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Quantification of Plasma HIV Viral Load at the National Referral University Hospital in N'Djamena

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Abstract

Introduction: Measuring HIV viral load allows for an assessment of the effectiveness of antiretroviral therapy. The objective of this study is to evaluate the outcomes of follow-up care for people living with HIV at the National University Hospital. **Methodology:** This is a cross-sectional study. Data were collected through a campaign conducted throughout 2024. The information gathered focused on patients' sociodemographic characteristics, antiretroviral therapy, and HIV viral load results. Data were entered and analyzed using Epi-Info version 6.0. **Results:** During 2024, 385 HIV-infected patients who had been receiving antiretroviral therapy for at least one year were seen at the outpatient clinic and had samples collected for HIV viral load quantification. This included 257 women and 128 men, for a sex ratio of 0.49. The average age was 40 years, and married individuals accounted for 50.1% of the patients. The earliest year of treatment initiation was 1994, and 63% of those tested had started treatment within the last 10 years. The undetectability rate was 72%. **Conclusion:** Access to viral load testing is limited despite the importance of this test. Improving performance requires the availability of functional equipment and the involvement of response stakeholders at various levels.

Keywords

Quantification, HIV, Antiretroviral

1. Introduction

HIV viral load testing involves quantifying the viral RNA in the plasma of an infected person through genomic amplification [1]. Viral load is expressed in copies per milliliter of blood (copies/mL) or as a logarithmic value.

It provides information on viral replication and reflects the effectiveness of antiretroviral therapy. This test has become a means of preventing HIV infection. The WHO recommends performing it 6 months after starting antiretroviral therapy and then at least once a year [2] [3].

An undetectable viral load is the goal of antiretroviral therapy.

Depending on the test result, the viral load is considered undetectable if the virus is absent in the sample or its concentration is less than 40 copies/ml. A viral load greater than 1000 copies/ml suggests treatment failure [3].

In Chad, viral load testing was introduced in 2017 at the laboratory of the National Referral University Hospital in N'Djamena. Other facilities were subsequently equipped, but access to viral load testing has remained very limited [4].

The objective of this study is to evaluate, as the deadline for global HIV control targets approaches, the results obtained at one of the country's largest care sites for people living with HIV.

2. Patients and Methods

This is a descriptive and analytical cross-sectional study based on data collected throughout 2024 via a plasma viral load measurement campaign at the National Reference University Hospital.

Included were all patients living with HIV who had been receiving antiretroviral therapy for at least one year and who attended medical consultations at the hospital during 2024. They were educated about viral load and then referred to the outpatient clinic for sample collection. Nurses and psychosocial counselors (PSCs) assisted with patient education and referral. The following information was recorded in a registry: ARV code, age, sex, family status, start date and regimen of antiretroviral therapy, and viral load test results.

Samples were collected at the day hospital of the National Referral University Hospital in accordance with the instructions provided by laboratory technicians at the Military Training Hospital (HMI), where the analysis was carried out. It is recommended that 5 ml of blood be collected in a dry tube, that the sample be stored in an air-conditioned room, and that it be transported to the laboratory on the same day in a cool box. Samples received at the laboratory are centrifuged and the plasma is analysed using a GENEXPERT-type device. The detection limit is 40 copies per ml.

We have not lost sight of the ethical considerations and have taken great care to strictly respect patient anonymity at every stage and to obtain their consent prior to sampling.

3. Results

A total of 385 HIV-infected patients who had been receiving antiretroviral therapy (ART) for at least one year were enrolled in a study to measure plasma HIV viral load in 2024 at the Outpatient Hospital of the National University Teaching Hospital in N'Djamena.

The patients' ages ranged from 17 to 70 years. The mean age was 41 years for the overall group, 43 years for men, and 40.6 years for women (**Table 1**).

Table 1. Distribution of patients tested by sex and age group.

Age group	Gender		Total	Percentage
	Men	Women		
≤18 years	1	1	2	0.52%
18 - 27	11	14	25	6.49%
28 - 37	39	79	118	30.65%
38 - 47	43	94	137	35.58%
[48 - 57[	23	45	68	17.66%
[58 – 67]	9	21	30	7.79%
>68 years	2	3	5	1.30%
Total	128	257	385	100%

More than three-quarters of the patients tested were between the ages of 28 and 57.

Of these patients, 257 were female and 128 were male, for a sex ratio of 0.49 (Figure 1).

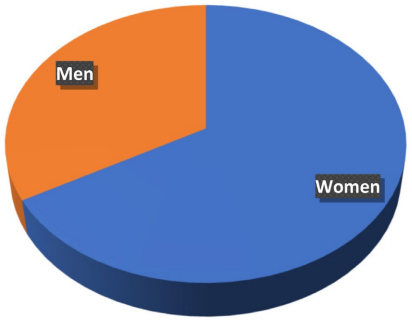

Figure 1. Distribution of patients by sex.

Two-thirds of the patients tested were female.

The marital status of the patients is shown in Figure 2 below.

More than half of the patients tested (50.13%) were married.

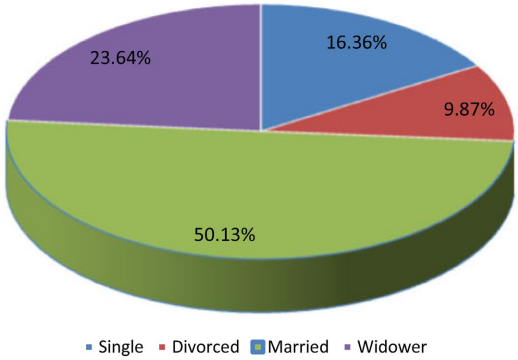

Figure 2. Distribution of patients by marital status.

Figure 3 shows the distribution of the number of patients tested by the year antiretroviral therapy was initiated.

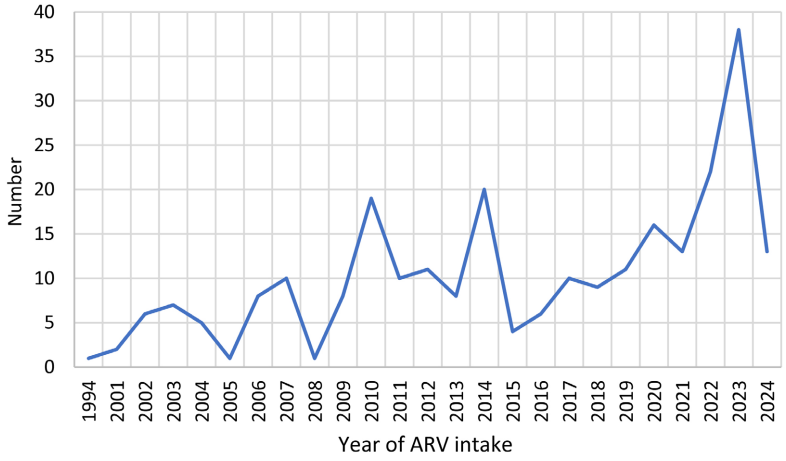

Figure 3. Evolution of number of patients sampled according to the year of the start of antiretroviral (ARV) treatment.

Patients who initiated antiretroviral treatement in 2023 were the most likely to have their viral load tested.

The oldest patient in the series has been taking ARVs since 1994, but no patients who started treatment between 1995 and 2000 were recorded. The majority of patients (63%) started antiretroviral treatment between 2014 and 2023.

Of the 385 samples, 342 results were returned by the testing laboratory, representing a 90% response rate.

The proportions of patients tested and undetectable viral load samples are illustrated in Figure 4 below.

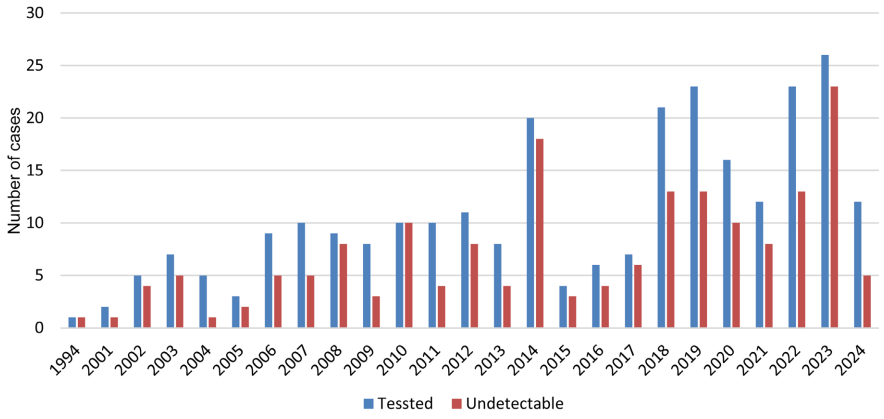

Figure 4. Distribution of patients tested and those with an undetectable viral load according to the years.

Strictly speaking, 246 patient samples were classified as undetectable, representing 72% of known results, and 41 samples had a viral load below 40 copies/ml (log 1.60).

Conversely, 38 patients (11%) had a viral load above 1000 copies/ml.

The percentage of patients with an undetectable viral load was 77% (169/220) in the group of women and 63% (77/122) in the group of men. The difference is not statistically significant with an odds ratio (OR) of 0.8370 (95% confidence interval), p = 0.00689.

Based on the year of initiation of antiretroviral therapy, the largest numbers of patients with an undetectable viral load were those from 2023 (23 patients), 2014 (18 patients), and 2018 and 2019 (13 patients).

The highest viral load suppression rates were observed among patients who started ARV treatment in 2014 (18/20, or 90%), 2023 (23/26, or 88%), and 2018 (13/21, or 62%).

4. Discussion

HIV viral load testing was not introduced in Chad until 2017. Availability expanded gradually, starting from the capital (the National University Teaching Hospital in N'Djamena). The geographic coverage of this testing has improved due to the acquisition of portable devices suited to the context of a resource-limited country.

Despite these efforts, viral load testing coverage among people living with HIV remains limited nationwide. The rate of access is only 18% for adults receiving antiretroviral therapy in the country [5]. In our study, based on the active registry at the end of 2023, which included 4190 people living with HIV, this rate was 9.2%. The viral load suppression rate was 84% nationally and 72% in our cohort. According to UNAIDS, coverage rates relative to global targets in 2024 were 87%, 77%, and 73% [6].

Low utilization of viral load testing is observed in several countries in the region [7]-[9]. For instance, in Burkina Faso, this rate was 25% in 2020 [7]. In Cameroon, a study identified the distance of patients from the site where viral load testing is performed as one of the main factors limiting access [10]. This situation is all the more concerning as it jeopardizes the achievement of HIV elimination goals.

The study population consisted predominantly of adults aged 28 to 57 years and women. A higher proportion of women was also observed in the HIV seroprevalence survey [8]. The study conducted in two health districts of Yaoundé [10] also reported a higher proportion of women undergoing HIV viral load testing.

There is significant variation in the number of patients sampled and those for whom results were reported; however, we observe a trend toward greater representation of patients who initiated antiretroviral therapy between 2014 and 2023. This finding highlights the difficulty of retaining patients in active care over the long term for chronic diseases. Several reasons can be cited, including a change of residence, treatment interruption due to non-adherence, or death. This finding has also been reported in Mali, Malawi, and South Africa [11]-[13].

It should be noted that viral load testing has not been offered at the National University Teaching Hospital for over five years (since 2020), and patients treated there have become accustomed to having this test performed at other facilities in

the city of N'Djamena, notably at the Al Nadjma Center, the Le Bon Samaritain University Hospital, or the Military Training Hospital. Unfortunately, the results of these tests are given to the patients concerned but are not forwarded to the treating facility.

To facilitate access to viral load testing, the use of dried blood spots (DBS) has been tested in several countries with encouraging results, but logistical challenges pose major constraints [14] [15].

The coverage rate is low in our study (less than 10%), but the proportion of detected viral loads is concerning (28%). Without access to genotyping, it is difficult to assess the extent of resistance in Chad. Studies conducted in other African countries report resistance rates to non-nucleoside reverse transcriptase inhibitors exceeding 10% [16], which explains the introduction of dolutegravir into first-line treatment in Africa.

Regarding viral suppression, the average age of patients who achieved it was 41 years in our study. It was 40 years in Koné's series in Mali [9]. In the Democratic Republic of the Congo, it was observed that the highest viral loads were associated with patients aged 30 and older and with female patients [17]. Conversely, we observed a higher rate of undetectable viral load in the group of women compared to men.

The limitations of the study relate to its retrospective nature, which makes it difficult to explain any missing data. Furthermore, a lack of resources means it is not possible to contact patients in advance to inform them of the option to have a viral load test.

5. Conclusions

HIV viral load testing is an essential component of treatment monitoring for people living with HIV, but conducting these tests in our context is not straightforward.

Networking among healthcare facilities that care for people living with HIV will, when necessary, enable the transmission of viral load results to the patients' original care sites and help improve treatment monitoring.

In addition to upgrading the technical infrastructure of care sites for people living with HIV—while not losing sight of the importance of equipment maintenance—it is also necessary to strengthen providers' skills in monitoring antiretroviral treatment and supporting treatment adherence, and to encourage the involvement of community stakeholders.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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