Biological Profile of People Living with Human Immunodeficiency Virus Starting Treatment in Kinshasa, Democratic Republic of the Congo

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Abstract

Context: The biochemical assessment is a real-time indicator of the state and evolution of an infection. Among other things, it makes it possible to determine the right moment when it becomes necessary to start or change a treatment. **Objective:** The objective of this study is to present the Biological profile of People Living with HIV starting AntiRetroViral treatment in Kinshasa in the era of Dolutegravir. **Methods:** The present study is a descriptive cross-sectional to determine the biological profile of People Living with HIV (PLHIV) starting AntiRetroViral Treatment (ART). The patient inclusion period was from October 4, 2021 to February 15, 2022. Sixteen centers were included. A sample of 5 ml of blood was taken in a tube with EDTA. Patients were randomly included consecutively in the centers during consultations. The population was made up of adults aged over 18, infected with HIV and starting ART. The parameters of interest retained for the present study were: sex, age, hemoglobin level, blood sugar, urea, creatinine, transaminases, total cholesterol, triglycerides, proteins total, as well as amylase. **Results:** 119 patients were included in this study in accordance with the inclusion criteria; 67 (56.3%) are female, giving a sex ratio of 1.29 in favor of women. The average age of the patients is 39.87 ± 12.36 years. The most represented age group is that of 36 to 45 years with 37 patients (31.9%). The mean values of the bio-

logical parameters of the patients at the start of ART are as follows: 31.61 ± 20.71 IU/L for ALT/SGPT, 25.81 ± 19.96 IU/L for AST/SGOT, 79.35 ± 49.49 IU/L for Amylase, 108.13 ± 62.17 mg/dl for Total Cholesterol, 2.77 ± 1.27 mg/dl for Creatinine, 72.53 ±22.23 mg/dl for Glycaemia, 10.30 ± 2.33 g/dl for Hemoglobin, 7.91 ± 1.75 g/dl for Total Protein, 131.23 ± 68.80 mg/dl for Triglycerides, and 33.61 ± 26.27 mg/dl for Urea. **Conclusion:** Mean values of PLHIV are, for the most part, within the normal range. The average creatinine is higher than the normal average value while the average total cholesterol is below the limit values.

1. Introduction

After four decades of fighting against the Human Immunodeficiency Virus (HIV) infection, it is still a major public health problem throughout the world. According to the United Nations Organization for the Fight against HIV/AIDS (UNAIDS), in 2020 there were an estimated 37.7 million [30.2 million - 45.1 million] the number of People Living with HIV/AIDS (PLHIV) and 1.5 million [1.0 million - 2.0 million] people were newly infected with HIV/AIDS in the same year [1]. Similarly, the World Health Organization (WHO) estimated that Sub-Saharan Africa remains the most affected region which bears the heaviest burden of the epidemic with 26 million people living with HIV and representing 70% of all AIDS-related deaths worldwide [2].

The assessment of the biological parameters constitutes a real-time witness on one hand of the state and the evolution of an infection, and on the other hand of the effectiveness and the tolerance of the treatment to that infection. The biological assessment of initiation and follow-up of HIV infection, which is often accompanied by an immunological, virological and molecular assessment, is an important complement to the clinical evaluation of the infected patient. Among other things, it makes it possible to determine the right moment when it becomes necessary to start or change a treatment.

But with the "Test and Treat" strategy, the care of PLHIV has been corrupted to simplify patient follow-up. The various patient biochemical monitoring parameters are no longer considered to put patients on AntiRetroViral Treatment (ART) for Limited Resource Countries (LRCs) [3] [4]. This makes it difficult to properly apprehend patients at the start of ART. Indeed, the use of certain ARVs that are particularly effective against HIV infection is accompanied by side effects, which are very toxic for certain vital organs such as the pancreas, kidneys and liver. Thus, the monitoring of specific biological markers is essential to assess the functioning of these vital organs [5].

It is important to specify that the evaluation of biological parameters remains

an essential tool for good orientation in the management of patients. These parameters are important for the epidemiological monitoring of patients, the accuracy of the established diagnosis, and adherence to ART and support for patients at the start of treatment. In the absence of these parameters, under the cover of the "test and treat" strategy for LRCs, patients are put on ART without para-clinical guidance.

Hence the objective of this work is to present the Biological profile of People Living with HIV before being put on AntiRetroViral treatment in Kinshasa in the era of Dolutegravir.

2. Methods

2.1. Study Design, Patient and Sample Setting

The present study is a descriptive cross-sectional one to determine the biological profile of People Living with HIV (PLHIV) starting AntiRetroViral Treatment (ART) in an HIV Outpatient Treatment Center (OTC) in Kinshasa, Democratic Republic of Congo (DRC). The patient inclusion period was from October 04, 2021 to February 15, 2022, where all patients initiating ART in an OTC were included. Sixteen OTCs were included in the study for their expertise in the care of PLHIV, their technical sampling platform and their accessibility [6]. All patients signed a written consent in order to be included for the study.

In the OTCs, a sample of 5 ml of blood was taken in a tube with EDTA anticoagulant from the vein in the bend of the elbow for biochemistry analyzes in any HIV positive patient by serology according to the national protocol, after reading and signed informed consent. Patients were randomly included consecutively according to their presence in the OTCs during the consultations.

The biological data were recorded on the study sheets previously tested by the work team.

2.2. Study Population

The population of the present study was composed of adults over the age of 18 at inclusion, infected by HIV and initiating ART in the OTC during the inclusion period.

2.3. Parameters of Interest

The parameters of interest retained for the present study were: sex, age, hemoglobin level, blood sugar, urea, creatinine, Alanine AminoTransferase/Serum Glutamate Pyruvate Transaminase (ALT/SGPT) and Aspartate AminoTransferase/ Serum Glutamate Oxaloacetate Transaminase (AST/SGOT), total cholesterol, triglycerides, proteins total, as well as amylase.

2.4. Biological Analyzes

After blood collection, the samples were taken, respecting the temperature, to the Biochemistry laboratory of the Faculty of Pharmaceutical Sciences for analy-

sis. The different analyzes were carried out on a spectrometer (HumaLyzer Primus, Human, Germany) with the different respective analysis kits. Hemoglobin was evaluated using a hematology analyzer (HumaCount 60TS, Human, Germany) with specific reagents. All the biological analyzes were carried out according to the protocols in force at the biochemistry laboratory.

2.5. Ethical Consideration

This study has been approved as a whole by the research ethics committee of the School of Public Health, Faculty of Medicine, University of Kinshasa (*ESP/CE*/115/2021). Authorization to access the OTCs was obtained from the competent authorities of the various institutions included. Prior to inclusion, fully informed consent was obtained from each patient. The blood samples were taken by the technical teams of the centers. The results of the biological analyzes were returned to the each centers at the end of the examinations.

2.6. Statistical Analyzes

Analyzes were carried out using SPSS software version 26 (Statistical Package for Social Sciences, IBM). Only available data were analyzed, missing data were considered completely random. Continuous variables were presented as mean ± standard deviation and compared using Student's t-test. Proportions and their respective 95% confidence intervals were calculated for categorical data.

3. Results

One hundred and nineteen (119) patients were included in this study in accordance with the inclusion criteria; 67 (56.3%) are female while 52 (43.7%) are male, giving a sex ratio of 1.29 in favor of women. Figure 1 shows the above data. The average age of the patients included is 39.87 ± 12.36 years with extremities of 18 to 69 years. The most represented age group is that of 36 to 45 years with 37 patients (31.9%) followed by that of 26 to 35 years with 24 patients (20.7%), that of 46 to 55 years with 22 patients (19.0%) and that of 18 to 25 years with 19 patients (16.4%). These data are presented in Figure 2. Table 1 presents all the above data.

The mean values of the biological parameters of the patients at the start of ART are as follows: 31.61 ± 20.71 IU/L for ALT/SGPT with extremes of 0.70 to 95.5 IU/L; 25.81 ± 19.96 IU/L for AST/SGOT with endpoints of 0.90 to 105.7 IU/L; 79.35 ± 49.49 IU/L for Amylase with ranges from 0.80 to 200.9 IU/L; 108.13 ± 62.17 mg/dl for Total Cholesterol with ranges from 7.8 to 530 mg/dl; 2.77 ± 1.27 mg/dl for Creatinine with ranges from 0.60 to 12.9 mg/dl; 72.53 ± 22.23 mg/dl for Blood Glucose with ranges from 7.0 to 121.0 mg/dl; 10.30 ± 2.33 g/dl for Hemoglobin with ranges from 3.4 to 16.59 g/dl; 7.91 ± 1.75 g/dl for Total Protein with endpoints of 5.10 to 20.60; 131.23 ± 68.80 mg/dl for Triglycerides with ranges from 2.8 to 365.0 mg/dl; and 33.61 ± 26.27 mg/dl for Urea with ranges from 10.0 to 140.0 mg/dl. These data are presented in Table 2.
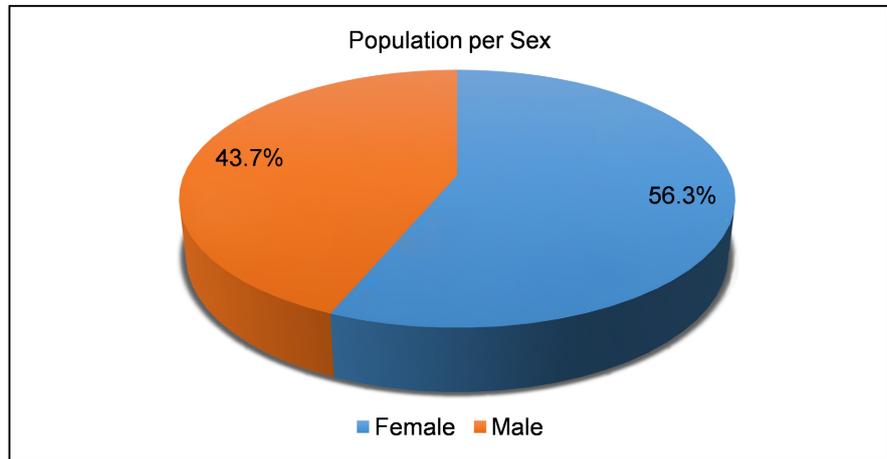
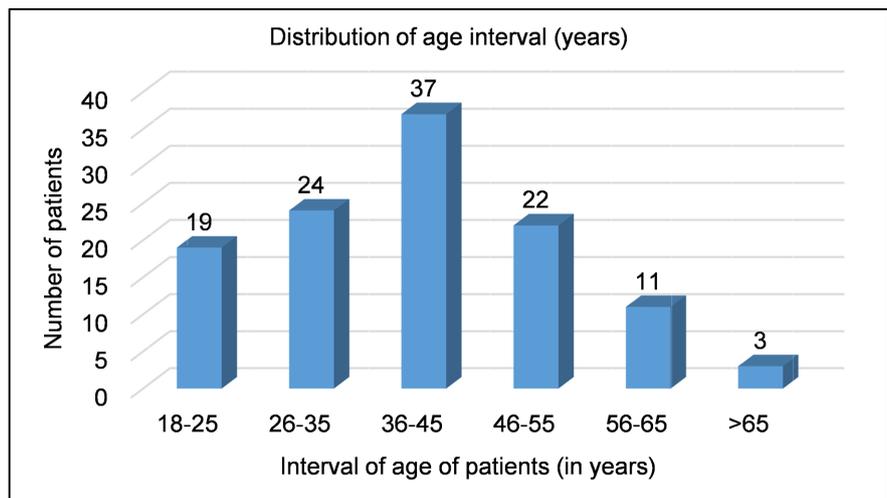**Figure 1.** Distribution of the population by gender.

Figure 2. Distribution of age interval.

Table 1. Distribution of the population by gender and age groups.

Parameters	Patients	
	Values	Percentage
Sex (*N* = 119)		
Female	67	56.3
Male	52	43.7
Age groups (*N* = 116) *in years*		
18 - 25	19	16.4
26 - 35	24	20.7
36 - 45	37	31.9
46 - 55	22	19.0
56 - 65	11	9.5
>65	3	2.5

Table 2. Biological values of patients at inclusion.

Parameters	Patients		Normal Values
	Mean	Standard deviation	
ALT/SGPT (IU/L)	31.61	20.71	0 - 41 UI/L
AST/SGOT (IU/L)	25.81	19.96	0 - 31 UI/L
Amylase (IU/L)	79.35	49.49	≤90 UI/L
Total cholesterol (mg/dl)	108.13	62.17	110 - 200 mg/dl
Creatinine (mg/dl)	2.77	1.27	0.5 - 1.5 mg/dl
Blood glucose (mg/dl)	72.53	22.23	60 - 110 mg/dl
Hemoglobin (g/dl)	10.30	2.33	≥ 12 g/dl
Total protein (g/dl)	7.91	1.75	6.6 - 8.2 g/dl
Triglycerides (mg/dl)	131.23	68.80	35 - 185 mg/dl
Urea (mg/dl)	33.61	26.27	15 - 45 mg/dl

4. Discussion

The main objective of this study was to present the Biological profile of People Living with HIV (PLHIV) starting AntiRetroViral treatment in Kinshasa in the era of Dolutegravir. One hundred and nineteen PLHIV were included, in accordance with the criteria, for this study initiating treatment in 16 Outpatient Treatment Center (OTC) disseminated in the four districts of Kinshasa, Democratic Republic of Congo.

Sixty-seven (67) patients, 56.3%, are female while 52 (43.7%) are male, thus giving a sex ratio of 1.29 in favor of women. These results presenting a sex ratio in favor of the female sex are similar to the trend in relation to the various studies published for Kinshasa in recent years [7] [8] [9].

The average age of the patients included is 39.87 ± 12.36 years with extremities of 18 to 69 years. The most represented age group is that of 36 to 45 years with 37 patients (31.9%) followed by that of 26 to 35 years with 24 patients (20.7%), that of 46 to 55 years with 22 patients (19.0%) and that of 18 to 25 years with 19 patients (16.4%). These values, which present the dominant age group of 36 to 45 years, are shared by the various authors who have published on PLHIV in Kinshasa in recent years [7] [8] [9].

The biological parameters characterize the different substances of the organism whose concentration is relatively constant and whose degree of variation makes it possible to judge the functional state of the organism. The quantitative assessment of these substances by the dosage and the comparison of the results obtained with so-called normal or constant biological values make it possible to highlight a possible pathological state. These so-called normal values result from statistical studies carried out on a large number of subjects considered to be

healthy and representative of the population whose biological constants are to be determined [10].

The mean value of Alanine-Amino-Transferase (ALAT) transaminases was 31.61 ± 20.71 IU/L for PLHIV starting ART with endpoints of 0.70 to 95.50 IU/L. Normal values are in the range of 0 to 41 IU/L. Hence, the mean of the present population is within the normal range with a tendency to rise at the start of ART. This may point towards the presence in some of the liver diseases to be observed in these patients.

The mean value of Aspartate-Amino-Transferase (ASAT) transaminases was 25.81 ± 19.96 IU/L for PLHIV starting ART with extreme values of 0.90 to 105.70 IU/L. Normal values are in the range of 0 to 31 IU/L. Hence, the mean of the present population tends towards the upper limit of the normal range of acceptable values, as for the mean ALT, at the start of ART.

The mean Amylase value was 79.35 ± 49.49 IU/L for PLHIV starting ART with endpoints of 0.80 to 200.9 IU/L. Normal values are below 90 IU/L. Hence, the mean of the present population is within the normal range with a trend towards the upper limit at the start of ART.

The mean total cholesterol value was 108.13 ± 62.17 mg/dl for PLHIV starting ART with extreme values of 7.8 to 530.0 mg/dl. Normal values are in the range of 110 to 200 mg/dl. Hence, the mean of the present population is lower than the interval. The average indicates hypolipemia present in patients starting ART.

The mean Creatinine value was 2.77 ± 1.27 mg/dl for PLHIV starting ART with endpoints of 0.60 to 12.90 mg/dl. Normal values are in the range of 0.5 to 1.5 mg/dl. Hence, the average of the present population is well above the normal acceptable range at the start of ART.

The mean blood glucose value was 72.53 ± 22.23 mg/dl for PLHIV initiating ART with extreme values of 7.0 to 121.0 mg/dl. Normal values are in the range of 60 to 110 mg/dl. Hence, the mean of the present population is within the normal range with a trend towards the lower limit at the start of ART.

The average Hemoglobin value was 10.30 ± 2.33 g/dl for PLHIV initiating ART with endpoints of 3.4 to 16.59 g/dl. Normal values are greater than or equal to 12 g/dl. Hence, the mean of the present population is below the normal acceptable value at the start of ART.

The mean value of total protein was 7.91 ± 1.75 g/dl for PLHIV initiating ART with extreme values of 5.10 to 20.60 g/dl. Normal values are in the range of 6.6 to 8.2 g/dl. Hence, the mean of the present population is within the normal range with a trend towards the upper limit at the start of ART.

The mean Triglyceride value was 131.23 ± 68.80 mg/dl for PLHIV initiating ART with endpoints of 2.8 to 365.0 mg/dl. Normal values are in the range of 35 to 185 mg/dl. Hence, the average for the present population is comfortably within the normal range at the start of ART.

The mean urea value was 33.61 ± 26.27 mg/dl for PLHIV initiating ART with extreme values from 10.0 to 140.0 mg/dl. Normal values are in the range of 15 to

45 IU/L. Hence, the average of the present population is within the normal acceptable range at the start of ART.

Some values mentioned above do not agree with those of the literature available for PLHIV in Kinshasa [9]. The differences mainly lie in the patient inclusion criteria and the stages of evaluation of these parameters in relation to HIV infection; in the present study, all patients are on day 0 and naïve to ART. Nevertheless, the data of the mean protein values corroborate that found in the literature which presents hyper-proteinemias observed in a population of PLHIV followed in Kinshasa at different stages [11].

Limitations of the Study

The present study was limited to some centers of Kinshasa. Therefore, generalization should be done carefully.

5. Conclusion

Biological values of people living with HIV starting ART are related to patient physiology and stage of infection. These average values are, for the most part, within the normal range. The average creatinine is higher than the normal average value while the average total cholesterol is below the limit values.

Acknowledgments

Conflicts of Interest

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

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List of Abbreviations and Acronyms

ALT: Alanine AminoTransferase; **SGPT:** Serum Glutamate Pyruvate Transaminase; **AST:** Aspartate AminoTransferase; **SGOT:** Serum Glutamate Oxaloacetate Transaminase; **ART:** AntiRetroViral Treatment; **ARV:** AntiRetroViral; **DRC:** Democratic Republic of Congo; **DTG:** Dolutegravir; **HIV:** Human Immunodeficiency Virus; **IU:** International Unit; **LRC:** Limited Resource Countries; **OTC:** Outpatient Treatment Center; **PLHIV:** Person Living with Human Immunodeficiency Virus; **RST:** Rapid Screening Test; **SSA:** Sub-Saharan Africa.