

Research Article

# Associated Factors with Non-retention of People Living with HIV in the Antiretroviral Treatment Program at the Donka National Hospital, Conakry: A Five-year Retrospective Cohort Study (2018 - 2023)

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## Abstract

**Background:** This study assesses the retention rate of patients living with HIV in the antiretroviral treatment (ART) program at Donka the National Hospital, Guinea, and identifies predictors of non-retention. **Methods:** Conducted as a retrospective cohort study from May 2018 to March 2023, it involved 4,169 HIV-positive patients aged 10 and older, who had been on antiretroviral treatment program for at least six months. Retention rates were estimated using Kaplan-Meier techniques, and multivariate Cox regression identified factors associated with non-retention. **Results:** Results showed a cumulative retention rate of 68.88%, declining over time: 91.3% at six months, 74.1% at 24 months, and 53.1% at 60 months. The study identified significant predictors of non-retention, including low CD4 counts (<100 cells/mm<sup>3</sup>: adjusted HR 2.158; 100-200 cells/mm<sup>3</sup>: adjusted HR 1.729), advanced HIV stages (III/IV) at treatment initiation (adjusted HR 1.335), and the use of "AZT + 3TC + NVP" regimen (adjusted HR 1.443). Most participants were women (66.2%) with a median age of 37 years, and a majority were unemployed (57.8%). **Conclusion:** The findings highlight a retention rate below the national target of 90%, with late treatment initiation and low CD4 counts as major barriers. The study calls for further qualitative and quantitative research to understand patient loss to follow-up and improve ART program retention and HIV care in Guinea.

## Keywords

Antiretroviral Treatment, HIV/AIDS, Retention, Factors Associated, Conakry

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## 1. Introduction

Since the discovery of its pathogen, the human immunodeficiency virus (HIV) in 1983, the acquired immunodeficiency syndrome (AIDS) epidemic has remained a major public health issue [1, 2]. According to recent estimates from the Joint United Nations Programme on HIV/AIDS (UNAIDS), 39.9 million people worldwide were living with HIV in 2023, and 1.3 million new infections were recorded that same year. The same estimates reveal that 630,000 people died from AIDS-related illnesses in 2023. It is important to note that a total of 88.4 million people have been infected with HIV, and 42.3 million have died since the start of the epidemic [3].

However, the numerous efforts made in improving access to antiretroviral therapy (ART) have substantially transformed the course of the HIV/AIDS epidemic, which is now considered a chronic disease [2]. As of December 2023, 30.7 million people living with HIV had access to ART globally [3]. Thanks to this progress, AIDS-related deaths have decreased by 69% since their peak in 2004 and by 51% since 2010 [3].

Despite this progress, retaining patients living with HIV on antiretroviral therapy remains a major challenge, especially in resource-limited settings. Yet, it is well-established that good patient retention in treatment programs is essential to achieve sustainable viral suppression, which is crucial for therapeutic success. This not only reduces the risk of HIV transmission, but also decreases morbidity (e.g., by limiting opportunistic infections) and mortality due to AIDS-related illnesses [4-6].

A 2010 meta-analysis of 33 studies involving 39 cohorts and a total of 226,307 patients in sub-Saharan Africa highlights a gradual decline in the retention rate of patients on antiretroviral therapy. This rate decreases from 86.1% at 6 months to 80.2% at 12 months, 76.8% at 24 months, and finally 72.3% at 36 months. After adjustment for the duration of follow-up, retention at 24 months stands at 70.0%, while it is 64.6% at 36 months [7].

Various factors influence the retention of patients living with HIV in antiretroviral therapy programs. A 2014 systematic review of studies conducted in sub-Saharan Africa found lower retention rates among individuals over 25 years of age, those with low CD4 counts, high body mass index, or co-infection with tuberculosis [8]. Another systematic review, published in 2016, identified several predictors of non-retention among patients living with HIV in sub-Saharan Africa: the year of antiretroviral therapy initiation, weight loss of 10% or more, a decrease in total lymphocyte count, the presence of chronic diarrhea, male gender, age 28 years or younger, and lack of a partner [9].

In Guinea, a study conducted on a cohort of patients revealed that 55.9% experienced at least one episode of treatment interruption between 2018 and 2020. The cumulative probability of remaining in medical care six months after initiating treatment was 65.9%, decreasing to 48.7% at 12

months and 34.1% at 24 months [10]. Another study, carried out across nine care sites in Conakry over 13 years (2007-2020), highlighted a cumulative retention probability of 76.2% at 12 months and 70.2% at 24 months. This study identified factors associated with non-retention, including starting treatment between 2012 and 2015, being single, having an initial CD4 count below 100 cells/ $\mu$ L, and initiating treatment at an advanced clinical stage [11].

These findings underscore that retaining patients living with HIV on antiretroviral therapy remains a significant challenge in Guinea, potentially jeopardizing the global 2025 targets (the “three 95s”): 95% of people living with HIV knowing their status, 95% of diagnosed individuals receiving treatment, and 95% of those on treatment achieving viral suppression. Achieving these targets is crucial for eliminating HIV/AIDS as a public health threat by 2030 [12].

Ensuring optimal patient retention in treatment programs is essential to meet the third “95” target: that 95% of patients on antiretroviral therapy achieve viral suppression [12]. Therefore, regular evaluations of patient retention are critical to track progress toward these goals and to adapt interventions aimed at enhancing adherence to ART programs.

Within its strategic framework for eliminating AIDS, Guinea has committed to achieving a 95% retention rate for patients living with HIV, measured 12 months after the initiation of antiretroviral therapy [13]. This study aims to estimate the retention rate of patients living with HIV within the antiretroviral therapy program at the HIV care units of Donka National Hospital and to identify factors associated with non-retention.

## 2. Methods

### 2.1. Study Type and Duration

This was a retrospective cohort study conducted over a 5-year period among patients living with HIV who were being monitored in the HIV care units of Donka National Hospital in Conakry.

### 2.2. Study Setting

#### 2.2.1. General Setting

Located in West Africa, Guinea shares borders with several countries and features diverse topography. In 2014, its population was estimated at approximately 11.7 million people. Despite significant natural wealth, particularly in mining resources such as bauxite, the country faces persistent socio-economic challenges, with a national poverty rate that stands at 43.7% according to the World Bank. Key sectors of the economy include agriculture, livestock, hydroelectric power, fishing, and mining [14].

Guinea's healthcare system faces numerous challenges, including a high burden of infectious diseases, access to essential medicines, and the proliferation of illicit distribution networks. The health crisis triggered by the Ebola epidemic exposed profound weaknesses in the country's healthcare infrastructure, underscoring the urgent need for its strengthening.

To address this situation, the Ministry of Health of Guinea included strategic priorities in its 2015-2024 National Health Development Plan, focusing on disease prevention (HIV/AIDS, tuberculosis, malaria, etc.), strengthening vaccination coverage, and promoting maternal and child health [14].

### 2.2.2. Specific Context

Donka National Hospital, located in Conakry, is the largest healthcare facility in Guinea and the primary referral center for HIV care. It houses four key departments involved in the diagnosis, treatment, monitoring, and follow-up of people living with HIV: the departments of infectious diseases, internal medicine, pediatrics, and the day hospital. The facility also includes a resolute unit for managing advanced HIV cases.

The HIV care units at Donka National Hospital follow a protocol based on the national guidelines of the Ministry of Health. According to this protocol, all patients diagnosed with HIV must receive antiretroviral therapy, regardless of their immune status. Fixed-dose combinations are prioritized to enhance adherence and reduce costs for the healthcare system. However, a considerable proportion of patients are on second- or third-line antiretroviral therapy, highlighting challenges related to treatment failure and the management of complex cases [15].

## 2.3. Study Population

This study included all patients aged 10 years and older who were diagnosed with HIV and started ART between May 1, 2018, and March 31, 2023. Participants were required to have been on treatment for at least six months prior to data collection, with a well-documented treatment initiation date. Patients for whom the dates required to calculate the follow-up time were unavailable were excluded from the analysis.

This study included all patients aged 10 years and older who were diagnosed with HIV and started antiretroviral treatment (ART) between May 1, 2018, and March 31, 2023. Participants were required to have been on antiretroviral therapy for at least six months before the data collection date, with a clearly documented treatment initiation date. Patients for whom the dates required to calculate the follow-up time were unavailable were excluded from the analysis.

## 2.4. Sample Size and Sampling Technique

We conducted an exhaustive sampling of patients who be-

gan ART during the study period. Data from patient monitoring databases were exported to Excel for cleaning and processing. After applying the inclusion criteria, our final sample consisted of 4,169 patients.

## 2.5. Study Variables

### 2.5.1. Dependent Variable

The dependent variable in this study was non-retention in the ART program. To estimate the rate of non-retention, patients who experienced the event of interest during the study period were classified as "non-retained" in the ART program, while those who did not experience the event were classified as "retained."

A patient was considered "non-retained" if they were lost to follow-up, deceased, or had discontinued ART. A patient was classified as "lost to follow-up" if she/he did not attend the treatment site for at least 90 days (3 months) after the date of their last scheduled visit to collect antiretrovirals, with no available information about their health status before the data extraction date. For these patients, the date of the last clinical visit was recorded as the event date. A death was confirmed if the information was documented in the patient monitoring database, based on reports from healthcare providers (for hospital deaths), family members, or follow-up agents (for community deaths). The date of death was recorded as the event date; in the absence of this information, the date of the last visit to the healthcare center was used. A patient was considered to have discontinued treatment if they were known to be alive by the site's staff but had stopped ART at the site and had not resumed treatment at another facility. The date of the last visit was recorded as the date of treatment discontinuation.

Conversely, a patient was classified as "retained" in the program if they had been officially transferred to another site or remained under follow-up and on ART at the end of the study period, i.e., on the data extraction date. Any patient referred to another ART-providing center before this date was considered transferred and censored on the date of transfer.

### 2.5.2. Independent Variables

Independent variables included sociodemographic characteristics (age, sex, marital status, education level, occupation), clinical data, and biological information (HIV type, clinical stage of infection based on WHO criteria, body mass index, tuberculosis co-infection, CD4 count, viral load).

## 2.6. Data Analysis

Data were analyzed using SPSS software version 21. For descriptive analysis, categorical variables were summarized as proportions with confidence intervals, while continuous variables were presented as medians with interquartile ranges.

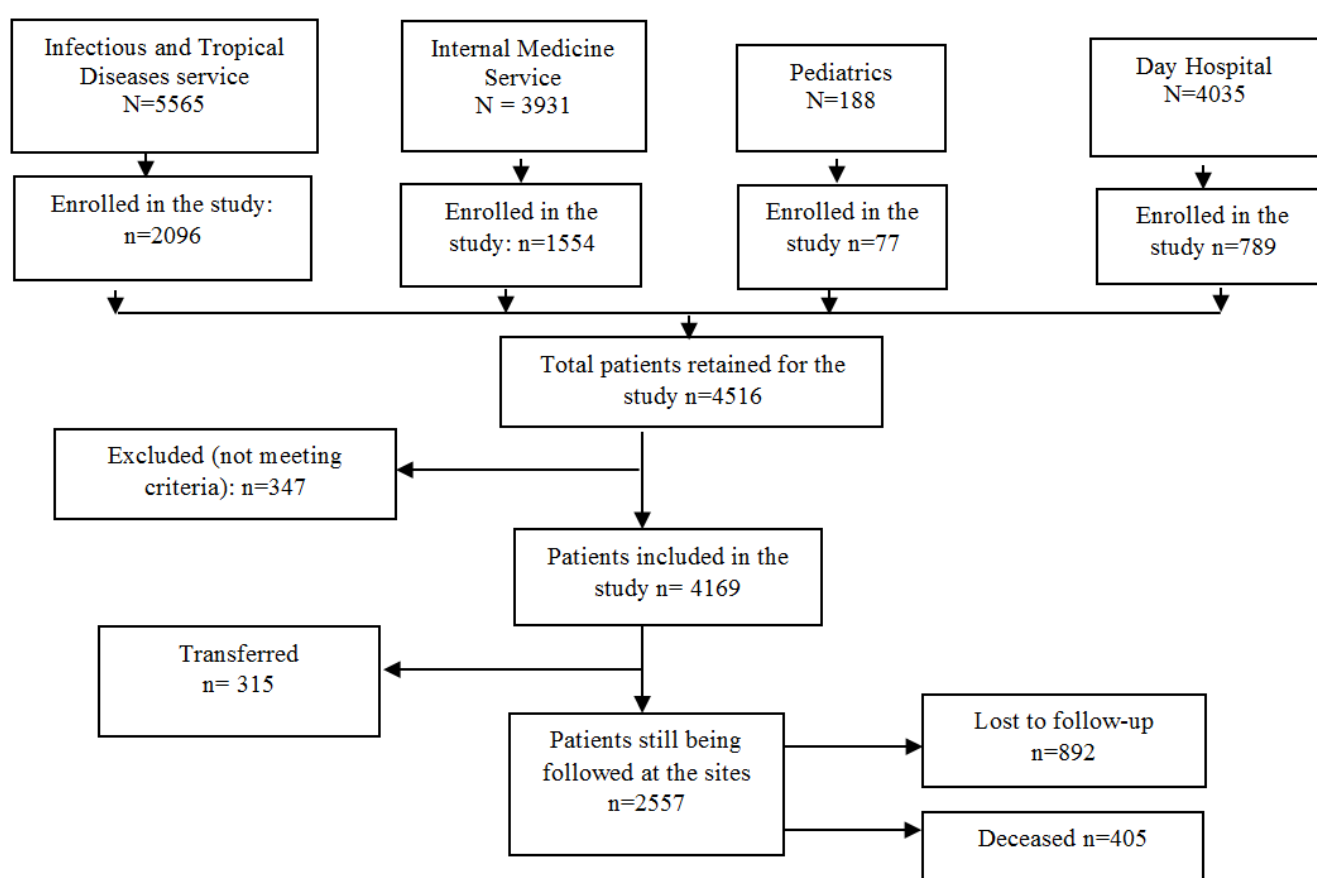
Kaplan-Meier techniques (survival tables and Kaplan-Meier curves) were used to estimate the probability of patient retention in the program over the follow-up period, and the Mantel-Haenszel log-rank test was employed to compare survival curves.

Predictors of non-retention were identified using a multi-variable Cox proportional hazards model, which estimated adjusted hazard ratios (aHR) with 95% confidence intervals for each including predictor. During the multivariable regression process, a stepwise backward elimination method based on maximum likelihood was used, checking for and controlling confounding factors at each stage of the analysis. Results were considered statistically significant at a  $p$ -value  $\leq 0.05$ .

### 3. Results

#### 3.1. Patient Flow in the Study

At the start of the study, there was a cohort of 13,719 individuals living with HIV and receiving ART in the four specialized departments of Donka National Hospital. Of these, 4,516 patients were selected for the study. After applying inclusion and exclusion criteria, 347 patients were excluded, resulting in a final sample size of 4,169 patients. Among them, 2,557 continued follow-ups at their original sites, while 315 were officially transferred to other facilities to continue treatment. By the end of the study, 892 patients were classified as lost to follow-up, and 405 were reported deceased (Figure 1).



**Figure 1.** Flowchart of patients selected for the retention study in the antiretroviral treatment program at the Donka National Hospital (2018-2023), Conakry, Guinea.

#### 3.2. General Characteristics of the Attended

Most participants in this study were women (66.2%), with a median age of 37 years (interquartile range: 30 - 46 years). The most common age group was 25-34 years (33.5%), followed by 35-44 years (30.7%). In terms of marital status, majority (76.8%) of the patients were married or living in a common-law relationship. Regarding occupational activity,

the largest group of patients (57.8%) were unemployed.

The serological profile of patients was overwhelmingly (99.2%) people living with HIV type 1. Among the 4,169 patients included, 1,651 (39.6%) had started treatment at an advanced stage of the disease (clinical stages 3 and 4). Furthermore, a significant proportion of patients (42.5%) had a CD4 count of less than 100 cells/mm<sup>3</sup> at the start of treatment.

Regarding treatment, most patients (77.9%) were following a regimen based on TDF + 3TC + EFV. It is also important to

note that significant differences were observed between the characteristics of patients enrolled in the ART program and those who were not. These differences included marital status,

CD4 count at the initiation of treatment, the clinical stage of HIV at the time treatment began, and the chosen therapeutic regimen (Table 1).

**Table 1.** Socio-demographic, clinical, and biological characteristics of the 4169 patients included in the study based on retention in the antiretroviral treatment program at the DonKa National Hospital (2018 - 2023), Conakry, Guinea.

Variables	Number	Percentage	Retained in the antiretroviral treatment program		p-value	
			Yes n (%)	No n (%)		
Age						
Under 15 years old	12	0.3	9 (75.0)	3 (25.0)	0.28	
15-24 years old	351	8.4	216 (61.5)	135 (38.46)		
25 - 34 years old	1395	33.5	962 (69.0)	433 (31.04)		
35 - 44 years old	1278	30.7	891 (69.7)	387 (30.28)		
45 - 54 years old	736	17.7	516 (70.1)	220 (29.89)		
≥55 years old	397	9.6	278 (70.0)	119 (29.97)	0.68	
Patient Gender						
Women	2758	66.2	2020 (73.24)	738 (30.7)		
Man	1411	33.8	1009 (71.51)	402 (31.4)		
Marital Status						
Married/free union	3200	76.8	1981 (69.9)	1219 (38.09)	0.05	
Unmarried	969	23.2	564 (66.4)	405 (41.80)		
Profession/occupation						
Employee	1761	42.2	1071 (67.8)	690 (39.18)	0.16	
Unemployed	2408	57.8	1474 (61.21)	934 (38.79)		
HIV type						
HIV type 1	4137	99.2	2524 (69.0)	1613 (38.99)	0.69	
HIV (2 or 1 & 2)	32	0.8	21 (72.4)	11 (34.38)		
CD4 count (cells/mm <sup>3</sup> )						
> 350	1455	17	1382 (95.4)	73 (5.02)	< 0.001	
200 - 350	858	15.6	773 (90.1)	85 (9.91)		
100 - 200	89	24.9	13 (15.0)	76 (85.39)		
< 100	1764	42.5	247 (14.0)	1517 (86.00)		
HIV stage						
Early stage (I & II)	2518	60.4	1944 (88.5)	574 (22.80)	< 0.001	
Advanced stage (III & IV)	1651	39.6	601 (40.4)	1050 (63.60)		
Antiretroviral treatment regimen						
TDF + 3TC + EFV	3247	77.9	1990 (70.9)	1257 (38.71)	< 0.001	
AZT + 3TC + NVP	410	9.8	212 (53.7)	198 (48.29)		
Other antiretroviral treatment regimens	512	12.3	343 (71.0)	(33.01)		

### 3.3. Estimation of Retention Rate in the Antiretroviral Treatment Program

At the end of the study, the cumulative retention rate was 68.88% (confidence interval: 62.33% - 73.41%). The results highlighted a gradual and significant decrease in the cumula-

tive probability of retention in the antiretroviral treatment program over time. This probability was estimated at 91.3% at 6 months, 81.2% at 12 months, 74.1% at 24 months, 69.3% at 36 months, 64.8% at 48 months, and only 53.1% at 60 months (Table 1).

**Table 2.** Probability of retention over time of the 4169 patients enrolled in the antiretroviral treatment program at Donka National Hospital (2018 - 2023), Conakry, Guinea.

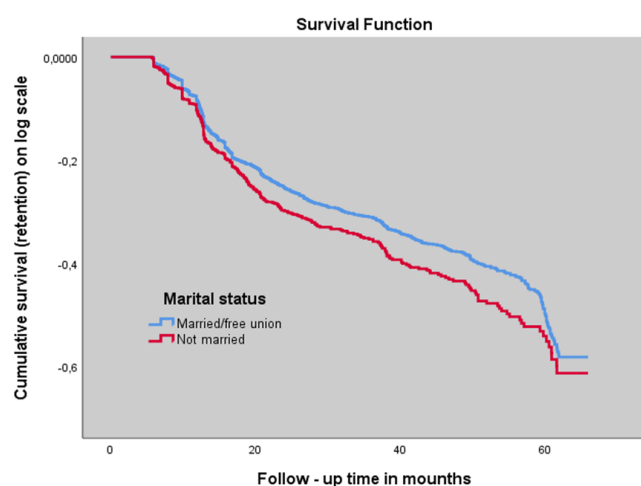
Follow-up duration in months	Range of number of entrants	Number of leavers during the period	Number of people exposed to risk	Cumulative retention proportion (%)	95% CI
0	4169	0	4169	-	-
6	4112	104	4060	91.3	90.9 - 91.8
12	3708	172	3622	81.2	80.5 - 81.8
18	3132	242	3011	76.8	76.1 - 77.4
24	2727	235	2610	74.1	73.4 - 74.8
30	2401	300	2251	72.5	71.8 - 73.2
36	2053	300	1903	69.3	68.5 - 70.1
42	1669	365	1487	67.5	66.7 - 68.3
48	1266	380	1076	64.8	64.0 - 65.7
54	843	391	648	60.6	59.6 - 61.7
60	410	383	219	53.1	- 54.8

### 3.4. Comparison of Survival (Retention) Curves for Variables

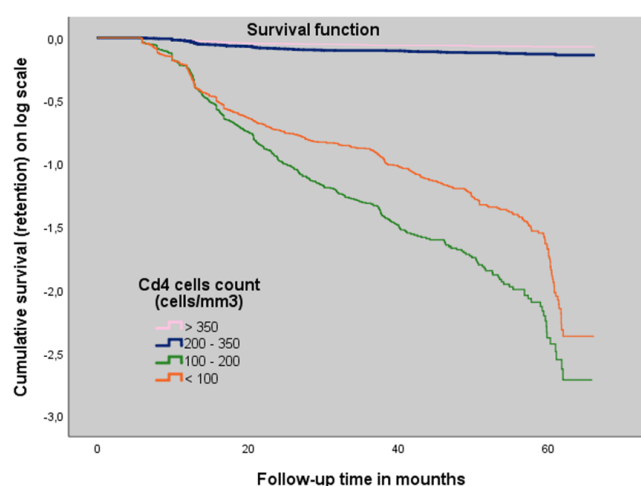
Figure 2 illustrates the variations in survival (or retention) curves for patients based on the different variables studied. Regarding marital status, the curve for unmarried patients is significantly lower than that for married patients, indicating better retention among the latter. For the CD4 count, patients who started their antiretroviral treatment with a high CD4 count (greater than 350 cells/mm<sup>3</sup> or between 200 and

350 cells/mm<sup>3</sup>) show significantly higher survival curves than those who started treatment with low CD4 counts (below 100 cells/mm<sup>3</sup> or between 100 and 200 cells/mm<sup>3</sup>). This suggests that retention is better among patients who began treatment with a higher CD4 count. A similar observation is made for patients who initiated antiretroviral therapy at an early stage of infection, where retention rates are also higher. Finally, the log-rank test, used to compare the different survival curves, confirms that the variations observed between these curves are statistically significant (log-rank  $\leq 0.05$ ).

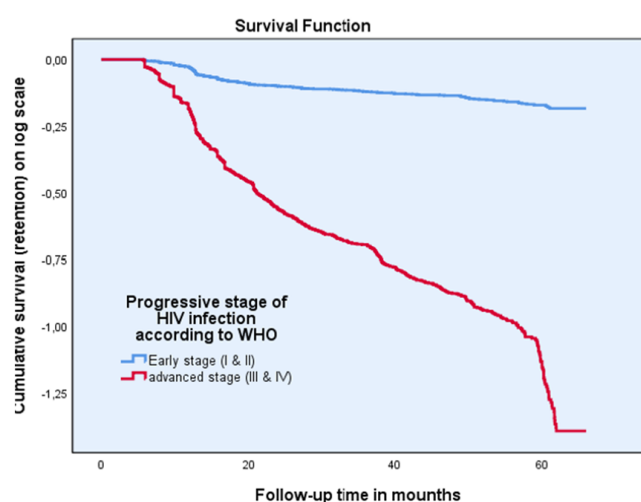




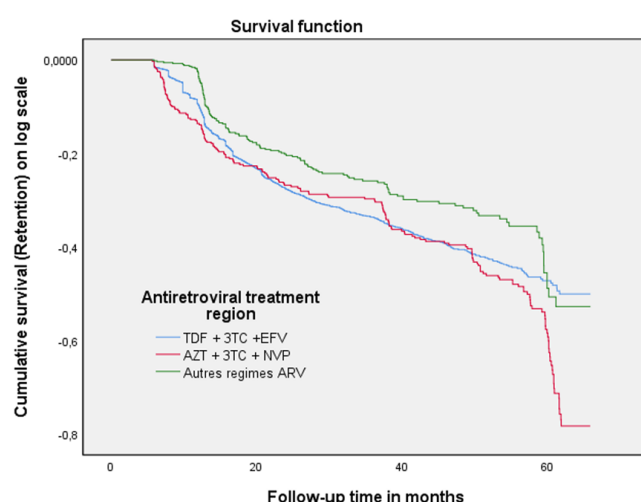
A. Survival curve (retention) as a function of marital status



B. Survival curve (retention) as a function of CD4 cells count



C. Survival curve (retention) as a function of progressive stage of HIV infection



D. Survival curve (retention) as a function of antiretroviral treatment regimen

**Figure 2.** Retention curve based on marital status, CD4 count, stage of HIV infection, and antiretroviral treatment regimen of patients living with HIV followed in the antiretroviral treatment program at Donka National Hospital (2018 - 2023), Conakry, Guinea.

### 3.5. Predictors of Non-retention

The results of the multivariate analysis using Cox regression reveal that several factors are strongly associated with non-retention of patients living with HIV in the treatment program at the National Donka Hospital. Among these factors, a CD4 count lower than 100 cells/mm<sup>3</sup> (adjusted HR: 2.158; 95% CI: 1.834 - 2.539) at the initiation of antiretroviral therapy compared to a CD4 count  $\geq$  300, a CD4 count be-

tween 100 and 200 cells/mm<sup>3</sup> at the initiation of antiretroviral therapy (adjusted HR: 1.729; 95% CI: 1.459 - 2.047) compared to a CD4 count  $\geq$  300, an advanced stage of HIV infection (stages III and IV) at the start of treatment (adjusted HR: 1.335; 95% CI: 1.291 - 1.612) compared to the early stage, and the use of the antiretroviral regimen "AZT + 3TC + NVP" (adjusted HR: 1.443; 95% CI: 1.291 - 1.612) compared to other regimens have been identified as major predictors of non-retention (Table 3).

**Table 3.** Multivariate Cox regression analysis of predictive factors for non-retention of HIV-positive patients in the antiretroviral treatment program at Donka National Hospital (2018-2023), Conakry, Guinea.

Variables	HR adjusted	95% CI	p-value
CD4 count (cells/mm <sup>3</sup> )			

Variables	HR adjusted	95% CI	p-value
> 350	1		
200 - 350	0.985	0.763 - 1.272	0.907
100 - 200	1.729	1.459 - 2.047	<0.001
< 100	2.158	1.834 - 2.539	<0.001
HIV stage			
Early stage (I & II)	1		
Advanced stage (III & IV)	1.335	1.188 - 1.500	<0.001
ARV regimen			
TDF + 3TC + EFV	0.458	0.390 - 0.548	<0.001
AZT + 3TC + NVP	1.443	1.291 - 1.612	<0.001
Other antiretroviral treatment regimens	1		

## 4. Discussion

In recent years, antiretroviral therapy (ART) has marked a decisive turning point in the fight against HIV, transforming what was once perceived as an acute illness into a chronic condition with which people can live for many years. This progress is attributed to the significant reduction in the risk of mortality related to opportunistic diseases associated with AIDS, and in the transmission of HIV between individuals. However, insufficient retention of people living with HIV in ART programs remain a major challenge, especially in resource-limited countries like Guinea. This issue undermines the gains made by increasing the risk of treatment failure and HIV-related mortality. It is therefore crucial to regularly assess patient retention in these programs to identify gaps and readjust intervention strategies to improve outcomes. This study aimed to evaluate the retention rate of patients in the antiretroviral treatment program at Donka National Hospital and identify the key predictors of non-retention. To this end, a retrospective cohort study was conducted over a five-year period (from May 1, 2018, to March 31, 2023) among people living with HIV followed in this program.

The study aimed to evaluate the retention rate of patients in the antiretroviral treatment program (ART) and identify factors associated with non-retention among people living with HIV followed at Donka National Hospital in Conakry. At the end of the study, the cumulative retention incidence was 68.88%, corresponding to a non-retention rate of 31.12%.

Multivariate analysis revealed that several independent predictive factors were associated with non-retention. These included: initiation of antiretroviral treatment with a low CD4 count ( $< 100$  cells/mm<sup>3</sup> and between 100 and 200 cells/mm<sup>3</sup>), starting treatment at an advanced stage of infection (stages III and IV), and the use of the "AZT + 3TC + NVP" regimen at

the start of treatment. These factors were identified as key influences on patient retention in the antiretroviral program for individuals aged 10 years and older, living with HIV, at Donka National Hospital.

The overall incidence rate of non-retention in this study was 31.12%, which corresponds to a retention rate of 68.88%. Our results are like those reported by Muwanguzi et al. from Uganda, who found a non-retention incidence rate of 34.30% [16]. Another study conducted in Mozambique by Molfino et al. showed a non-retention rate of 28.70% [17]. This difference in non-retention rates between studies may be explained by the differences in the characteristics of the populations included in the studies. For instance, the Muwanguzi study focused on young people aged 12 to 24 years [16], while the Molfino study included patients living with HIV of all ages [17]. However, it should be noted that the retention rate found in this study is below the national target in Guinea, which is 90% [18].

In this study, we observed a progressive decline in the cumulative incidence of HIV-positive patients lost to follow-up each year after the initiation of antiretroviral treatment. Specifically, the cumulative retention incidence rate decreased from 91.3% at 6 months to 53.1% at 60 months (5 years).

Our findings are the same as those of Mekuria et al. in Addis Ababa, Ethiopia, in 2015, who also reported long-term retention issues among patients on ART. According to their study, the cumulative probability of retention at 12, 24, and 36 months after starting ART was 85.97%, 82.70%, and 79.04%, respectively [6]. Molfino et al. also reported retention probabilities at 12, 24, 36, and 48 months after ART initiation in a cohort of 1,657 patients followed at the inter-mediate referral center in Maputo, Mozambique. These were 63.00%, 55.00%, 53.00%, and 52.00%, respectively [18]. In Côte d'Ivoire, Vuylsteke et al. found retention probabilities of 68% at 12



months, 55% at 24 months, and 47% at 36 months [16]. This demonstrates that there is still work to be done to improve retention in ART programs. This could involve strengthening patient traceability in follow-up, establishing and operating community antiretroviral distribution centers for stable patients, organizing home visits, and providing food and nutritional support to people infected and affected by HIV.

In this study, the total number of patients lost to follow-up was 1,297 out of 4,169. These lost patients were primarily due to being lost to follow-up (892/4169, or 21.40%) and deaths (405/4169, or 9.71%). When considering the total number of lost patients, 68.77% were lost to follow-up, and 31.23% had died.

The high number of patients considered lost to follow-up in our study's antiretroviral treatment program may be explained by several factors. One possibility is silent transfers due to weak patient traceability systems. Therefore, patients on ART may be considered lost to follow-up at Donka National Hospital, even though they continue taking ART elsewhere, leading to inaccurate estimates of lost patients in the program. In this regard, Tweya et al. found in a Malawian cohort that 21% of patients considered lost to follow-up at their original sites were obtaining treatment from other sites [18]. Brinkhoff et al. also reported in their study (meta-analysis) that silent transfers to other treatment sites were the main reason for patients not returning to their original treatment site [17].

Additionally, patients in our study on antiretroviral treatment may also be lost to follow-up due to financial barriers, including the lack of free biological tests (chemistry, hematology, etc.), long waiting times, lack of food support, interruptions in anti-opportunistic infection medications, stigma, and certain socio-cultural barriers (religion, social and family environment). A study conducted in Malawi showed that 24% of patients classified as lost to follow-up returned to the same site after the removal of direct costs associated with ART treatment [18].

Mertens et al., in a meta-ethnography of African cohorts, and Hossein et al., in a qualitative study in South Africa, reported that long waiting times, stigma, refusal to accept one's status, failure to disclose HIV status within couples, and negative religious influences negatively affected retention and adherence to antiretroviral treatment [19, 20]. It should also be noted that insufficient active search for patients with missed appointments, lack of home visits (when needed), insufficient community organization support, and lack of involvement of spouses in psychosocial care could jointly influence the retention of patients starting antiretroviral treatment with profound immunodeficiency. Several studies have reported the beneficial effect of community involvement on adherence and retention of HIV patients in ART programs [5, 21].

The estimation of the incidence of mortality in our study did not include the results from investigations of lost-to-follow-up cases, which may lead to underestimation.

This is supported by Brinkhoff et al., who, in a meta-analysis based on studies tracking lost-to-follow-up cases, estimated a higher cumulative mortality rate for lost-to-follow-up patients, ranging from 12% to 87% [21].

The multivariate analysis based on the Cox model revealed that the initiation of antiretroviral (ARV) treatment with a low CD4 count, at an advanced stage of infection, as well as the use of the AZT + 3TC + NVP regimen, were the main predictive factors for non-retention of patients in the treatment program at the Donka National Hospital.

Patients who started treatment with a CD4 count below 100 cells/mm<sup>3</sup> had a 2.15 times higher risk of not being retained in the program compared to those who initiated treatment with a CD4 count above 350 cells/mm<sup>3</sup>. Similarly, patients with a CD4 count between 100 and 200 cells/mm<sup>3</sup> were 1.72 times more likely to drop out of the program than those with a CD4 count above 350 cells/mm<sup>3</sup>.

These results highlight the negative consequences of delayed ARV treatment initiation, particularly on morbidity and mortality for patients living with HIV. Patients who start treatment at an advanced stage, with a low CD4 count, are more exposed to the risks of death and loss to follow-up due to the increased prevalence of opportunistic diseases such as tuberculosis, cryptococcal meningitis, septicemia, wasting syndrome, and chronic diarrhea. These findings are corroborated by other studies. A study conducted by Amin S. Hassan et al. A study in Kenya found that an initial T lymphocyte count of less than 100 cells/ $\mu$ L was an independent predictor of non-retention (attrition) among patients living with HIV on antiretroviral therapy [22].

In this study, we found that patients who initiated HIV/AIDS care with an antiretroviral therapy regimen consisting of AZT, 3TC, and NVP had a 1.44 times higher risk of not being retained in the antiretroviral treatment program. A study conducted in 2020 at the University of Gondar Specialized Hospital also revealed that this antiretroviral regimen was associated with lower patient retention in treatment programs [22]. Similarly, another study conducted in Ethiopia demonstrated that initiating antiretroviral therapy with the AZT, 3TC, and NVP regimen increased the risk of patients being lost to follow-up [23].

This association could be explained by the dosing frequency of this therapeutic combination. Twice-daily dosing of the AZT, 3TC, and NVP regimen complicates patient adherence. Irregular or inadequate adherence to this treatment may increase the risk of disengagement, ultimately leading to loss to follow-up in the antiretroviral care program.

At Donka National Hospital, as in other HIV care centers in Guinea, it is essential to strengthen early diagnosis and management of opportunistic infections in patients living with HIV. Rapid intervention at this stage could prevent complications that may compromise the physical condition of patients and significantly reduce the risk of mortality.

## 5. Strengths and Limitations of the Study

Our study assessed the retention of people living with HIV in an antiretroviral treatment program implemented at the largest care site in Guinea and identified risk factors associated with non-retention. It was notable for its extended five-year follow-up period and the inclusion of a large sample of over 4,000 patients on antiretroviral therapy.

This study also updated statistics on patient retention in antiretroviral treatment at this national reference site. However, despite these strengths, several limitations should be acknowledged.

The data analyzed were retrospectively collected from longitudinal databases, which may introduce information bias due to underreporting of certain events of interest (deaths, transfers, opportunistic infections, etc.). Additionally, the analysis of factors associated with non-retention was limited to variables available in the database. Other relevant variables not included could further enrich the study of predictors of non-retention.

Mortality estimation was based solely on reported deaths without adjustments for unreported deaths among patients lost to follow-up, due to insufficient information. Furthermore, the sample used came from a large-cohort site that receives particular attention from health authorities and partners. Studies conducted at smaller-cohort sites or in rural areas might yield different estimates of cumulative non-retention incidence.

Despite these limitations, the findings of our study provide valuable insights into the magnitude and determinants of non-retention among patients on antiretroviral therapy in a national reference hospital. These results form a strong foundation to strengthen efforts by Conakry sites, the Ministry of Health, and the National Program for the Fight Against AIDS and Hepatitis to improve patient retention in the ARV program in Guinea.

## 6. Conclusion

This study revealed that the overall retention rate of people living with HIV in the antiretroviral treatment program in Guinea was 68.88%, corresponding to a cumulative non-retention incidence of 31.12%. The patient retention rate progressively decreased over time, from 91.3% at six months to only 74.1% at 24 months. This 24-month retention rate falls significantly short of the national target of 90%.

These findings highlight the critical importance of implementing targeted interventions to improve patient retention in the antiretroviral treatment program. Such efforts are essential to achieving the global HIV/AIDS goals by 2030.

Furthermore, the study identifies late initiation of antiretroviral treatment—often starting with a low CD4 count, diagnosis at an advanced stage of HIV infection, and the antiretroviral regimen consisting of AZT + 3TC + NVP—as the main factors negatively influencing retention. This underscores the need to intensify community-based actions to promote early access to and utilization of HIV testing. Such an approach could enhance antiretroviral treatment success and

strengthen patient retention in the program.

Based on the results of this study, we recommend that the national AIDS control program intensify efforts to promote early testing for people living with HIV. This can be achieved through various approaches, including self-testing, provider-initiated testing, community-based testing, and testing integrated into prenatal care consultations. These strategies aim to reduce late diagnoses and improve management in the early stages of infection.

We also strongly advocate for the prioritized adoption of single daily-dose antiretroviral treatment regimens. This simplified approach could reduce the risk of poor adherence, often a cause of treatment failure and loss to follow-up—while enhancing the effectiveness of the treatment. Finally, we recommend conducting an in-depth study to explore the specific reasons behind patient loss to follow-up. This investigation could include a qualitative component based on direct interviews with patients lost to follow-up or their families, as well as a quantitative component to analyze general trends. A mixed-methods approach would provide a better understanding of the causes of non-retention and offer actionable data to improve HIV/AIDS care in Guinea.

## 7. Ethical Considerations

This study was conducted as part of support to the National Program for the Fight against AIDS and Hepatitis in Guinea, aimed at periodically evaluating the retention rate of patients living with HIV in antiretroviral treatment programs. It was carried out as part of a Doctor of Medicine thesis at the Faculty of Health Sciences and Techniques of the Gamal Abdel Nasser University of Conakry.

The data used in this study were sourced from the routine database of the antiretroviral treatment program at Donka National Hospital. The research protocol was approved by a dedicated scientific committee at the Gamal Abdel Nasser University of Conakry and registered under number 024/A/DC/FSTS/VDR/UGANC/RECT/2023.

Data collection was performed by a medical doctoral candidate from the same university. Official authorization was obtained from the National Program for the Fight against AIDS and Hepatitis, as well as from the HIV care units of Donka National Hospital. Patients' names and phone numbers were strictly excluded during data extraction, ensuring anonymity using unique identifiers. The database was accessible exclusively to the candidate and the supervising team, adhering to confidentiality and ethical standards.

## Abbreviations

aHR	Adjusted Hazard Ratio
UNAIDS	Joint United Nations Programme on HIV/AIDS
TDF	Tenofovir
NVP	Nevirapine

HR	Hazard Ratio
HIV	Human Immunodeficiency Virus
EFV	Efavirenz
CI	Confidence Interval
CD4	Cluster of Differentiation 4
AZT	Zidovudine
ART	Antiretroviral Therapy
AIDS	Human Immunodeficiency Syndrome
3TC	Lamivudine

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## Author Contributions

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## Conflicts of Interest

The authors declare no conflicts of interest in the conduct of this study or the publication of its results.

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