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Research Article

Biological Monitoring of Children Living With HIV on ARVs at the Pediatric Ward of the Donka National Hospital

Camara Salematou Hassimiou[2,3], Aïssata Barry[2,3], Toure Amadou Oury[1,3*], Mariama Sadjo Diallo[1], Nabé Aminata[2], Doukouré Mamadou Aliou[2], Ibrahima Sory Diallo[1,3], Bangoura Mmah Aminata[1,3]

[1]Department of Pediatrics, Institute of Nutrition and Child Health, Conakry, Guinea; [2]Department of Pediatrics, Donka National Hospital, Conakry, Guinea; [3]Department of Health Sciences and Technology, Gamal Abdel Nasser University of Conakry, Conakry, Guinea

ABSTRACT

Objective: Human Immunodeficiency Virus (HIV) infection in children is a public health problem and a priority, as it is one of the main causes of morbidity and mortality in infants and children. Biological monitoring is just as essential as clinical and psychosocial monitoring, and forms part of the general monitoring of patients on Antiretroviral (ARV) therapy.

Methods: We conducted a descriptive cross-sectional study over a 15-month period from January 1, 2017 to March 31, 2018, in the pediatric department of Donka National Hospital. In the course of this study, all HIV-positive children aged 2 to 17 years followed and/or hospitalized in the department under antiretroviral treatment, and having performed the biological workup at treatment initiation and at M6 or M12 were included.

Results: We found an active file of 182 patients in the department, all of whom were on ARVs. The number of HIV-positive individuals included in this study was 30. The age range 5 to 9 years was the most represented at 56.7%, with extremes of 2 and 14 years. Females accounted for 56.7%, with a gender ratio Male/Female=0.76.

Conclusion: Prevention through education remains the most accessible weapon for developing countries. For a real reduction in HIV prevalence. The provision of a high-performance technical platform, decentralization of ECP and ongoing staff training will improve biological monitoring of children living with HIV.

Keywords: Biological; Children; Human Immunodeficiency Virus; Antiretroviral

INTRODUCTION

Human Immunodeficiency Virus (HIV) infection in children is a public health problem and a priority, as it is one of the main causes of morbidity and mortality in infants and children [1].

Biological monitoring is just as essential as clinical and psychosocial monitoring, and forms part of the general monitoring of patients on Antiretroviral (ARV) therapy. It is generally carried out in two stages: Before and after the start of treatment. Viral load and Differentiation Class (CD) 4 T lymphocyte count are the main biological analyses used to assess the evolution of HIV infection in children. In addition, viral load is used as a marker to monitor disease progression and measure the efficacy of ARV treatment. Plasma RNA quantification measures the level of viral replication and its corollary, the rate of CD4 lymphocyte destruction. In children, the normal percentage is over 25%, while a percentage below 15% defines a severe infection. This value can be used to

Correspondence to: Toure Amadou Oury, Department of Pediatrics, Institute of Nutrition and Child Health, Conakry, Guinea, Telephone number: (00224) 622 437 976; E-mail: toureamadououry61@gmail.com

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estimate the risk of HIV-related clinical manifestations and opportunistic infections [2].

According to the 2021 United Nations Acquired Immune Deficiency Syndrome (UNAIDS) report worldwide, 38.4 million people were living with HIV, including 36.7 million adults and 1.7 million children aged 0-14. In the same year, there were an estimated 1,600,00 new HIV infections among children, including 54,000 in West and Central Africa [2].

In Guinea, the HIV epidemic is generalized, with a prevalence of 2%, including 6,300 children living with HIV in 2018. Around 60,000 children are AIDS orphans, making up 13.4% of all orphans in Guinea [3].

Pediatric HIV care at Hospital National Donka began in 2005. The care package (serology, lymphocyte typing and ARV treatment) was made free of charge in 2007. Despite the progress made in the management of HIV/AIDS infection in children under 17, there is a frequent shortage of inputs and the high cost of other tests, which are borne by parents. To our knowledge, no study has been carried out to evaluate the follow-up of children on Antiretroviral Therapy (ART) in our department. It seemed appropriate to us to carry out the present work in order to contribute to the improvement of the care of children living with HIV at Donka. The aim of this study was to describe the biological parameters of children living with HIV on ART in the pediatric ward of the Donka National Hospital [4-8].

MATERIALS AND METHODS

Study design

The pediatrics department of Donka National Hospital served as our setting for this study.

Type and duration of study: This was a descriptive cross-sectional study over a 15-month period from January 1, 2017 to March 31, 2018.

Selection criteria

Inclusion criteria: Were included in this study all HIV-positive children aged 2 to 17 years followed and/or hospitalized in the department during the study period under antiretroviral treatment, and having completed the biological workup at treatment initiation and at M6 or M12 [9,10].

Exclusion criteria: All HIV-positive children admitted to the department outside the study period or who had not undergone a biological check-up at initiation: M6; and all Prevention of Mother-To-Child Transmission (PMTCT) cases.

Sample

All children meeting our selection criteria were included.

Study variables: Our variables were quantitative and qualitative. Quantitative variables included age, weight, CD4 lymphocyte count, plasma viral load, blood count.

Biochemical parameters: Blood glucose, creatinemia, transaminases.

Qualitative variables: Gender, residence, parent's vital status, parent's serology, HIV typing, clinical stage, molecules used, antiretroviral treatment.

Evolution: Active file, lost to follow-up, transferred and deceased.

Data collection technique

Data were collected manually from the consultation and follow-up registers, patient files and the results of complementary examinations, then recorded on a survey form.

Collection procedure: All our patients were sampled and registered at the laboratory of the day hospital of the Donka National Hospital. This laboratory has equipment for CD4 count and plasma viral load.

RESULTS

The total number of HIV-positive people followed (active file) was 182, all of whom were on ARVs. Of these, 30 tested positive were included in the study. There were no patients lost to follow-up, one transferred and one deceased (Table 1).

In this study, the most represented age group was between 5 and 9 years, i.e., 56.7%, with extremes of 2 and 14 years. Females were the most represented at 56.7%, with a gender ratio M/F=0.76 [11-13].

With regard to parents, the percentage of living fathers and mothers was 76.7% and 66.7% respectively, with 100% of mothers being HIV-positive compared with 30% of fathers. WHO stage 2 patients were the most represented in this study, with 50%, followed by stage 4 patients (26.7%). Discovery mainly through PMTCT represented 63.3%, while clinical and intra-familial screening accounted for 33.3% and 3.3% respectively. In terms of CD4 evolution, the number of children with severe immune deficiency at inclusion (M0) was 26.66%. After 6 months of treatment, we observed a 30.01% increase in CD4 count and a 13.3% decrease at M12. Over the course of our study, the percentage of children with a viral load ≤ 1000 rose from 65.5% at 6 months to 85.7% at 12 months (Table 2).

Among the biological parameters performed on the children, 46.7% had a normal haemoglobin level (greater than 10.5 g/l) at inclusion, and 6 months later, 55.2% had moderate anemia (haemoglobin level between 8 g/l and 10.5 g/l). For white blood cells, 76.7% and 65.5% at baseline and six (06) months later, respectively, had levels of between 4 g/l and 10 g/l.

At baseline, 63.3% had creatinine levels below 61.8 µmol/l and at 6 months, 55.2% had creatinine levels between 61.8 µmol/l and 123.7 µmol/l. Atripla was the drug taken by more than half the children in our study (53.3%). And 76.7% of these children had not changed their line of treatment. With regard to evolutionary status, 94% remained in the department's active file, while for those who were transferred and those who died, the figures were 3% each.

Table 1: Sociodemographic and clinical characteristics of children on ARV treatment.

Characters	Numbers	Percentage (%)
Age (in years)		
1-4	4	13.3
5-9	17	56.7
10-15	9	30.0
Gender		
Female	17	56.7
Male	13	43.3
Residence		
Ratoma	17	56.7
Matoto	9	30.0
Dixinn	4	13.3
Weight (in Kg)		
19-26	16	53.3
11-18	8	26.7
27-34	3	10.0
35-40	2	6.7
3-10	1	3.3
Father of the child		
Live	23	76.7
Deaths	6	20.0
Not specified	1	3.3
Mother of the child		
Live	20	66.7
Deaths	10	33.3
Serology of the child's parents		
Father		
Not specified	14	46.7
Positive	9	30.0
Negative	7	23.3
Mother		
Positive	30	100.0

Clinical stage at screening		
Step 1	4	13.3
Step 2	15	50.0
Step 3	3	10.0
Step 4	8	26.7
Circumstances of discovery		
PTME	19	63.3
Clinic	10	33.3
Intra-family screening	1	3.3

Table 2: CD4 evolution, biological parameters and treatment of children living with HIV.

Evolution of CD4	**M0**		**M6**		**M12**	
	Number	%	Number	%	Number	%
No immune deficiency (≥ 500 cells/mm_3)	11	36.67	13	43.33	20	66.7
Moderate immune deficiency (200-499 cells/mm_3)	11	36.67	8	26.66	6	20.0
Severe immune deficiency (<200 cells/mm_3)	8	26.66	9	30.01	4	13.3
Biological parameters						
Haemoglobin (g/dl)						
>10.5	14	46.7	0	0	13	43.3
8-10.5	13	43.3	16	55.2	15	50.1
<8	3	10.0	13	44.8	1	3.3
No information	-	-	-	-	1	3.3
White blood cells (G/L)						
4-10	23	76.7	19	65.5	25	83.3
>10	6	20.0	3	10.3	1	3.3
<4	1	3.3	7	24.1	3	10.1

Blood glucose (mmol/l)						
3.33-6.10	27	90.0	28	93.3	27	90
<3.33	2	6.7	1	3.4	1	3.3
>6.10	1	3.3	-	-	0	0
No information	-	-	-	-	2	6.7
Creatininemia (U/L)						
<61.8	19	63.3	13	44.8	7	23.3
61.8-123.7	11	36.7	16	55.2	21	70
No information	-	-	-	-	2	6.7
ALAT (U/L)						
≤ 40.0	26	86.7	26	89.7	26	86.7
>40.0	4	13.3	3	10.3	3	10.0
No information	-	-	-	-	1	3.3
ASAT (U/L)						
≤ 38.0	25	83.3	26	89.7	26	86.6
>38.0	5	16.7	3	10.3	2	6.7
No information	-	-	-	-	2	6.7

Treatment/ Molecules	Number	%
Atripla	16	53.3
Duovir N	14	46.7
Change of line		
No	23	76.7
Yes	7	23.3
Children's status		
Transferred	1	3
Died	1	3
Active file	28	94

DISCUSSION

HIV infection in children remains a public health problem, and this study, which aimed to describe the biological parameters of children living with HIV on ARV in the pediatric ward of Donka National Hospital, enabled us to assess the biological parameters of 30 children collected between 2017-2018 i.e., a rate of 56.7% girls and 43.3% boys.

The most common age range was 5 to 9 years, with extremes of 2 and 14 years. Females were the most represented. A study by MBaye et al., in Senegal reported a gender ratio of 1.2 with a

median age of 2 years in a cohort of 98 children. Kalla et al., in Cameroon in 2011, on a sample of 116 children, 50.9% were male. In this study, the high rate of infection in the 5-9 age group could be explained by the immaturity of the immune system (which is not only still developing, but also weakened by HIV) [14,15].

As far as the parents were concerned, all the mothers were HIV-positive. The predominance of mothers in our study could be explained by the fact that the female genital organ is much more exposed to recurrent infections, making them more vulnerable and responsible for HIV transmission to their children.

WHO stage 2 patients were the most numerous. This trend could be explained by early diagnosis of HIV infection in children.

Speaking of CD4 evolution, among children included at M0 and presenting a severe immune deficiency, after 6 months of treatment we observed an increase in CD4 rate and a decrease at M12. This could be due to recurrent infection during treatment, poor compliance or relapse. Mbaye et al., in 2005 in Senegal reported a severe deficit at inclusion of 57%. The variation in viral load between months 6 and 12 in our study indicates good compliance with treatment. The reinforcement of post-test counseling, correct use of medication, free antiretroviral drugs and viral load would explain the improvement in our initial result [14].

Speaking of the biological parameters carried out on the children, after 6 months of treatment, anemia was moderate in more than half the patients. This could be explained by the ARV treatment with Zidovidine (which has an anti-anemic effect) and the occurrence of certain opportunistic infections.

The variation in white blood cell and creatinine levels between inclusion and 6 months of treatment could be explained by the weakness of biological monitoring in our context. Atripla was the drug of choice for the majority of children in our study. Our results are in line with the recommendations of the Guinean HIV management standards and protocols. In this study, patients who remained in the active file were the most numerous. This result differs from that found by Bouraima et al., in Togo in 2014, who reported 56.5% lost to follow-up [16].

The non-observance of certain mothers during pregnancy and their critical state of health could explain these cases of death. Acquired immunodeficiency virus in children could be kept under control through proper monitoring, including compliance, CD4 counts and viral load measurements by their mothers. However, more needs to be done to boost the confidence of these mothers in the community and in the care sites.

CONCLUSION

HIV infection in children remains a major public health problem in our country. At the end of this study, almost all patients had a severe immune deficiency at inclusion, and more than half had a viral load below 1000 after 6 months of treatment. Our experience in biological monitoring has taught us that biological parameters such as CD4 count, viral load, haemoglobin and white blood cell count are essential in monitoring patients on ARV treatment. Prevention through education remains the most accessible weapon available to developing countries for a real reduction in HIV prevalence, and the strengthening of PMTCT and ETME strategies and the meticulous control of blood products should contribute to this. The provision of a high-performance technical platform (PCR, CD4, CV), ARVs, IO, decentralization of PEC and ongoing staff training will improve biological monitoring of children living with HIV.

AUTHOR'S CONTRIBUTION

Study design by MBaye AD, Oury AT, Hassimiou SC; data collection by Hassimiou SC; data analysis by MBaye AD, Oury AT, Barry A; initial drafting of the manuscript by MBaye AD, Oury AT, Aliou MD; manuscript revision by MBaye AD, Oury AT, Diallo SM, Aminata N. The authors have read and approved the final manuscript.

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The authors declare that it was not funded article.

AVAILABILITY OF DATA MATERIALS

Data supporting the results of this study are available from [M'mah Aminata Bangoura1], but restrictions apply to the availability of these data and are therefore not publicly accessible, as our research group is working on further analyses using the same data which will then be submitted for publication. However, these data are available on reasonable request from the corresponding author [M'mah Aminata Bangoura1].

DATA ANALYSIS

Data were entered and analysed using Epi info version 7.2 software.

ETHICAL STATEMENT

This study was submitted to and approved by the chair of pediatrics. We obtained the declared assent of the children's parents or legal guardians and the informed consent of the older children before including them in the study.

DECLARATIONS

Ethical approval and consent to participation consent for publication, not applicable.

COMPETING INTEREST

The authors declare that there is no competing interest.

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