical transmission in Nigeria requires the implementation of viable, culturally relevant, and effective approaches and measures that address a range of issues related to the health system (Olakunde et al., 2019).

Despite significant efforts to improve retention in lifelong antiretroviral therapy (ART) programs for HIV-positive pregnant women, many still struggle to stay engaged in care. Research has highlighted various social and demographic factors associated with retention, but these connections often stop at correlation, leaving unanswered questions about what truly drives women to continue or abandon their treatment. This lack of clarity makes it challenging to design interventions that genuinely address the root causes of low retention.

In the Gamboru Maternal and Child Health (MCH) Clinic, low retention rates among pregnant women not only undermine the success of HIV programs but also heighten the risk of mother-to-child transmission of the virus. To improve outcomes for these women and their babies, it's essential to dig deeper into the factors influencing retention and identify actionable solutions that will truly make a difference.

Study Objectives:

To understand the real-life challenges and social-demographic factors that influence whether HIV-positive pregnant women stay in or drop out of lifelong ART programs at the Gamboru MCH Clinic.

To uncover key predictors of low retention, helping us understand why some women disengage from their treatment journey.

To provide clear, evidence-based insights that can shine a light on the barriers to care and offer solutions for improving retention rates.

To empower decision-makers and stakeholders with actionable recommendations to create supportive policies and interventions that enhance ART retention, ensuring better health outcomes for mothers and their babies.

METHODOLOGY

Study Approach and Design

The present study utilizes a quantitative approach to investigate retention in care and the associated factors among pregnant women on antiretroviral therapy (ART) in Nigeria. This approach is aligned with the positivist paradigm, which focuses on acquiring knowledge through observation and empirical data, without preconceived interference. The quantitative design is particularly suited for this study because it allows for the analysis of secondary data, providing a structured and systematic approach to understanding the issue.

The use of secondary data enables the researcher to gather information quickly, allowing for the extraction, analysis, and interpretation of data specific to the study's objectives. This approach is also advantageous in identifying correlations and potential causal relationships between various factors (such as socio-demographic characteristics) and the retention rate in ART programs.

However, there are some limitations inherent in the quantitative design. Confounding bias may arise due to the absence of randomization, meaning that unmeasured factors could influence the observed outcomes. Information bias could occur due to the potential incompleteness or inaccuracy of secondary data, which may not capture all relevant details. Additionally, selection bias might result from excluding individuals who did not attend the health facility, potentially skewing the results toward those who have more favorable outcomes or were more likely to seek care.

To address the study's objectives, key variables were collected, including the date of ART initiation, gestational age, contact information, educational background, and distance to the health facility. These data were used to analyze relationships among these factors and retention in ART care.

Study Setting

The study was conducted at Gamboru MCH Clinic in Maiduguri, Borno State, serving over 20,000 residents with antenatal care and integrated HIV services. As a primary healthcare center, it meets essential standards, supports maternal and child health, and offers free HIV services. To boost retention, the clinic conducts monthly outreaches and community defaulter tracking.

Study population

In the Maternal and Child Health Clinic (MCH), Gamboru, Maiduguri, Nigeria, the study population consisted of pregnant women who are HIV positive and are receiving antiretroviral therapy (ART) in the maternal and child health Gamboru during 2015-2019. They were mostly indigenous women and lived within 2 kilometers of the MCH clinic. Accessibility to the clinic in terms of distance and mobility were not potential factors that will affect the retention outcome considering the strategic siting of the clinic.

Eligibility Criteria

This study focused on defaulters and non-defaulters among pregnant women on antiretroviral therapy (ART). Records from January 2015 to December 2019 were reviewed, including only HIV-positive pregnant women aged 15 to 43 years within the reproductive age range. Non-pregnant clients, regardless of HIV status or ART care, were excluded, ensuring the focus remained solely on pregnant women.

Sampling Procedure

The sampling procedure consists of all eligible and complete records carefully filtered from the electronic database. A complete census was conducted, including all eligible women in the study database. For this study, the detail medical information of all HIV-confirmed positive pregnant women who initiated ART in the facility for up to six months between January 2015 and December 2019, were reviewed and used. Pregnant mothers who do not return to the clinic within 6 months of the scheduled hospital visit and do not have a death certificate nor information regarding the transfer to other HIV management centres may be tracked during the intensive defaulter tracking. If the tracking fails, such client may be termed as a loss to follow-up (LTFU).

In this study, a defaulter refers to someone who begins their treatment but stops before completing it, either by missing appointments or not adhering to their prescribed antiretroviral therapy (ART), which can negatively affect their health. A Lost to Follow-Up (LTFU) patient is someone who initially engaged in treatment but fails to attend appointments for an extended period, often without explanation, making it difficult to track their progress or assess their adherence to ART.

Data Source

Traditionally, during clinical activities, medical cards, antenatal care (ANC) registers, and HIV registers were used to collect information on clients' health status, which was then entered into the facility's database. For this study, the main data sources were these tools and the electronic database. The matron (ANC provider) and HIV specialist typically gather clients' medical history, which is then recorded by the facility's medical recorders.

However, since the data collection was initially intended for clinic purposes, some challenges arose, such as incomplete or erroneous information (e.g., education, address, or employment status), which may have been useful for the study. The data extraction was done from the health facility's database, where medical records, disease registries, and other vital information are stored. Only authorized personnel, like State and LGHA M&E officers, have access to this data.

For the study, only pre-existing data from hand cards, registers, and the DHIS system were used, as they were originally collected during routine visits and not specifically for research purposes.

Statistical Analysis of Data

The data for this study were collected electronically and analyzed using SPSS version 25. The "Age" variable was transformed into an ordinal variable with three categories: 15-25 years, 26-

35 years, and 36-45 years. Initially, age was recorded as a continuous numeric variable representing the client's age at the start of ART treatment.

Descriptive statistics, including the mean and standard deviation, were used to summarize both categorical and continuous data. To assess the relationship between the dependent variable (retention rate) and independent variables, the chi-square test was applied, in line with the study's objectives. Since retention is a binary variable, binomial logistic regression was also used, with a 95% confidence level, corresponding to a 5% margin of error. A significant relationship between variables was inferred when the p-value was less than or equal to 0.05. If the p-value was greater than 0.05, it was assumed that no significant correlation existed.

The chi-square test was chosen because of the categorical (nominal) nature of the variables. This test generated a contingency table that displayed the distribution of factors across variables, expressed in frequencies and percentages. The analysis was conducted at a 95% confidence interval.

The key variables in the study were as follows:

Employment Status: A binary variable indicating whether the client is employed or unemployed.

Access to Services: A variable indicating whether the client receives health services at home or at a facility.

Year of Treatment Start: A categorical variable representing the year the client began treatment, spanning five years (2015-2019).

Socio-economic Factors: This includes whether the client has access to a mobile phone.

Education Level: A categorical variable with four levels: no formal education, primary, secondary, and post-secondary education.

RESULTS

Social Demographic Characteristics of the Sample

The data collected consists of a total of 235 medical records of pregnant women from age 15 to 43 years old. The ART clients in this study comprised mainly of mid-aged women between 26 and 35 years old (61.7%) followed by clients aged between 15 to 25 years old (27.7%) and those aged 35 years and older, which constitute about a tenth of the total sample (10.6%). The average age of the sample is 28.9 ± 5.74 . Almost all of the women were adults. 1st. Line are LTFU (Loss to follow up) while 31.8% and 8.9% stopped and were transferred out respectively. Over a third, 36.6%, of the women, have no education, over half of them, 58.7% have primary education, only 3.4% have a secondary education while 1.3% have post-secondary education. Most of the respondents are married, 84.1%, about 2.8% are divorced and only 13.1% are single women. The proportion of employed women is 36.6% while the remaining 65.1% were unemployed. The employment characteristics are used as a proxy to the poverty index in this study. Some of the women had no

mobile phones, 11.5%, while most of them own phones, 88.5%. Over half of the women delivered their babies at home, 67.2%, while 32.8% of others delivered at a health facility.

Table 1 shows the social and demographic characteristics of the women enrolled in the ART program. The average month from the start of ART to the last pick-up date was 6.2 ± 10.18 with a minimum of 0 and a maximum of 52 months. The current viral load of the pregnant women including the ones with 0 has an average of $389.3.2 \pm 1237.7$, without the 0 current viral loads, the average is 650.88 ± 1538.46 . The average age of the women enrolled within the timeframe was 29.8 ± 5.6 years.

Table 1 Social and Demographic Characteristics of women

	Frequency	Percent
All	235	100
Age group,		
15-25	65	27.7
26-35	145	61.7
36 and over	25	10.6
<u>2015 Age at ART Start</u>		
15-25	1	33%
26-35	2	67%
36+	-	-
<u>2016 Age at ART Start</u>		
15-25	-	-
26-35	6	100%
36+	-	-
<u>2017</u>		
15-25	10	40%
26-35	15	60%
36+	-	-
<u>2018 Age at ART Start</u>		
15-25	21	28%
26-35	45	61%
36+	8	11%
<u>2019 Age at ART Start</u>		
15-25	33	26%
26-35	77	61%
36+	17	13%
Education Status		
None	86	36.6
Primary	138	58.7
Secondary	8	3.4
Post-Secondary	3	1.3
Marital Status		
Married	180	84.1
Divorced	6	2.8
Single	28	13.1
Job Status/ Employment		

Employed	86	36.6
Unemployed	153	65.1
Owns Phone		
Yes	208	88.5
No	27	11.5

The women within the age grade of 26 – 35 years indicate the highest retention rates so as the women with the marital status of “Married”. Also, unemployed clients and women who own phones constitute a significant portion of the retention rates above average.

Retention in care implies the initiation, adherence, and continuum of care till the discharge or death of the client. Table 2 indicates the clinical characteristics and outcome of the clients enrolled in the ART program. The clinical outcome may be Active, Dead, LTFU, Stopped, or Transferred out.

Table 2 Clinical Characteristics related to the clients

Clinical Characteristics	Frequency	Percentage
Regimen Line at ART		
Adult. 1st.Line	234	99.6
Peds. 1st.Line	1	4
Current ART Status		
Active	95	40.4
Dead	4	1.7
LTFU	47	20
Stopped	68	28.9
Transferred Out	21	8.9

1st.Line (99.6%) while a minute (0.4%) were Peds.1stLine. The current ART status of the women included 40.4% that are active in therapy (i.e. retention rate), 1.7% are dead, 20.0% are LTFU (Loss to follow up) while 31.8% and 8.9% stopped were transferred out respectively. The average month from the start of ART to the last pick-up date was 6.2 ± 10.18 with a minimum of 6 and a maximum of 53 months. The current viral load of the pregnant women including the ones with 0 has an average of $389.3.2 \pm 1237.7$, without the 0 current viral loads, the average is 650.88 ± 1538.46 . The current age of the women is average 29.8 ± 5.6 years.

Retention rate

The study defines retention as the number of pregnant women who continue to receive treatment after 6 months. The retention rate is the number of women who are still active in treatment divided by total women. Per this study, the minimum duration for women in care is from 6 months while the maximum for any client who has stayed in 53 months. The mean duration of clients is about 6.23 ± 10.33 .

The general retention rate across the years was 40.43%, that is, for every 10 pregnant women attending the ART treatment, less than half of them (4) would remain active while the others would be either dead, stopped the treatment, lost to follow up or transferred.

As shown in Table 3, The year 2019 shows the highest number of total enrolled and also the highest retention rate between 2015 – 2019. It constituted 56.7% of the total number of clients

retained in care.

Table 3 Retention rates of pregnant women

YEAR	Total Enrolled	LTFU	Died	Stopped	Transferred	Remained
2015	3 (100%)	-	-	1 (33.33%)	1 (33.33%)	1 (33.33%)
2016	6 (100%)	2 (33.33%)	-	2 (33.33%)		2 (33.33%)
2017	25 (100%)	3 (12%)	-	10 (40%)	2 (8%)	10 (40%)
2018	74 (100%)	19 (25.68)	2 (3%)	34 (40%)	9 (12.16%)	10 (15.51%)
2019	127 (100%)	23 (18.11%)	2 (1.57%)	21 (40%)	9 (7.09%)	72 (56.69%)
All	235	47	4	68	21	95

Comparatively, regarding the total enrolled, the year 2018 indicates the highest number of LTFU, Stopped and transferred out compared to the number of women enrolled in the other years into the ART program.

Table 4 Retention rates by 6 months and 1 year

YEAR	Total Enrolled	According to Data			6Months Definition			12Months Definition		
		Not Active	Active	% Active	Not Retained	Retained	% Retained at 6months	Not Retained	Retained	% Retained at 12months
2015	3	2	1	33%	-	3	100%		3	100%
2016	6	4	2	33%	-	6	100%		6	100%
2017	25	15	10	40%	8	17	68%	11	14	56%
2018	74	64	10	14%	51	23	31%	64	10	14%
2019	127	55	72	57%	120	7	6%	127		0%
All	235	140	95	40%	179	56	24%	202	33	14%

Although no specific factors were identified to have influence retention rates across the years, Table 5 indicates that a significant decline in a seemingly stable retention rate was observed in 2018 and a sharp increase in 2019 with pregnant women between the age group of 15 -25 years constituting the highest proportion.

Table 5 Retention rate of pregnant women

Retention Rate by Age and Year	YEAR					Retention by Age
	2015	2016	2017	2018	2019	
15-25	0.00%	-	20.00%	19.05%	66.67%	43.08%
26-35	50.00%	33.33%	53.33%	8.89%	57.14%	40.69%
36-45	-	-	-	25.00%	35.29%	32.00%
Retention by Year	33.33%	33.33%	40.00%	13.51%	56.69%	40.43%

The table revealed that the overall retention rate for pregnant women enrolled in the ART program was highest in 2019 (56.7%) and lowest in 2018 (13.5%) while a stable result was observed between 2015 and 2016. However, the overall retention rate across the study period was 40.43%. In summary, Table 6 revealed that the proportion of clients not retained in care across all age group were higher than those retained. The relationship between the sociodemographic characteristics was reviewed.

Table 6 Association between retention rate and various patient characteristics

		Not Retained	Retained	Total	Pearson Chi-Square	2-Sided P
Age	15-25	37 (56.9%)	28 (43.1%)	65	0.931	0.628
	26-35	86 (59.3%)	59 (40.7%)	145		
	36 and above	17 (68.0%)	8 (32.0%)	25		
Employment	Employed	49 (59.8%)	33 (40.2%)	82	0.02	0.967
	Unemployed	91 (59.5%)	62 (40.5%)	153		
Marital Status	Married	117 (59.4%)	80 (40.6%)	197	0.017	0.896
	Not Married	23 (60.5%)	15 (39.5%)	38		
Level of Education	Non-Educated	46 (53.5%)	40 (46.5%)	86	2.086	0.149
	Educated	94 (63.1%)	55 (36.9%)	149		

The relationship between the outcome variable (retention) has no significant association with exposure variables of age, employment, marital status, and access to the facility, the asymptotic significant values were more than ($p > 0.05$). From table 7, it can be concluded that there exists a significant association between retention and year of ART start also with the ownership of mobile phones by clients ($p < 0.05$). However, education has no significant relationship with retention.

Table 7 Comparison by year and ART regimen

		Not Retained	Retained	Total	Pearson Chi-Square	2-Sided P
Year	2015	2 (66.7%)	1 (33.3%)	3	36.3999	0.000
	2016	4 (66.7%)	2 (33.3%)	6		
	2017	15 (60.0%)	10 (40.0%)	25		
	2018	64 (86.5%)	10 (13.5%)	74		
	2019	55 (43.3%)	72 (56.7%)	127		
Regimen Line at ART Start	Adult. 1st.Line	139 (59.4%)	95 (40.6%)	234	0.681	0.409
	Peds. 1st.Line	1 (100%)	0	1		

To access the factors predicting the retention in the care of clients during the lifelong ART treatment, the binary multiple logistic regression analysis was carried out. From the model summary, the exposure variables are responsible for between 23.7% (Cox and Snell R^2) and 31.9% (Nagelkerke R^2) variableness in the retention rate of the clients on the ART program.

Table 8 reveals the variable(s) which significantly influence retention rate using a multiple logistic regression. MLS exposes the highest predictor for low retention in this analysis.

Table 8 Coefficient of logistic regression with an odds ratio

	B	Sig.	Adjusted Odds Ratio	95% C.I.	
				Lower	Upper
15-25	Reference				
26-35	0.568	0.259	1.765	0.658	4.737
36 and above	0.652	0.166	1.919	0.763	4.825
Employed	Reference				
Unemployed	-0.386	0.193	0.680	0.380	1.215
Married	Reference				
Not Married	0.436	0.250	1.546	0.736	3.246
Education	Reference				
Non-Educated	0.408	0.160	1.504	0.851	2.657
Owns Phone	Reference				
Do not Own Phone	-2.594	0.001	0.075	0.017	0.336
Constant	-1.127	0.075	0.368		

a. Variable(s) entered on step 1: Age, Employment, Marital Status, Level of Education.

The outcome of the multiple logistic regression indicated phone ownership ($B=-2.461$, $p<0.05$) as a significant predictor of retention of clients. For age groups, compared to women age 15-25, the odds ratio was (0.658-4.737, $p= 0.9$), for women aged 26-35 and (0.763-4.825, $p= 0.259$) for women aged 36 and above. This shows that the age 26-35yrs and those that are 36yrs and above are almost twice as likely to be retained than those who are between the ages of 15-25yrs. For the employment characteristics, compared to the employed, the odds ratio was (0.380 – 1.215, $p= 0.193$) compared to the unemployed. The retention by marriage showed that compared to the married, the odds ratio was (0.736 – 3.246, $p= 0.250$), with the unmarried. The education characteristic, compared to the educated, odds ratio was (0.851 – 2.657, $p= 0.160$), to the non-educated. Ownership of phones showed that compared with those who owned the phone, the odds ratio was (0.658-4.737, $p= 0.259$), to those who do not own a phone.

Table 9 Model accuracy and specification

Model Summary				
N	-2 Log Likelihood	Cox & Snell R2	Nagelkerke R Square	Hosmer-Lemeshow test -chi(sig)
235	294.36	0.092	0.125	3.332(0.912)

The above table includes the pseudo-R-squared values. Nagelkerke R-square (0.125) indicates that the model is not suitable. The Cox & Snell R-squared also indicates that only 9.2 percent of the retention in care is explained by the logistic regression. The Hosmer-Lemeshow test indicating how adequately the model describes the data showed a good fit, that is, $sig>0.05$. The model adequately fits the data.

DISCUSSION

It has certainly been recognized that commitment to and retention in ART treatment is intrinsically related to the clinical outcomes. Nonetheless, the uncertainties linked to the variables related to the retention in ART has made it more complex to ascertain which particular factor has the most

impact on retention. Other studies have also indicated that the educational background or the knowledge of ARVs, socio-economic status, awareness of HIV status and acceptance, as well as the implications of inequality, all have majorly impacted on the adherence and retention in care of ART. The majority of the clients who were started on the Option B+ program have the basic knowledge of antiretroviral therapy and its importance. However, the data indicated that the women preferred to deliver their babies at home rather than at the health facilities. In this scenario, other than stigmatization which may be perceived to be a significant factor associated with this practice, there is a need to conduct further (qualitative) studies to understand the choice for the place of delivery for other pregnant women and women of childbearing age infected with HIV in the area. One of the possible ways to contract infections, especially during labour and childbirth, has also been recognized to be by the poor health practices of traditional birth attendants (TBAs). It may therefore be of vital importance to recognize the motivators that often promote non-institutionalized delivery and the conduct of unskilled workers' delivery.

Contrary to other articles, the present study did not find age to be significantly associated with retention nor as a significant predictor of retention in the ART program. The finding from the study by Muhumuza et al. (2017) and another study by Dzangare et al. (2015) all found age to be significantly connected with retention. Another study by Kiwanuka et al. (2018) on pregnant women in the ART program in Uganda found education to be a significant factor promoting the retention in care, however, the present study does not support this as the data showed education not to be a significant contribution to retention of the women on the program.

Poor adherence and care retention have many implications for public health which are detrimental to the health of the global community as a whole. Such public health implications may include increased rates of morbidity and mortality among the infected population, undesirable ART program outcome, Poor HIV program impact with increased incidence of vertical transmission. The emergence of HIV antiretroviral drug resistance strains and a poor response to therapy could be other therapeutic issues.

In addition, even with the technical support and availability of funding for the HIV program, increasing HIV-related morbidity and mortality will impact negatively on the reputation of the health industry, thus, leading to undesired outcome indicators.

The antiretroviral program is now a life-saving program as, regardless of the patient's CD4 cell count, it offers unconditional eligibility for lifetime ART initiation. As evidenced in some studies, vertical transmission has declined significantly with the scaling up of HIV programs and other related interventions in sub-Saharan Africa. However, there is uttermost need to improve and adopt comprehensive HIV interventions in countries such as Nigeria with only a 21% reduction in the rate of a new infection.

The complexities associated with the adherence and retention of pregnant women in ART tend to be complicated. That being said, since these factors vary from individual to individual as well as context to context, a lot of creative interventions, HIV program re-evaluation, and comprehensive HIV management framework will be important to improve demand creation and service uptake. The primary goal of integrated health systems is to offer comprehensive treatment or standardized care to the clients. The concept is to improve quality of care and favourable health outcomes. In addition, there is a likelihood of improved and the creation of a community free of children infected with HIV. Through the adoption of different research strategies, identifying and understanding

these complexities is critical in addressing the associated factors on retention in real-life conditions.

CONCLUSION

The importance of retaining patients in ART treatment cannot be overstated, as it directly impacts clinical outcomes. However, the factors that influence retention are complex. While previous research has pointed to factors like education, socio-economic status, HIV awareness, and acceptance, this study found mixed results. It didn't find age or education to be significant predictors of retention, which contrasts with other studies that suggest otherwise.

A key finding in this study was that although most women in the Option B+ program understood the importance of ART, many still preferred home births over delivering at health facilities. This preference may be tied to stigma, and further research is needed to explore these decisions and their impact on ART retention. Additionally, the use of traditional birth attendants, whose practices can pose health risks, may contribute to higher infection rates. It's important to explore why women choose non-institutional deliveries and how to improve the role of skilled care providers.

Poor retention in ART can have serious consequences, such as increased morbidity, the emergence of drug-resistant HIV strains, and a higher risk of HIV transmission from mother to child. Despite progress in ART programs across sub-Saharan Africa, countries like Nigeria are still facing significant challenges, with only a 21% reduction in new infections. Continued efforts are necessary to improve HIV care, especially for pregnant women, and to encourage better adherence and retention.

Given the variety of factors affecting retention, it's clear that one-size-fits-all approaches won't work. Personalized, context-driven strategies are essential. By strengthening HIV care systems, offering creative program solutions, and focusing on community engagement, we can improve retention rates and ensure better health outcomes. In doing so, we move closer to a future where HIV transmission is minimized, and retention in care is no longer a barrier to treatment success.

Ethical Consideration

Permission for the conduct of this study was granted by the Borno State Primary Health Care Development Agency (BSPHCDA) and the health facility coordinator for Gamboru Maternal and Child Health Clinic (MCH). The study was also approved by the University of Roehampton. The data collection focused on the client's case file numbers, no name was line-listed thus maintaining total patient privacy and confidentiality at all times.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

- 1.
- 2.
- 3.

References

1. Boyd, M. A., Boffito, M., Castagna, A., & Estrada, V. (2019). Rapid initiation of antiretroviral therapy at HIV diagnosis: definition, process, knowledge gaps. *HIV medicine*, 20, 3-11.
2. Coffey, S., Bacchetti, P., Sachdev, D., Bacon, O., Jones, D., Ospina-Norvell, C., ... & Gandhi, M. (2019). RAPID antiretroviral therapy: high virologic suppression rates with immediate antiretroviral therapy initiation in a vulnerable urban clinic population. *Aids*, 33(5), 825-832.
3. Dzangare Dzangare, J. et al., (2015) HIV testing uptake and retention in care of HIV-infected pregnant and breastfeeding women initiated on 'Option B+' in rural Zimbabwe. *Tropical Medicine & International Health*, 21(2), pp. 201-212.
4. Federal Ministry of Health Nigeria, (2011) *Technical Report on 2010 National HIV seroprevalence sentinel survey*, Abuja: Federal Ministry of Health.
5. Georges , Y. N., Serge , M. K., Catherine , S., Berthe , K. M. K., Thierry , K. K., Jenny , N. T., Patrick , M. T., Dubois , B. I., Lievin , K. A. K., & Claude , M. M. (2024). Determinants of Adherence to Antiretroviral Therapy in People Living with HIV, Followed up at Lubumbashi, Democratic Republic of Congo. *Asian Journal of Research in Infectious Diseases*, 15(2).
6. Kiwanuka, G., (2018) Retention of HIV-infected pregnant and breastfeeding women on option B+ in Gomba District, Uganda: a retrospective cohort study. *BMC infectious disease*, 18(1), p. 533.
7. Kumar, N., Sharma, S., Kumar, R., Tripathi, B. N., Barua, S., Ly, H., & Rouse, B. T. (2020). Host-directed antiviral therapy. *Clinical microbiology reviews*, 33(3), 10-1128.

8. Muhumuza et al., (2017) Retention in care among HIV-infected pregnant and breastfeeding women on lifelong antiretroviral therapy in Uganda: A retrospective study. *International Journal of Infectious Diseases*, 12(12), pp. 123-154.
9. Olakunde, B.O., Adeyinka, D.A., Olawepo, J.O., Pharr, J.R., Ozigbu, C.E., Wakdok, S., Oladele, T. & Ezeanolue, E.E., 2019. Towards the elimination of mother-to-child transmission of HIV in Nigeria: a health system perspective of the achievements and challenges. *International Health*, 11(4), pp.240-249. Available at: <https://doi.org/10.1093/inthealth/ihz018>
10. Rubin, L. H., & Maki, P. M. (2019). HIV, depression, and cognitive impairment in the era of effective antiretroviral therapy. *Current HIV/aids Reports*, 16, 82-95.
11. Sangwan, A., Hemal, A., Dharmaraj Patra, G., & Kumar, N. (2022). The Relationship between Drug Adherence to Antiretroviral Therapy and Viral Load in Children Living with HIV. *Asian Journal of Research in Infectious Diseases*, 9(3), 11–25.
12. Uloeme, E. C., Caleb, N. J., Nwankwo, V. C., & Nosiri, C. I. (2022). Adherence to Antiretroviral Therapy (Art) among Pregnant Women Living with HIV/AIDS in Okigwe Imo State, Nigeria. *Asian Journal of Biochemistry, Genetics and Molecular Biology*, 12(4), 60–74.
13. UNICEF Eastern and Southern Africa, 2023. Adolescent girls are six times more likely to acquire HIV than boys in Eastern and Southern Africa. UNICEF. Available at: <https://www.unicef.org/esa/press-releases/adolescent-girls-are-six-times-likely-acquire-hiv-boys-eastern-and-southern-africa> [Accessed 18 Jan. 2025]
14. UNICEF Nigeria, 2023. Almost 15% of global AIDS-related deaths in children and adolescents globally occur in Nigeria. UNICEF. Available at: <https://www.unicef.org/nigeria/press-releases/almost-15-cent-global-aids-related-deaths-children-and-adolescents-globally-occur#:~:text=130%2C000%20adolescent%20girls%20were%20newly,compared%20with%203%2C100%20adolescent%20boys>
15. UNICEF, 2023. Global and regional trends: HIV/AIDS. UNICEF Data. Available at: <https://data.unicef.org/topic/hivaids/global-regional-trends/#:~:text=Of%20the%20estimated%2040.0%20million,prevention%2C%20care%20and%20treatment%20services> [Accessed 18 Jan. 2025]