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Diagnostic, Therapeutic and Evolutionary Aspects of Children Living with HIV/AIDS at Maroua Regional Hospital, Cameroon

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Abstract

Introduction: Paediatric HIV infection is a health problem in Cameroon, prevention of mother-to-child transmission (PMTC) strategies have revolutionized the prognosis of exposed children. However, thousands of Cameroonian children are still living with HIV. We conducted a study to describe the diagnostic, therapeutic, and evolutionary aspects of HIV-infected children followed at the Maroua Regional Hospital's accredited treatment center (ATC). **Methodology:** We conducted a retrospective, descriptive study of HIV-infected children aged 0 to 19 years followed up from 2008 to 2023 at the MRH-accredited treatment center (ATC). The study period was from January 1 to June 31, 2024. The variables studied were socio-demographic, diagnostic, therapeutic, and evolutionary characteristics. Data analysis was performed using CSPro version 8.01 and SPSS version 22 software. **Results:** We collected 235 pediatric files meeting our inclusion criteria out of 4500 patients followed up at the ATC, representing 5.22% of HIV-infected patients at the ACT of MRH. The sex-ratio M/F was 0.8. The mean age was 11.5 ± 3.5 years (Min.: 1 month; Max.: 19 years). Adolescents accounted for 63.40% and the mode of transmission was vertical in 95.31% of cases. Children aged 2 - 5 years were diagnosed in 45.96% of cases. At the time of diagnosis, 32.8% were in WHO clinical stage 3 and 31.06% in stage 4. According to the antiretroviral treatment protocol (ART), 49. 36% were on triple therapy combining Abacavir, Lamivudine, and Dolutégravir (ABC + 3TC + DTG), and 37.02% were on the protocol combining Tenofovir, Lamivudine, and Dolutégravir (TLD). Chemoprophylaxis with Isoniazid and Trimethoprim sulfamethoxazole (Cotrimoxazole) was initiated in 51.48% and 70.21%

of patients, respectively. During follow-up, 73.2% had suppressed viral load. The mortality rate was 4.7%, and the lost to follow-up rate was 2.9%. **Conclusion:** HIV screening and diagnosis in children are still delayed. Systematic search for exposed children and early detection would improve optimal management of paediatric cases in the Far North region.

Keywords

HIV/AIDS, Children, Cameroon

1. Introduction

Paediatric HIV infection remains a major public health problem in developing countries, particularly in Cameroon, where 1.4 million of the 40.8 million people living with HIV/AIDS worldwide are children aged 0 to 14 [1]. HIV prevalence remains a concern among young people in Africa, despite the fact that many countries around the world have adopted strategies to prevent mother-to-child transmission (PMTCT). These prevention strategies have revolutionized the prognosis of HIV-exposed children worldwide [1] [2]. Mortality and morbidity among children living with HIV decreased from 240,000 in 2010 to 75,000 in 2024 [1]. However, the situation among children and adolescents remains worrying in Africa. In 2022, prevalence among children under 15 was 8% [2]. Sub-Saharan Africa is the most affected by this scourge, with 89% of new paediatric HIV cases, and HIV infection accounts for 88% of HIV-positive children and adolescents worldwide, with viral load suppression of only 24% [3].

In Cameroon, HIV prevalence has been falling in the general population over the last few decades, from 5.4% in 2004 to 2.7% in 2024. Prevalence is disparate in the different regions of Cameroon. The far north region has the lowest prevalence in the country at 1.1% [4] [5]. Cameroon's goal is to eliminate mother-to-child transmission (TME) of HIV by 2030. To achieve this, strategies to reduce MCTC have been adopted by the Ministry of Public Health through the National AIDS Control Committee (NACC), supported in this task by multiple partners [6] [7]. These strategies are based on the pillars of Cameroon's adoption of Option B+ in 2014, which involves treating all seropositive pregnant women, regardless of their clinical stage and immune status (CD4 count). Other pillars include primary prevention, which consists of education, awareness-raising, screening, and counseling of women of childbearing age. Prevention of unwanted pregnancies in HIV-positive women is achieved by offering family planning services to HIV-positive women, care of HIV-positive women and their children, and strengthening the health care system by training healthcare staff in PMTCT and the care of children living with HIV, supported by the decentralization of services and community involvement [8] [9]. Despite all strategies, children and adolescents aged 0 to 19 remain the most vulnerable, with 50,000 new cases of infection, *i.e.*, 7.9% of the general population, and

37% have access to ART [6] [8] [9]. The accredited treatment center (ATC) at Maroua Regional Hospital was set up in 2000 and is one of the first public centers in the Far North region to provide medical, psychosocial, and medicinal care for children infected with HIV/AIDS. This center has an active file of more than 4500 adult and child patients living with HIV/AIDS, admitted and monitored. In order to gain a better understanding of the situation of paediatric HIV in the region, and to identify the needs and challenges in paediatric care, we conducted this study on the diagnostic, therapeutic and evolutionary aspects of children treated at the region's referral accredited treatment center (ATC).

2. Methodology

The accredited treatment center (ATC) at Maroua Regional Hospital is one of the first public centers in the Far North region to provide medical, psychosocial, and medicinal care for children infected with HIV/AIDS. This Center has an active file of more than 4000 adults and almost 400 children and teenagers' patients living with HIV/AIDS admitted and monitored. The diagnosis of HIV in infants and children is based on the national algorithm. Rapid test: a sensitive test, Determine and a more specific test: OraQuick. In case of doubt, confirmation is carried out by ELISA. In Infants with persistent maternal antibodies, PCR is used. The PCR is carried out at 6 weeks, 9 months and the serogical confirmation test at 18 months for those not breastfed and 6 weeks after weaning for those breastfed. We conducted a retrospective, descriptive and analytic study of HIV-infected children aged 0 to 19 years followed up from 2008 to 2023 at the MRH-ATC. The study period was from January 1 to June 31, 2024. The variables studied were socio-demographic (age, gender, religion, origin), diagnostic (mode of transmissions, clinical stage, viral load, and diagnostic circumstances), therapeutic (antiretroviral protocol, chemoprophylaxis), and evolutionary characteristics. We used the Yamané formula [10] to calculate the minimum sample size $n = n^0/1 + (n^0 + 1/N)$, $n^0 = Z^2 \times p\,(1 - p)/m^2$. The p used corresponds to 0.5% given that the prevalence of HIV among children in Cameroon is not known, the minimum sample size was 195 patients. Data were collected from the patient files and the various registers according to a pre-established data sheet. Inclusion criteria were all HIV-infected patients receiving ART aged 0 to 19 years, followed up at the ATC during the study period. Sampling randomly in order to avoid selection bias and ensure fairness in the selection files. We ensured the confidentiality and anonymity of the data collected during this study and obtained authorization from the management of the MRH. Data analysis was performed using CSPro version 8.01 and SPSS version 22 software.

3. Results

3.1. Socio-Demographics Data

We compiled 235 Paediatric files representing 5.22% of patients living with HIV and followed up at the Maroua Regional Hospital's accredited treatment center

(ATC). The sex ratio M/F was 0.8. Adolescents accounted for 63.40%, with an average age of 11.5 ± 3.5 years (Min. 1 month; Max. 19 years). Most of these children (54.04%) were placed with guardian or extended family (Table 1).

Table 1. Distribution by socio-demographic data.

Socio-demographics	Variables	Frequency	Percentage (%)
Age	0 - 5 years	29	12.34
	>5 - 10 years	57	24.25
	>10 - 15 years	82	34.89
	>15 - 19 years	67	28.51
	Total	**235**	**100**
Sex	Male	108	45.96
	Female	127	54.04
	Total	**235**	**100**
Origin	Urban area	168	71.48
	Rural area	67	28.51
	Total	**235**	**100**
Religion	Muslim	131	55.74
	Christian	97	41.27
	Others	**7**	2.98
	Total	**235**	**100**
Type of Fireplace	Single-Parent	77	32.76
	Two Parent	31	13.19
	Guardian/Extended Family	127	54.04

3.2. Clinical Data

The age of diagnosis was 45.96% in children aged 2 - 5 years; at the start of treatment, 32.8% of patients were at WHO clinical stage 3 and 31.06% at WHO stage 4. Vertical transmission was found in 95.74% of cases. The circumstances of diagnosis were in 54.04% during hospitalization and in 15.31% during PTMCT follow-up of children (Table 2 and Figure 1).

Table 2. Distribution according to initial age of diagnosis and mode of transmission.

	Age	Frequency	Percentage (%)
Diagnosis	0 - 23 month	39	16.59
	2 - 5 years	108	45.96
	>5 - 10 years	60	25.53
	>10 years	28	11.91
	Total	**235**	**100**

Continued

Mode of Transmission	Vertical	225	95.74
	Sexual	5	2.13
	Blood Transfusion	1	0.42
	Soiled Object	2	0.85
	Unknown	2	0.85
	Total	**235**	**100**
Circumstances of Discovery	Hospitalization	127	54.04
	Medical Consultation	23	9.78
	Family Screening	29	12.34
	Community Screening	17	7.23
	Vaccination	3	1.27
	PTMCT	36	15.31

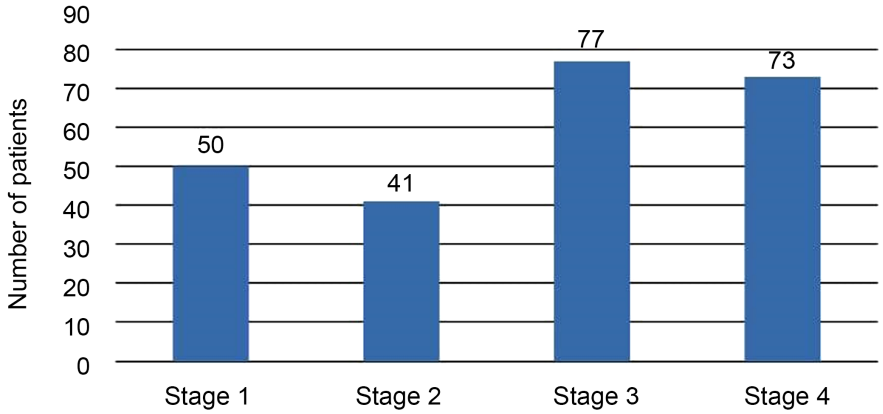

Figure 1. Distribution according to the WHO clinical stage at initiation of ART.

Table 3. Distribution according to ART protocol received.

	Treatment	Frequency	Percentage (%)
ART Protocol	ABC + 3TC + DTG	116	49.36
	TDF + 3TC + DTG	87	37.02
	ABC + 3TC + ATV/r	5	2.12
	AZT + 3TC + ATV/r	4	1.70
	TDF + 3TC + ATV/r	3	1.27
	TDF + 3TC + EFV	2	0.85
	TDF + 3TC + ATV/r + DTG	1	0.42
	TDF + 3TC + ATV/r + DRV/r	1	0.42
	Total	**235**	**100**
Chemoprophylaxis	Cotrimoxazole	165	70.21
	Isoniaside	121	51.48

ABC: Abacavir; AZT: Zidovudine; 3TC: Lamivudine; TDF: Ténofovir; ATV/r: Atazanavir/ritonavir; DTG: Dolutégravir; DRV/r: Darunavir/ritonavir.

3.3. Therapeutic and Evolutionary Data

The majority of patients (49.36%) were on Abacavir, Lamivudine, and Dolutégravir (ABC + 3TC + DTG), and 37.02% were on Ténofovir, Lamivudine, and Dolutégravir (TLD). Chemoprophylaxis with Isoniazid and Trimethropime sulfamethoxazole (Cotrimoxazole) was initiated in 51.48% and 70.21% of patients, respectively. During follow-up, 212 patients (90.21%) tested viral load, 155 (73.2%) had suppressed viral load and 26.89% had a high viral load. HIV resistance testing was performed in 5 children (2.5%), including 3 adolescents and 2 children. The mortality rate was 4.7% and 7 (2.9%) children were lost to follow-up (**Table 3**).

4. Discussion

In our study, the majority of patients were represented. Our data are similar to those of Mekame Meye *et al.* in Gabon [11], who found 44.6% adolescents and Coulibally *et al.* [12] in Mali, who found a median age of 14.25. The sex ratio was in favor of girls, which corroborates the data in the literature. According to UNAIDS, three out of four infected adolescents are girls. This predisposition of women is multifactorial [13], 47% of patients were diagnosed between the ages of 2 - 5 years, and only 16. 59% were diagnosed before the age of 24 months. Most cases (54.04%) were discovered after hospitalization; only 15.34% were diagnosed during PMTCT follow-up of exposed children. Dicko-Traore *et al.* [14] also found that 78.4% of cases were diagnosed during hospitalization. These data show that HIV diagnosis is delayed in children in our context, which could be explained by the sub-optimal follow-up of children exposed to HIV in the region. Since in Sub-Saharan Africa 50% of births take place at home [15], and in the Far North, many pregnant women do not undergo prenatal consultation (PNC) and continue to give birth at home with the help of matrons and are not screened for HIV [16]. Children exposed to HIV who are not registered in hospitals and who are not known to the health services are not systematically sought out in the community, for those who are known, follow-up is not optimal. During the first national PMTCT forum in 2016, a study of HIV-exposed infants aged under 24 months in the Far North region revealed that nearly 27% of PCR results obtained at 6 weeks were never collected by the parents, and the follow-up of some children stopped when the result of the first PCR was negative [17]. On the other hand, the inaccessibility of early diagnosis by PCR of exposed children in health facilities, as the expensive test was for a long time paid for by the patients and then subsidized by partners of Ministry of Public Health (ESTHER, ICAP, Clinton Foundation…) before the introduction of universal health coverage (UHC) in the region. PCR reagents are sometimes in short supply at the MRH and the samples taken have to be sent to other HIV treatment centers in the region, such as the Swiss Social Foundation of Pétté, more than 60 km from the MRH [18]. Sometimes the break could be regional and in this case, the samples are sent to the Chantal Biya International Reference Center (CIRCB) in Yaoundé, which takes a very long time to obtain the PCR results and sometimes the results get lost, which can have an impact on the early diagnosis and therapeutic management of these patients.

The issue of monitoring and early diagnosis of children exposed to the disease in the Far North therefore remains a topical one. Vertical transmission was the main mode of transmission in 95.74% of cases; these data are in line with the literature, which shows that vertical transmission is the almost exclusive mode of contamination in children. There may be immediate, intermediate or slow progressors, in which cases they are infected during childhood or adolescence [19]-[21]. In our study for 2 patients, the mode of transmission was the use of soiled objects during scarification. This mode of transmission is rare in children [22], so the National AIDS Control Committee (NACC) should provide better information on the different modes of transmission and strengthen its advice to HIV-infected patients and their families. At the start of ART, 63.86% of patients were at WHO stage 3 and 4. Our data are similar to that of Coulibally *et al.* [12] but lower than those of Dicko-Traore *et al.* in Mali [14], Penda *et al.* [23] and Davies *et al.* [24], with respectively 91.9%, 71.5%, and 75%. Mekame Meye *et al.* in Gabon [11] found data lower than ours, with 39.7%. Without ART, HIV in children will progress rapidly to the AIDS stage, Violari *et al.* [25] found that this occurred in 76% of cases. The ART protocol used was triple therapy following WHO recommendations [26] and national HIV management guidelines [27]. In 88.7% of cases, patients were on first-line therapy and 2 patients were put on quadri-therapy after resistance testing and failure of second-line treatment. Third-line ART in children does not yet exist in the country. Nearly 86.8% of children followed at the ATC are on protocols containing the integrase inhibitor (Dolutégravir), our data are similar to that of Guillaume *et al.* [28], who found that the uptake of Dolutégravir in children living with HIV was 98% at the central level, 80% at the intermediate level and 76% at the peripheral level. Since 2017, following WHO recommendations, the transition from PVVS to Dolutégravir-containing protocols has begun at the MRH [29] [30]. In pediatrics, the main difficulty is sometimes the availability of pediatric forms. During follow-up, 90.21% had a viral load, of which 73.11% were undetectable. These data fall far short of the targets for ending the pandemic by 2030 set by UNAIDS and adopted by Cameroon's Ministry of Public Health [1] [29] [31]. Our patients had failed virological therapy in 26.89% of cases, these figures are close to those of Bitwale *et al.* [32], who found 34%. They are higher than those of Penda *et al.* [23], who found 17.6%. Genotypic HIV resistance testing was performed on 5 patients with treatment failure, including 3 adolescents and 2 children, during which 2 children and 1 adolescent received reinforced counseling on ART compliance and 2 adolescents were placed on quadri-therapy. HIV poses a long-term risk of resistance to ART, especially in children who have been put on ARV prophylaxis [33]. Kitiyo *et al.* [34] in Uganda found that 32% of children who received first-line ART after 24 months showed virological failure and 16% of children who received a protocol based on non-nucleotide reverse transcriptase inhibitors (INNRTIs) showed resistance to pre-treatment ideally; these children should be tested for resistance before being put on ART. This would enable us to define the appropriate molecules and thus avoid therapeutic failures. Unfortunately, in our context, this is an expensive test that is not subsidized and not widely used in the region's various labora-

tories; it's produced exclusively at CIRCB. The mortality rate was 4.68% and reflects hospital mortality, especially among children, as mortality in the community is not always reported. Nearly 3% of patients were lost to follow-up at the ACT of MRH. These figures are lower than those found by Dainguy *et al.* [35] and Berthié [36], who found 18.4% and 6.39% respectively. This low rate of loss to follow-up in our context may be due to actions carried out at MRH, such as active case-finding in the community by psychosocial agents and the use of differentiated dispensing models, the most widely used being home dispensing and the reimbursement of transport costs to parents coming from far from the site to stock up on ART. Unfortunately, these activities are not sustainable because they are financed by partners who are not stable in the region. The NACC would benefit from taking ownership of these community dispensing activities and dispensing to the homes of distant parents in the long term in order to improve compliance with ART and achieve the objectives 95-95-95.

5. Conclusion

Adolescents were the most HIV-infected and the most followed-up at MRH's ATC. The age of diagnosis was late, and most patients were diagnosed during hospitalization. Early screening of children would enable optimal management of children exposed to HIV in the Far North of Cameroon. The transition to Dolutégravir remains encouraging, very few resistance tests are carried out in pediatrics. These tests should be popularized and recommended for infected children who have received ARV prophylaxis before being put on ART. This should be one way of reducing therapeutic failures in pediatrics.

6. Recommendations

6.1. To the Ministry of Public Health, through the NACC

To popularize and subsidize resistance testing among children and adolescents infected with and being monitored for HIV in order to detect resistance to ART.

6.2. To the Management of the MRH

To integrate systematic HIV screening in certain entry points, such as the vaccination and hospitalization departments, in order to be able to detect and make up for certain cases of maternal-fetal exposure or HIV infection in children.

6.3. To the Far North AIDS Technical Group (GTR SIDA)

To improve the organization and monitoring of off-site PCR sampling and reporting of results to health facilities.

6.4. To the ATC Staff

To improve patient record-keeping and completeness. Raise awareness among HIV-infected women about the importance of knowing their children's serological status, by complying with biological monitoring (PCR) in accordance with the national

HIV management algorithm in force in Cameroon.

7. Limits of Study

As with any retrospective study, we were limited by the absence of data on the immunological status (CD4 count) of these children at diagnosis and follow-up. The records of some of the follow-up patients were empty because they were duplicates; the initial files had been lost.

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Conflicts of Interest

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

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