Factors limiting the achievement of viral load among PLWHA followed in the active file of the University Hospital of Bogodogo.

Facteurs limitant la réalisation de la charge virale chez les PVVIH suivies dans la file active du Centre Hospitalier Universitaire de Bogodogo.

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Abstract

Introduction: In Burkina Faso in 2019, less than 25% of people living with HIV undergoing treatment have their viral load measured periodically. The aim of our study was to investigate the factors limiting viral load testing among people living with HIV in the active file of the Bogodogo University Hospital. **Methods**: Descriptive and analytical cross-sectional study from 1 January to 30 June 2020. Patients infected with HIV-1 or HIV1+2, under antiretroviral treatment for at least 6 months at the Bogodogo University Hospital were included. Data were analyzed using Stata software. The significance threshold was 5%. **Results**: In 2019, the viral load failure rate was 88.87% (1965/2211). A total of 337 patients were included in the study. Mean age was 40.87 ± 9.8 years. The sex ratio (M/F) was 0.27. The rate of medical prescription of VL was 43.92%. Factors associated with viral load testing were: residence in Ouagadougou (p=0.034; OR=0.32 [0.11 - 0.92]), school attendance (p=0.000; OR=2.24 [1.44 - 3.47]) and knowledge of viral load as an essential follow-up test (p=0.000; OR=5.01 [2.24 - 11.17]). **Conclusions**: Despite the fact that viral load tests are free, the rate at which they are performed remains low. Increasing awareness would improve the uptake rate. Studies including practitioners and community organizations could help to identify other factors.
Keys word: HIV; Limiting factors, Viral load, Bogodogo University Hospital, Burkina Faso.

Résumé

Introduction : Moins de 25% des personnes vivant avec le VIH sous traitement bénéficient d'une mesure périodique de la charge virale au Burkina Faso en 2019. Notre étude avait pour but d'étudier les facteurs limitant la réalisation de la charge virale chez les personnes vivant avec le VIH de la file active du centre hospitalier universitaire de Bogodogo. **Patients et méthodes** : Etude transversale descriptive et analytique du 1er Janvier au 30 juin 2020. Ont été inclus, les patients infectés par le VIH-1 ou le VIH1+2, sous traitement antirétroviral depuis au moins 6 mois au centre hospitalier universitaire de Bogodogo. Les données ont été analysées grâce au logiciel stata. Le seuil de significativité était de 5%. **Résultats** : En 2019, le taux de non réalisation de la charge virale était de 88,87% (1965/2211). Au total 337 patients ont été inclus dans l'étude. L'âge moyen était de $40,87 \pm 9,8$ ans. Le sex-ratio (H/F) était de 0,27. Le taux de prescription médicale de la VL était de 43,92%. Les facteurs associés à la réalisation d'une charge virale étaient : la résidence à Ouagadougou (p=0,034 ; OR=0,32 [0,11 – 0,92]), le statut de scolarisé (p=0,000; OR=2,24 [1,44 – 3,47]) et la connaissance de la charge virale comme un examen essentiel de suivi (p=0,000; OR=5,01 [2,24 – 11,17]). **Conclusion** : Malgré la gratuité de la charge virale, son taux de réalisation reste faible. La sensibilisation améliorerait son taux de réalisation. Des études prenant en compte les praticiens, les structures associatives, pourraient contribuer à identifier d'autres facteurs.
Mots clés : VIH ; Facteurs limitants, Charge virale, CHU Bogodogo, Burkina Faso

BACKGROUND

HIV/AIDS remains a public health problem worldwide, particularly in developing countries. More than 75.7 million people have been infected with HIV and 32.7 million people have died from AIDS-related illnesses since the beginning of the epidemic. In 2019, UNAIDS estimated that 38.0 million people are living with HIV, 36.2 million of whom are adults. And 81% of people living with HIV knew their HIV status. Sub-Saharan Africa remains the region most affected by the disease with 25.6 million cases including 20.7 million in East and Southern Africa and 4.9 million in West and Central Africa [1].

In Burkina Faso, an estimated 100,000 people were living with HIV in 2019, of whom 69,000 were on ARV treatment. HIV prevalence among adults aged 15-49 years was 0.7% [2].

In order to end the AIDS epidemic, UNAIDS set targets to be reached by 2020: 90% of people living with HIV know their HIV status; 90% of HIV-infected people who know their HIV status are on ARV treatment; 90% of people receiving ARV treatment have a suppressed viral load [3, 4]. These targets took into account screening, entry into care, initiation of ARV treatment, biological response, primarily virological, and retention in care [5]. Achieving the 90-90-90 has been difficult, especially the third 90, which is overdue in our resource-limited countries.

Plasma viral load (PLV) is an essential indicator for early assessment of antiretroviral treatment efficacy and for early detection of treatment failure. This test, which has been rarely available in low- and middle-income countries in recent years, is now increasingly available. The total number of people on antiretroviral therapy with access to viral load increased from 4.4 million to 8.1 million between 2015 and 2016. Despite this progress, globally, less than half of people living with HIV on treatment receive periodic viral load testing. In West and Central Africa, fewer than one in five patients received this test in 2017 [4]. Although 90-90-90 has not been achieved, UNAIDS has still set a target of "95-95-95" by 2030 [3].

In Burkina Faso, despite free access to ARVs and biological monitoring, including viral load testing, 24,538 (25%) of patients had their viral load tested in 2019 according to the sectoral health programme for the fight against HIV and sexually transmitted infections (PSSL-IST) [6].

To contribute to the availability of data and for a better understanding, we proposed to study the factors limiting the completion of the viral load among PLWHIV followed at the active file of the University Hospital of Bogodogo (CHU-B), in a context of limited resources.

METHODS

This was a descriptive and analytical cross-sectional study with retrospective data collection in the active file of CHU-B from September 1er to December 31 2020.

The source population was HIV-infected patients on ARV treatment followed in the CHU-B active file. Only HIV1 and HIV1+2 infected patients on treatment and older than 15 years of age followed in the active file of CHU-B for at least six months and who gave verbal consent were included. The patients were submitted to the questionnaire and then the investigator with his file number would collect some data retrospectively.

In order to study the factors limiting the achievement of the viral load, we proceeded with a accidental sampling among PLWHIV during consultations from 1st September to 31st December 2020. The Schwartz formula ($n=p(1-p)t^2/e^2$) was used to determine the sample size: "p" the percentage of patients who completed their VL in 2019 (25% according to the Sectoral Health Programme for the fight against HIV/AIDS); "t" the confidence level deduced from the confidence rate (1.96); "e" the margin of error (5%). The sample size was estimated at 337 patients from 1st September to 31st December 2020.

Viral load was performed with the cobas® 4800. Data were collected using a questionnaire designed on Kobocollect with a tablet during a patient interview. Patient records, ESOPE software (Evaluation and Operational Follow-up of ESTHER Program), and the pharmacy's 2019 dispensing file were used as data sources. These data were analyzed using stata 16 software. A descriptive and comparative analysis between the subjects who have performed and those who have not performed the viral load. The descriptive analysis consisted of determining the medians/means, standard deviation, confidence interval if the distribution is normal and median and interquartile range if the distribution is skewed, extremes of certain quantitative variables of interest, including socio-demographic data and the last CD4 count. Confidence intervals (5% CI) were also used for reporting quantitative

data. For the categorical variables of interest, proportions were determined in order to describe them.

In order to better understand the factors limiting the performance or not of the viral load, a comparative analysis of proportions by means of Chi2 tests was performed. A threshold of association of 5% was defined for the determination of an association between the independent variables and the dependent variable (completion of the viral load).

A multivariate analysis was then performed taking into account the variables that had an association in the univariate analysis. Stepwise logistic regression in a top-down manner was performed in this multivariate analysis to determine the factors limiting the realization of viral load. The significance level was set for a p value ≤ 0.05.

The variables studied were : socio-demographic characteristics (age, occupation, level of education, residence, distance from home to CHU-B); clinical and biological data (WHO clinical stage, last CD4 count); therapeutic data (ART regimen and protocol at initiation, current ART regimen and protocol, date of ART initiation, duration on ART); assessment of knowledge and understanding of essential biological tests in follow-up (knowledge of essential biological tests, having already heard about CD4 count and viral load, having already received explanations on viral load and CD4 count, knowing how to define viral load, knowing the most important test between viral load and CD4 count); therapeutic education; factors influencing the performance of the viral load (accessibility of the doctor, respect for appointments, having received the VL report card at the last consultation); performance of the VL; motivations and difficulties related to the performance of the VL.

We considered as :
• Without a fixed source of income, absence of a stable job that can provide a regular income;
• Source of fixed income: the existence of a job or an activity that provides more or less stable remuneration (e.g. employee, shopkeeper);
•Not in school: not attending a school and/or a structure teaching literacy;
• Schooling: attendance at school and/or a literacy teaching facility.
• Essential biological examinations: we considered as essential biological examinations of follow-up and in order of importance, the examination of the VL first and secondly the examination of the CD4 rate.

Arrangements were made to ensure anonymity and confidentiality of data. The collection forms were anonymous. Only the ESOPE software identification numbers were used to enter the information. We obtained permission from the management of the CHU-B and from the head of the internal medicine department where the active file is attached.

RESULTS

Descriptive analysis

As of December 31, 2019, 2211 patients were enrolled in the CHU-B Day hospital active file and were regularly obtaining ARVs. Patients who did not achieve viral load in 2019 represented 88.87% (n=1965) and 11.13% (n=246) had achieved viral load. A total of 337 patients were included.

Socio-demographic characteristics of patients
The mean age of the patients was 40.87 ± 9.8 years [21 and 79 years]. Table I shows the socio-demographic characteristics of the study participants.

Table I: Distribution of patients by socio-demographic characteristics

Characteristics	(n)	(%)
Age (in years)		
< 24	9	02.67
24 – 49	270	80.12
≥ 50	58	17.21
Sex		
Female	265	78.64
Male	72	21.36
Profession		
Sourc of fixed income	99	29.38
Non-fixed income	238	70.62
Study level		
Not in school	148	43.92
Educated	189	56.08
Marital Status		
Single	50	14.84
Concubinage	42	12.46
Divorce	30	08.90
Married	161	47.77
Widow(er)	54	16.02
Residence		
Outside	20	05.93
Ouagadougou	317	94.07
Distance from home to hospital		
≤ 25 km	323	95.85
> 25 km	14	04.15

Clinical, biological and therapeutic aspects

The clinical, biological and therapeutic aspects of the patients included in the study are summarized in Table II.

Table II: Distribution of patients according to clinical, biological and therapeutic aspects

Categories	Frequenc	Percentag
Type of HIV		
HIV1	324	96.14
HIV1+2	13	03.86
WHO clinical stage at initiation of ARV		
1	63	18.69
2	258	76.56
3	15	04.45
4	1	00.30
Protocol in progress		
1st line		
	173	51.34
	119	35.31
2nd line		
	5	01.48
Other	8	02.37
Duration of treatment		
< 5 years	219	64.99
6-11 years old	82	24.33
≥ 12 years	36	10.68
Last CD4 count		
< 200	45	13.35
200-350	74	21.96
≥350	218	64.69
Latest VL		
≤1000	92	90.20
>1000	10	09.80

*Tenovofir/Emtricitabine/Efavirenz ;
**Tenofovir/Lamivudine/Dolutegravir ;
***Abacabir/Lamivudine/Atazanavir/Ritonavir

Assessment of knowledge and understanding of biological tests

Out of 337 patients, the essential biological tests in monitoring HIV infection were known by 243 (72.11%) patients in our study. CD4 count was given as answer in 90 (26.63%) patients. Only 81 (24.04%) patients had heard about viral load and 117 (34.72%) about CD4 count. Explanations of viral load and CD4 count were received by 30 (8.90%) and 41 (12.17%) patients respectively. Thirty-one patients (9.20%) who claimed to be able to explain the viral load test. Twelve patients (38.71%) had given a correct answer.

A total of 330 (97.92%) patients claimed to have received therapeutic education prior to initiation of ARV treatment; 326 (96.74%) patients claimed not to have received any explanation on the therapeutic purpose and 324 (96.14%) on the usefulness of viral load.

More than half of the patients (272; 80.71%) did not know which test was more important between VL and CD4 count. Fifty (14.84%) patients had a choice oriented on CD4 count. Table III shows the distribution of patients according to their level of knowledge and understanding of essential biological tests.

Table III: Distribution of patients by assessment of knowledge and understanding of biological tests

Categories	Frequency	Percentage
Knowledge as an essential follow-up		
VL	43	12.76
CD4	90	26.71
Other	39	11.57
No	243	72.11
Already heard of the VL		
No/ Don't	256	75.96
Yes	81	24.04
Ever heard of CD4 count		
No/ Don't	220	65.28
Yes	117	34.72
Have received explanations on VL		
No/ Don't	307	91.10
Yes	30	08.90
Have had the CD4 count explained to		
No/ Don't	296	87.83
Yes	41	12.17
Know the explanation VL		
No/ Don't	306	90.80
Yes	31	09.20
Be able to explain the VL		
Correct	12	38.71
Incorrect	13	41.94
Partially	6	19.35
Most important test between VL and		
CD4	50	14.84
VL	15	04.45
Don't know	272	80.71
Have already benefited from		
No/ Don't	7	02.08
Yes	330	97.92
To have received explanations of the		
No/ Don't	326	96.74
Yes	11	03.26
Have received explanations on the		
No/Don't	324	96.14
Yes	13	03.86

Performing and interpreting the viral load

Ninety-nine patients (29.38%) had already had a viral load in previous years and 92 (27.30%) had received a viral load interpretation.

A VL was prescribed to 148 (43.92%) patients at their last consultation in 2019 and 121 (81.76%) had performed it. At the consultation, the physician would have interpreted the viral load results most often as "it's undetectable" (43.70%; n=52), or "it's good" (36.13%; n=43). Table IV shows the distribution of patients according to the performance and interpretation of the VL.

Table IV: Distribution of patients according to the performance and interpretation of the viral load

Categories	Frequenc	Percenta
Have already achieved previous years		
No/Don't	238	70.62
Yes	99	29.38
Number of VC achievements in previous		
No/Don't	326	96.74
1	70	70.71
2	24	24.24
3	4	04.04
4	1	01.01
Interpretation received in consultation		
No/Don't	245	72.70
Yes	92	27.30
Interpretation received		
It's okay.	58	63.04
This is not	12	13.04
Detectable but less	3	03.26
Undetecta	16	17.39
Don't	3	03.26
Does the doctor have a VL request in		
No/Don't	189	56.08
Yes	148	43.92
If so, was the viral load performed?		
Don't	1	0.68
No	27	18.25
Yes	121	81.76
If VL performed in 2019 what was the		
It's okay.	43	
This is not	1	0.84
Detectable	8	06.72
Detectable	3	02.52
Undetecta	52	
Don't	12	

Reasons for not performing viral load according to patients

In the study, 77 (63.64%; n=121) patients had performed the load in search of perfect health and 27 (21.95%; n=121) at the request of the physician. The reasons given by those who did not perform the viral load test after doctor's prescription are detailed in table V.

Table V: Reasons for not performing a viral load test

Categories	(n)	(%)
Reasons for not achieving VL		
Thought that VL was paid for	9	34.62
Unwelcome in the lab	6	23.08
Travel / Moving	4	15.39
Lack of knowledge of the timing of the VL	3	11.54
Family problem	2	07.69
Sick during the period	1	03.84
It is too much to carry out the VC once a year	1	03.84

Difficulties related to the realization of the viral load according to the patients

The difficulties in performing the VL were diverse (Table VI).

Table VI: Distribution of patients according to difficulties in performing viral load

Categories	(n)	(%)
Reasons for not achieving the VL		
Quality of the	7	31.75
No explanation on	4	16.00
It is too much to carry	3	12.00
Distance from the	13	52.00
Thought the VL	13	52.00
Discouragement	22	14.64
Causes of difficult viral load access		
The cost	140	41.54
The distance	24	07.12
Patient ignorance	184	54.60
Reception at the care	48	14.24
Difficulties	21	14.00
Other reasons	130	38.58

Analysis of factors associated with the achievement of at least one viral load during treatment follow-up

In univariate (Table VII) and multivariate (Table VIII) analysis, residence, level of education, and knowledge of viral load as an essential test in the follow-up of PLWHIV were

the factors associated with the performance of viral load.

Table VII : Factors associated with the achievement of a viral load in univariate analysis

Variables	Univariate analysis	
	Orb (IC$_{95\%}$)	P
Age (year)		
< 24	1	
24 – 49	2.28 (0.56 – 9.32)	0.249
≥ 50	1.51 (0.34 – 6.65)	0.582
Sex		
Female	1	
Male	1.09 (0.64 – 1.84)	0.739
Residence		
Outside Ouagadougou	1	
Ouagadougou	0.32 (0.11 – 0.92)	0.034
Study status		
Not in school	1	
Educated	2.24 (1.44 – 3.47)	0.000
Source of revenue		
Fixed pitch		
Fixed	0.86 (0,54 – 1.38)	0.554
Knowledge of the VL as an essential test		
No	1	
Yes	5.01 (2.24 – 11.17)	0.000

Table VIII : Factors associated with achieving a viral load in multivariate analysis

Variables	Univariate analysis Orb (IC$_{95\%}$)	
Age (year)		
< 24	1	
24 – 49	2.28 (0.56 – 9.32)	0.249
≥ 50	1.51 (0.34 – 6.65)	0.582
Sex		
Female	1	
Male	1.09 (0.64 – 1.84)	0.739
Residence		
Outside	1	
Ouagadougou	0.32 (0.11 – 0.92)	
Study status		
Not in school	1	
Educated	2.24 (1.44 – 3.47)	**0.000**
Source of revenue		
Fixed pitch		
Fixed	0.86 (0.54 – 1.38)	0.554
Knowledge		
No	1	
Yes	5.01 (2.24 –	**0.000**

DISCUSSION
Limitations and constraints of our study

Our study was based on interviews and on the use of files. As for the interview component, data collection can be biased, either because of forgetfulness or simply because the interviewees conceal the truth, especially when it comes to a subject as sensitive as HIV and sexuality, which are still taboo in our regions.

Socio-demographic characteristics of patients

The average age of our patients is corroborated by other authors [7, 8, 9]. This average age is increasingly higher, thanks to ART.

With a sex ratio (F/H) of 3.68, the majority of patients were female. This female predominance in HIV-infected patients in sub-Saharan Africa has been reported in the literature [10, 11, 12].

Almost half of the patients (45.56%) did not have a fixed monthly income. Poverty is believed to be a vulnerability factor exposing to HIV infection [11, 13].

Patients with no schooling (about 44%) were the least represented. However, HIV infection affects all social classes. Selection bias could be an explanation for this observed difference. Most HIV-infected patients live in couples [5, 7, 14].

The average distance travelled by patients from home to the follow-up facility was significant (21 km). The fear of stigmatization would be a reason for this, pushing patients to go beyond their area of residence in order to better conceal their seropositive status.

Clinical, biological and therapeutic aspects

Although the discovery of HIV infection is done at advanced clinical stages for some authors [15, 16], the majority of patients included in the study were at clinical stage 1 or 2 of the WHO classification. The discovery of HIV infection and its management would be increasingly early, thanks to the adoption at the national level of the WHO recommendations which are included in the document of standards and protocols for the management of HIV infection [17].

Majority of the patients were still on first line ART (90.83%). The prescriptions were in accordance with the current recommendations [17].

Assessment of patients' knowledge and understanding of biological tests

Knowledge of essential HIV follow-up tests

More than half of our patients did not know the different essential tests for monitoring HIV infection (72.11%). The reasons that could be incriminated in this low knowledge of biological examinations are the lack of schooling of most of the patients and the insufficiency of therapeutic education but also the lack of contextualization (translation in local language) during consultations and therapeutic education sessions

Information and explanations received on CD4 count and viral load

More than half of the participants had not heard of the VL and CD4 rate, respectively 75.96% and 65.28%. In another referral facility, the CHU Yalgado OUÉDRAOGO, 63.29% of patients were aware of the VL [18] and 74.88% of the CD4 count. Doctors Without Borders in South Africa [18] reported that 83% of patients had heard of the viral load. Explaining the viral load test to patients during therapeutic education sessions would contribute to a wider use of the viral load in case the physician forgets to prescribe it.

Be able to explain the viral load test

Only 8.90% (n=30) of the study participants could explain what the viral load test was. Indeed, few patients were able to explain the test [18]. This is not always the case elsewhere as reported by "Doctors Without Borders" in South Africa [19] where 62% of the patients were able to explain what the viral load test consists of. It would be wise to explain and give clear information about viral load to patients according to their level of understanding.

Therapeutic education and explanation of the therapeutic goal and the usefulness of the viral load

Therapeutic education is a very important step that every HIV infected patient should receive before any initiation of ART, which was remarkable in our study with 97.92% of patients having received therapeutic education. On the other hand, almost all 96.74% (326) had not received any explanation about the therapeutic purpose and 96.14% (324) about the usefulness of viral load. The time given to the therapeutic education sessions and the topics covered should be addressed.

Importance of viral load and CD4 count

In our study 80.71% (272) patients did not know the most important test between viral load test and CD4 count. There were 14.84% (n=50) who opted for CD4 count and 4.45% (n=15) for viral load. The low level of education and the lack of optimal information on the biological examinations of follow-up and particularly the viral load could explain these results.

Have you ever paid for a viral load?

Although free of charge in all public facilities in Burkina Faso, 31.75% had already paid for a viral load test. Tapsoba [18] reported that 38.16% of patients had already paid for a viral load test. A circular from the permanent secretariat for the fight against HIV/AIDS and sexually transmitted infections reminding people that viral load tests are free of charge in all facilities would be useful.

Performing and interpreting the viral load

Some patients receive an interpretation of their viral load test result. This interpretation often does not allow the patient to understand. In this interpretation, the expression "it is good", "it is not good", "it is detectable", "it is undetectable" [9]. The results should be better explained to patients in simple terms or even in local languages.

Burkina Faso has integrated in its document of standards and protocols, the recommendations of the WHO which recommends at least one viral load per year for each patient. Recommendations that are sometimes not respected by prescribers, as shown by the rate of prescription of the viral load examination which was 43.92% in 2019 in the structure. A reminder of the recommendations during ongoing training could improve this prescription rate.

Factors associated with achieving a viral load

In univariate and multivariate analysis, we found a significant association between level of education, residence, knowledge of viral load as an essential test, and completion of a viral load during treatment follow-up. Patients with education were more likely to have a viral load. Being educated would facilitate good communication and better understanding

between doctor and patient during the consultation and therapeutic education sessions. An explanation in the local language, if necessary, with a translator (if the provider does not understand the language in which the patient speaks) would be an asset.

Patients residing in Ouagadougou and living less than 25 km from the facility had their viral load tested. The facility should be brought closer to the patient. In addition to these factors, we should not lose sight of the reasons given by the patients during the interview to justify the fact that they had not carried out the viral load test. These reasons were multiple: either related to the facility (service of care, laboratory), or related to the patients or providers. It would be necessary to raise awareness among providers and patients, ensure the availability of inputs, and allow access to viral load tests at any time, even during consultations.

CONCLUSION

Viral load is an important indicator in the monitoring of people living with HIV infection. Despite the fact that it is free of charge, the rate of implementation remains low at the national level. Awareness-raising, compliance with recommendations, continuous training and the availability of inputs would improve the rate of viral load testing. In addition, larger-scale studies, involving all national HIV care facilities and health care personnel, would make it possible to identify other factors that could limit the achievement of the viral load, which is so important in the monitoring of PLWHIV.

Ethics approval and consent to participate

Ethical clearance for this study was obtained from the National Ethics Committee of Burkina Faso (No2022/000151/MSHP/MESRI/CERS). All methods were performed in accordance with the relevant guidelines and regulations and the principles of the Declaration of Helsinki.

Consent for publication: "Note applicable"

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due [the sensitivity of the subject in our context] but are available from the corresponding author on reasonable request. This requires the authorization of the hospital Director.

Competing interests

"The authors declare that they have no competing interests"

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