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Research Article

Study of Viral Load as A Predictive Marker of the Evolution of HIV Type 2 Infection in Burkina Faso

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Abstract

Background: HIV - 2 infection is characterized by low sexual and vertical transmission and slow clinical and immunological progression. However, it can lead to AIDS. Viral load measurement is a predictive test of the success or failure of antiretroviral therapy. In order to evaluate the efficacy of ARV treatment, we measured plasma viral load; and CD4 T - cell counts in 68 patients, of whom 56 were HIV - 2 infected and 12 were HIV - 1/HIV - 2 co - infected.

Method: We tested EDTA plasma samples stored at - 80 ° C, taken from patients followed in sentinel sites in the city of Ouagadougou. The sera were obtained by centrifugation, and the plasmatic viral load quantified by droplet double polymerase chain reaction (dd PCR), at a detection threshold of 10 copies/ml. Sociodemographic, clinical and therapeutic data were collected from patients charts and completed during an interview.

Results: Patients had a mean age of 53.8 ± 7.8 years with extremes of [38 - 72 years] and were predominantly females (57.4%), with a sex ratio of 0.80. There was a predominance of housewives and married couples with respectively 36.8% and 75.0% of patients. The majority of patients (77.9%) were Category A, that is, they were either asymptomatic or in the primary infection phase. 22.0% of patients were symptomatic, with 13.2% and 8.8% respectively belonging to categories B and C. The most observed opportunistic infections were shingles found in 7.3% of patients, oral candidiasis found in 5.9%, signs of weight loss (undernutrition) in 5.9% and genital herpes in 1.5% of patients. Four patients (4.7%) had hepatitis B. One case of tuberculosis (1.5%) was reported. The therapeutic combination of protease inhibitors (Lopinavir / ritonavir) was the most prescribed (94, 1% of patients); 58.8% of the patients had a CD4 level < 500/mm3, and 41.2% had CD4 level ≥ 500 cells/mm3. Plasma viral load was undetectable (≤ 10 copies / ml) in 70.6% of patients; 7.3% had a viral load of 10 to 50 copies / ml, and 19.1% of patients had a high viral load (≥ 101 copies / ml).

Our study showed that the highest CD4 levels are observed in patients with undetectable viral load (< 10copies / mL). This established that the CD4 cell count and the plasma viral load value move in the opposite direction, and are two predictors of the evolution of HIV infection, and the virological and / or immunological response to HAART.

Keywords: HIV-2; Viral Load; CD4 T Cells; Antiretroviral

Introduction

With 36.7 million people infected worldwide and 95,000 PVHIV in Burkina Faso in 2016, 4% of them with HIV - 2 infection is a public health priority [1,2].

Belonging to the sub familyorthoretrovirinae, and to the genus Lentivirus. HIV - 2 has a more limited spread and is less pathogenic than HIV - 1 [3].

Mainly present in West Africa, HIV - 2 is characterized by its low sexual and vertical transmission and slow clinical and immunological progression [4,5].

The successful scaling up of ART as a global response to the epidemic has made viral load surveillance a new challenge in the management of PV - HIV [6,7].

The measurement of plasma viral load is therefore a key consideration in the follow-up and management of these patients.

It is a predictive test of the success or failure of antiretroviral therapy [8-10].

HIV viral load is the number of RNA copies of the virus per milliliter of blood.

Many investigations have reported HIV - 2 resistance to most of drugs used for its treatment, demonstrating the importance of regular monitoring of the response to treatment in people with HIV infection [8,11-15,].

The WHO recommends that CD4 T lymphocyte count and plasma viral load be available for efficient monitoring.

In our context in Burkina Faso, although there are HIV - 1 viral load assay techniques, HIV-2 infected patients face a biological monitoring problem due to the lack of a viral load quantification technique [4,10].

The aim was to study the plasma viral load of patients infected by HIV type 2 in Burkina Faso as an element of their biological follow - up.

For this reason, we have proposed to measure CVP in HIV - 2 patients, in collaboration with the LRS/UCL (Belgium), in order to assess the relationship between the value of viral load and the efficacy of antiretroviral therapy, and thus the evolution of HIV - 2 infection.

Materials and Methods

Our study was held in the city of Ouagadougou and at the LRS/UCL.

The Medical Centre of the General Sangoule Lamizana Military Camp and the associations for the treatment of Pvhiv served as sample collection sites for us.

The laboratories of the CHUP - CDG and CERBM - Pietro Annigoni provided us with the framework for the analysis and storage of our samples.

This was a descriptive prospective study that was conducted from January 2017 to March 2018.

Our study population consisted of women, adult men infected with HIV - 2 or co - infected with HIV – 1 + 2, followed by the associations of PV - HIV in Ouagadougou City and the CMGASL Medical Centre.

Included in our study were any adult HIV2 or HIV1 + 2 patients who were members of PEC associations or who were followed at CMGASL on ART.

Socio - demographic characteristics (age, sex, occupation, marital status); clinical (pathologies and associated opportunistic infections); biological (CD4 count, viral load) and therapeutic (ARV, treatment of opportunistic infections) were studied.

The data collected on an individual collection sheet were entered on a microcomputer and analyzed using the EPI - INFO version 7.2.2.2.2, Microsoft Word and Excel 2013 statistical software.

Only HIV - 2 or co - infected patients who consented to participate in the study were selected for sampling.

After checking the serological status, we collected blood from 2 EDTA tubes at the fold of the elbow.

The blood collected was stored in a box and then sent to the laboratory. In the laboratory, after a serological status check, using the Immunocombs II technique, we first deposited 4 drops of blood from each sample on DBS paper.

Then we centrifuged the samples at 3000 rpm for 15 minutes.

After centrifugation, the sera were collected in cryotubes, placed in a cryobox, and stored at - 80°C.

Finally, the samples and DBS papers were sent to the AIDS Reference Laboratory of the Catholic University of Louvain (LRS/UCL) where the confirmation of the type of HIV and the measurement of the viral load were performed.

Information collected from patients and test results were kept confidential.

Results and Discussions

The serology

At the end of our analysis, we had 85 patients, including 52 HIV - 2 patients and 33 co - infected patients. However, the AIDS reference laboratory found different serological results. Indeed, 13 of

the patients screened for HIV – 1 + 2 co - infection in Burkina Faso were found to be HIV - 1 in Belgium; 4 patients screened for HIV – 1 + 2 in Burkina Faso were found to be HIV - 2 in Belgium.

In total, our study enrolled 68 patients, 56 of whom were HIV - 2 patients (82.4%) and 12 patients living with HIV – 1 + 2 co - infection (17.6%).

Socio-demographic characteristics

The average age of the patients was 53.8 ranging from 38 and 72 years old. The most represented age group was [50; 60].

We noted a female predominance at 57.4%, or a sex ratio of 0.80.

The majority of patients (75.0%) were married.

Clinical and therapeutic characteristics

Shingles, candidiasis were the most dominant OIs, with 7.3% and 5.9% of cases respectively. Most patients (77.9%) were at clinical stage I.

ART based on Zidovudine + Lamivudine + Lopinavir/Ritonavir was the most prescribed, accounting for 54.4% of cases.

Biological characteristics

The majority of patients (48.5%) had CD4 levels between [200 - 499 cells/mm3]. And 58.8% of patients had CD4 < 500 cells/mm3 levels.

At the 10 copy/ml threshold, 70.6% of patients had an undetectable viral load.

Most of these patients (with undetectable viral load) had CD4 levels ≥ 500 cells/mm3.

The majority of patients with undetectable viral load nearly 36.8% of patients, had a treatment duration ≤ 5 years.

The majority of patients (33.8%) with CD4 levels ≤ 500 cells/mm3 had a treatment duration ≤ 5 years.

We found differences between the serological diagnoses made in Burkina Faso and Belgium. In 2015, SANOU M. (Burkina) also noted discrepancies between the diagnoses established in Burkina and the LRS/UCL [10].

These discrepancies could probably be explained by the existence of cross - reactions due to the homology between the 2 types of viruses.

These results highlight the importance of having quality reagents for confirmatory serological diagnosis before ARV treatment is initiated.

Socio-demographic characteristics

The average age reported in our study was 53.8 years. Oumar F. (Mali, 2009), Didier., *et al.* (2013) and Gottlieb., et al. found mean ages lower than those in our study, at 46.2; 45.3 and 36.9 years respectively [18].

The average age found in patients in our study was between [50 - 60 years]. This could be explained by the fact that nowadays, with the availability of ARVs and access to care services, Plwha have a longer lifetime, justifying the existence of elderly patients living with HIV.

There was a female predominance. The same observation was made by Didier., *et al.* who reported a female predominance of 56%; Sanogo M. and Oumar F. also reported a predominance of 58.8% and 60% respectively, and a respective sex ratio of 0.68 and 0.66 [18,19].

The high female prevalence in our study is explained by the high female demographics in Burkina Faso, as well as the vulnerability and high susceptibility of women to contracting HIV [4,10].

Almost all of our patients were married. The same observation was made by Oumar F. and Sanogo M. who found 77.1% and 63.5% of married respectively [18].

These results can be explained by the African context in which marriage is often a social requirement [10, 18].

Clinical characteristics

The majority of patients were in clinical stage I, i.e., either asymptomatic or in the primary infection phase.

This high prevalence of asymptomatic patients could be explained on the one hand by the particularly slow clinical course of HIV - 2 and on the other hand by a good response to antiretroviral treatment.

The most common opportunistic infections were shingles and Candidiasis. A similar observation was made by Oumar F. (Mali) which found a predominance of Candidiasis and Shingles with 5.7% and 8.6% respectively [18,19].

In addition, N'Dour., *et al.* (Dakar) and Eholie (Côte d'Ivoire) reported that Candidiasis, Shingles and Tuberculosis were the most common OIs among HIV - 2 patients [20,21].

Among the prescribed ARVs, AZT + 3TC + LPV/r was the most commonly used. Our results are similar to those of Didier K., *et al.* who reported that 84.0% of HIV - 2 patients were on a PI - based diet.

The high use of PIs in our study is explained by the fact that PIs, in this case LPV/r, are recommended for the management of HIV - 2 and HIV - 1/2 co - infected patients.

The majority of patients had an undetectable viral load at the threshold of 10 copies/ml. This indicates good control of infection with antiretroviral therapy.

At the 10 copy/ml threshold, viral load was detectable in only 29.4% of patients; however, it was detectable in 41.6% of patients in the study by Didier K., *et al.*

The detectable viral loads reported in our study could be explained either by the fact that these patients had just started ART, or by poor compliance with treatment, or the existence of resistant strains.

This establishes that the initiation of effective ARV treatment allows HIV - 2 infection to be controlled and significantly reduces plasma viral load.

The analysis of these results showed us that plasma viral load and CD4 T - cell level would be inversely proportional.

In addition, they would depend on whether or not ARV treatment was initiated, the duration, effectiveness of treatment, and the sensitivity of the HIV strain to treatment.

Our results are in accordance with the literature data according to which viral load and TCD4 lymphocyte rate change inversely [8,13,15,17].

Indeed, this hypothesis was also confirmed in studies by Ariyoshi., *et al.* Berry., *et al.* (Gambia) reported in 2012 that the viral load of HIV - 2 was even more undetectable as the CD4 cell count increased.

Conclusion

32 years after its discovery, HIV infection still remains a problem.

In Burkina Faso, considerable progress has been made in the fight against HIV since the first cases were discovered in 1986.

However, the absence of an available test for measuring HIV - 2 plasma viral load hinders the monitoring of the effectiveness of antiretroviral therapy in HIV patients2.

Sex	Effective	%	Type of VIH	
			VIH-1+2	VIH-2
Female	39	57,4	7	32
Male	29	42,6	5	24
Total	68	100,0	12	56
Sex-ratio: 0,8				
Married	51	75.0	9	42
Single	6	8,8	0	6
Common union	5	7,3	1	4
Divorced)	5	7,3	1	4
Widower	1	1,5	1	0
Total	19	100,0	12	56
ARV				
AZT / 3TC / LPV/r	37	54,4	4	33
TDF / 3TC / LPV/r	18	26,5	3	15
TDF / FTC / LPV/r	8	11,7	3	5
ABC/3TC/LPV/r	1	1,5	0	1
AZT / 3TC / DRV/r	1	1,5	0	1
AZT / 3TC / EFV	1	1,5	1	0
TDF/3TC/NVP	1	1,5	1	0
Autres	1	1,5	0	1
TOTAL	6	100	12	56
Viral load				
<10	48	70,6	12	36
[10 - 50]	5	7,3	0	5
[50 - 100]	2	2,9	0	2
[100 - 1000]	11	16,2	0	11
[1000 - 45000]	2	2,9	0	2
TOTAL	68	100,0	12	56
P=0,19				

Table 1: Socio-demographic, biological and therapeutic data of patients.

Viral load	CD4 count			Total
	[0 - 200]	[200-499]	≥500	
<10	2	13	21	36
[10 - 50]	1	2	2	5
[50 - 100]	0	2	0	2
[100 - 1000]	3	8	0	11
[1000 - 45000]	1	1	0	2
TOTAL	7	26	23	56

Table 2: Correlation between viral load and CD4 T Lymphocyte count in HIV-2 patients. *P=0,05*

Our study allowed us to perform confirmatory serological diagnosis tests in 68 HIV - 2 patients, quantify their plasma viral load for the first time since initiation of their treatment, and evaluate the efficacy of antiretroviral therapies in these patients.

It appears that the serological tests carried out in the monitoring centers are not always reliable for the initiation of ARV treatment. This requires quality control.

In addition, combining CD4 T cell count and quantification of the highly sensitive HIV - 2 viral load with a threshold of 10 copies/mL could improve the initiation and monitoring and evaluation of patients' ART.

Therefore, the implementation of the HIV2 viral load measurement technique in Burkina Faso is necessary for regular follow - up of HIV - 2 patients as well as HIV 1.

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