Predictors of Nonadherence to Antiretroviral Therapy Among Children Living with HIV Aged 0–14 Years at the Paediatric Complex, Bangui, Central African Republic

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ABSTRACT

Background: *In the Central African Republic (CAR), HIV prevalence was estimated at 2.4% in 2024. Antiretroviral therapy (ART) is central to HIV control; however, achieving sustained adherence in children remains difficult. This study assessed ART adherence and identified factors associated with nonadherence among children living with HIV.*

Methods: *We conducted a descriptive and analytical case–control study from January to December 2024 at the Chronic Diseases Unit of the Bangui Pediatric University Hospital. Cases were children living with HIV (0–14 years) with poor ART adherence; controls were children with good adherence. Data were collected from medical records, ART dispensing registers, program reports, and structured interviews with caregivers and/or children. Analyses were performed using Epi Info 7.2. Factors associated with nonadherence were explored using logistic regression, with results reported as odds ratios (ORs), 95% confidence intervals (CIs), and p-values.*

Results: *A total of 142 children were included (71 cases, 71 controls); mean age was 10.0 ± 3.7 years. In bivariate analysis, nonadherence was associated with caregiver relationship (self-managed treatment vs parental care; OR = 8.0; 95% CI: 1.04–70.4; p = 0.019). In multivariable analysis, nonadherence was independently associated with high viral load (OR = 27.9; 95% CI: 7.58–103.1; p < 0.001), presence of comorbidities (OR = 15.1; 95% CI: 1.79–127.3; p = 0.013), and participation in differentiated service delivery models (OR = 7.3; 95% CI: 4.06–13.13; p < 0.001).*

Conclusion: *ART nonadherence among children living with HIV in Bangui appears to be driven by clinical, organizational, and socio-behavioral factors. Integrated clinical and behavioral interventions are needed to strengthen adherence and improve outcomes.*

Keywords

HIV, Antiretroviral Therapy, Paediatric.

Introduction

HIV infection remains a major global public health challenge. In 2024, an estimated 40.8 million people were living with HIV worldwide, including approximately 1.4 million children under 14 years of age (3.4% of all cases). AIDS is responsible for about 75,000 pediatric deaths each year. Sub-Saharan Africa bears the largest burden, with an estimated 26.3 million people living with HIV [1].

The Central African Republic (CAR) is among the most affected countries in West and Central Africa, with a generalized epidemic and an estimated prevalence of 2.4% in 2024 [2]. Approximately 100,000 people live with HIV in CAR, including 8,000 children. The introduction of combination antiretroviral therapy (ART), including pediatric formulations, has substantially reduced HIV-

related morbidity and mortality [3].

Despite these gains, ART effectiveness depends on lifelong adherence, which remains particularly challenging in children aged 0–14 years, whose treatment is largely dependent on caregivers [4]. Adherence is defined as the extent to which a patient's behaviour aligns with prescribed medical recommendations [5]. Adherence is defined as the extent to which a patient's behaviors align with prescribed medical recommendations. Suboptimal adherence increases the risk of virologic failure and drug resistance. For maximal virologic efficacy, adherence rates of 95–100% are often recommended [6]. Studies from high-income settings suggest that only 70–80% of children and adolescents achieve optimal adherence, and barriers persist even where pediatric ART is widely available. These barriers include complex dosing schedules, formulation challenges, adverse effects, and caregiver-related constraints [7].

Given the clinical consequences of poor adherence and the reliance of children on caregivers for treatment, identifying determinants of nonadherence is essential for designing targeted interventions. This study therefore assessed ART adherence and examined factors associated with nonadherence among children living with HIV followed at the Pediatric University Hospital in Bangui, CAR.

Methods
Study Setting
The study was conducted at the Chronic Diseases Unit of the Paediatric University Hospital of Bangui (CHUPB), the only referral hospital and specialized paediatric HIV care center in the Central African Republic.

Study Design and Period
We conducted a descriptive, analytical case-control study from January 1 to December 31, 2024, using a 1:1 case-to-control ratio.

Study population
Children aged 0–14 years living with HIV and followed at the Chronic Diseases Unit were eligible.
- **Cases:** children with poor adherence to ART.
- **Controls:** children with good adherence to ART.

Eligibility Criteria
Inclusion criteria: Children aged 0–14 years, receiving ART for at least six months, with an identified caregiver/guardian.

Exclusion criteria: Incomplete or unusable medical records. Children aged 0–14 years, on ART for at least six months, and with a caregiver or guardian.

Sample Size and Sampling
We included 71 cases and 71 controls. Sample size was calculated using the case–control formula:
$$n \geq 2(Z\alpha + Z1-\beta)^2 \times P(1-P)/(P0-P1)^2$$

with $\alpha = 0.05$, power = 70%, OR = 2, $P_0 = 0.17$, and $P_1 = 0.30$, yielding 71 participants per group. Cases were randomly selected from the registry of nonadherent children and controls were selected from adherent children and matched by sex.

Data sources and data collection
Data were extracted from medical records, ART dispensing registers, and activity reports, and supplemented by structured interviews with caregivers and/or children. A standardized questionnaire captured sociodemographic variables, clinical characteristics, ART regimen, viral load status, comorbidities, and differentiated service delivery model.

Statistical analysis
Data were coded and entered into Epi Info 7.2. Descriptive analyses used frequencies, percentages, and means ± standard deviation. Categorical variables were compared using Pearson's chi-square test or Fisher's exact test as appropriate. Logistic regression was used to identify factors independently associated with nonadherence. Associations are presented as ORs with 95% CIs; $p < 0.05$ was considered statistically significant.

Results
A total of 142 children living with HIV were included: 71 cases (nonadherent) and 71 controls (adherent). The most represented age group in both arms was 10–14 years, and the mean age was 10.0 ± 3.7 years. The male-to-female ratio was 1.4 among cases and 1.2 among controls.

Table 1: Distribution of children living with HIV according to sociodemographic characteristics.

	Cases		Controls	
	n	%	n	%
School attendance				
Preschool	0	0	1	1.41
Attending school	64	90.14	47	66.20
Dropped out of school	0	0	11	15.49
Never attended school	7	9.86	12	16.90
Academic performance				
Good	56	78.87	45	63.38
Poor	8	11.27	13	18.31
Not attending school	7	9.86	13	18.31
Relationship with caregiver				
Parents	63	88.73	59	83.10
Self	1	1.41	8	11.27
Foster care/home	7	9.86	4	5.63
Place of residence				
Bangui	67	94.37	68	95.77
Province	4	5.63	3	4.23
Social status				
Paternal orphan	18	25.35	15	45.45
Maternal orphan	17	21.13	13	18.31
Double orphan	5	7.04	12	16.90
None orphan	31	43.66	31	43.66

Most children were enrolled in school (90.1% of cases and 66.2% of controls), and good academic performance was reported for

78.9% of cases and 63.4% of controls. The majority of children were cared for by their parents (88.7% of cases and 83.1% of controls) and lived in Bangui (94.4% of cases and 95.8% of controls). Foster care or living with a family member was reported for 9.9% of cases and 5.6% of controls.

Table 2: Distribution of parents' HIV serological status.

Variables		Cases		Control		Total
		n	%	n	%	
Father's HIV status	positive	16	22,54	23	32,39	39
	negative	0	0,00	0	0,00	0
	Unknown	55	77,46	48	67,61	103
Father on ART	Yes	14	19,72	18	25,35	32
	No	5	7,04	4	5,63	9
	Unknown	52	73,24	49	69,01	101
Mother's HIV status	Yes	49	69,01	53	74,65	102
	No	0	0,00	0	0,00	0
	Unknown	22	30,99	18	25,35	40
Mother on ART	Yes	48	67,61	49	69,01	97
	No	1	1,41	3	4,23	4
	Unknown	22	30,99	19	26,76	41
Viral load	Detectable	62	87,32	18	25,35	125
	undetectable	9	12,68	53	74,65	62
Associated conditions	Yes	69	97,18	63	88,73	132
	No	2	2,82	8	11,27	10
Type of non-adherence	Missed dose	43	60,56	0	0,00	43
	Delayed dose	22	30,99	0	0,00	22
	Not following schedule	6	8,45	0	0,00	6

Parental HIV status was frequently undocumented, particularly among fathers. Viral load was detectable in 87.3% of cases compared with 25.4% of controls. Comorbidities were recorded in 2.8% of cases and 11.3% of controls.

Table 3: Distribution of patients living with HIV according to treatment modalities and patient outcomes.

Variables	Cases		Controls	
	n	%	n	%
Antiretroviral regimen				
ABC_3TC_DTG	56	78,87	55	77,46
AZT_3TC_DTG	5	7,04	5	7,04
TDF_3TC_DTG	10	14,08	11	15,49
Differentiated service delivery model				
Antiretroviral refill every 1 months (R1M)	52	73,24	14	19,72
Antiretroviral refill every 2 months (R2M)	18	25,35	10	14,08
Antiretroviral refill every 3 months (R3M)	1	1,41	47	66,20
Circumstances of HIV diagnosis				
Index case testing	5	7,04	0	0,00
Provider-Initiated Counselling and Testing (PICT)	18	25,35	10	14,08
Diagnosis based on opportunistic infection symptoms	48	67,61	61	85,92
Patient death				
No	67	94,37	70	98,59
Yes	4	5,63	1	1,41

The first-line regimen ABC/3TC/DTG was the most prescribed regimen in both groups. Differentiated service delivery differed between groups: monthly ART refills (R1M) were predominant among cases, whereas three-month refills (R3M) were more common among controls. Mortality was higher among cases (5.6%) than among controls (1.4%).

Table 4: Factors associated with non-adherence to antiretroviral therapy.

	Cases	Controls	OR	95% IC	P-Value
Place of residence					
Bangui	67	68	Reference		
Province	4	3	0,74	0,16 - 3,43	0,069
Academic performance					
Poor	56	45	Reference		
Good	8	13	2	0,77 - 5,30	0,147
Not attending school	7	13	1,14	0,32 - 4,08	0,837
Relationship with caregiver					
Parents	63	59	Reference		
Self	1	8	8	1,04 - 70,4	**< 0,019**
Foster home (family member)	7	4	1,98	0,74 - 5,31	0,167
Viral load status					
Detectable	62	18	Reference		
Undetectable	9	53	20	8,41 - 48,91	**< 0,000**
Associated conditions					
Yes	2	8	Reference		
No	69	63	0,23	0,05 - 1,11	**0,049**
Differentiated service delivery model					
R1M	52	14	Reference		
R2M	18	10	2,06	0,78 - 5,46	0,140
R3M	1	47	174	22 - 379	**< 0,000**
Social status					
Paternal orphan	28	15	Reference		
Maternal orphan	19	12	1,17	0,45 - 3,06	0,736
Double orphan	21	16	1,21	0,45 - 3,19	0,705
Non-orphan	55	28	0,67	0,30 - 1,47	0,318

In bivariate analysis, self-management of ART (vs parental care) was associated with higher odds of nonadherence (OR = 8.0; p = 0.019). Comorbidities were also associated with nonadherence (P = 0.049). Viral load suppression was strongly associated with adherence. Differentiated service delivery model was associated with nonadherence.

Other factors, including place of residence (province vs. Bangui, OR = 0.74; p = 0.069), academic performance, R2M model, and social status, were not significantly associated with non-adherence.

Table 5: Determinants of non-adherence to medical follow-up among paediatric HIV patients by logistic regression.

	OR ajusted	95% IC	P-Value
Residence	0,79	0,16 - 3,96	0,7745
Academic performance	1,55	0,81 - 2,96	0,1837
Caregiver	1,00	0,47 - 2,14	0,9965
Viral load performed	**27,9**	**7,58 - 103,1**	**0,0000**
Associated conditions	**15,1**	**1,79 - 127,3**	**0,0126**
Differentiated service delivery model	**7,30**	**4,06 - 13,13**	**0,0000**
Social status	1,09	0,75 - 1,59	0,6584

In multivariable analysis, nonadherence remained independently associated with the viral load variable (adjusted OR = 27.9; 95% CI: 7.58–103.1; p < 0.001), presence of comorbidities (adjusted OR = 15.1; 95% CI: 1.79–127.3; p = 0.013), and differentiated service delivery model (adjusted OR = 7.30; 95% CI: 4.06–13.13; p < 0.001). Other factors including residence, academic performance, caregiver category, and social status were not independently associated with nonadherence.

Discussion

This study evaluated factors associated with nonadherence to antiretroviral therapy (ART) among 142 children living with HIV in Bangui. Children aged 10–14 years were most affected, with a slightly higher proportion of boys among non-adherent cases. These findings are consistent with reports from Mali [8] and Ethiopia [9,10], which identified older children and adolescents as at higher risk of non-adherence.

Parental or caregiver involvement was crucial: children under parental care were more likely to adhere to ART. This highlights the importance of caregiver engagement, consistent with findings from Ethiopia [9,10]. Urban residence predominated, reflecting the study setting and healthcare access limitations for children outside the capital.

Detectable viral load was strongly associated with non-adherence, confirming the critical link between adherence and virological suppression [9,11]. Comorbidities also increased the risk of poor adherence, underscoring the need for integrated clinical management. Differentiated care models influenced adherence: monthly appointment models (R1M) were associated with higher non-adherence, while multi-month models (R3M) supported adherence, echoing literature on patient-centered care approaches [10].

Qualitative findings revealed additional barriers: non-disclosure of HIV status, transportation difficulties, caregiver unavailability, and reliance on traditional medicine. These socio-behavioural factors highlight the need for comprehensive interventions beyond clinical management.

Conclusion

Non-adherence to ART among children living with HIV in Bangui is influenced by clinical factors (viral load, comorbidities) and organizational factors (care models), compounded by socio-behavioural barriers. An integrated approach combining enhanced clinical follow-up, tailored care models, and interventions targeting contextual and behavioural barriers is essential to improve adherence and optimize health outcomes for children living with HIV.

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