



# The spectrum of HIV infected children in four hospitals in the Bamenda municipality, Cameroon

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## Abstract

**Introduction:** According to World Health Organization (WHO) in 2023, 39.9 million people were living with HIV globally. Children are not exempted, with an estimated 1.4 million children (0–14 years) living with HIV. The main problem with pediatric HIV remains the inadequate prevention of mother-to-child transmission (PMTCT) despite being largely preventable. Inappropriate management of HIV in children will lead to an increase mortality and morbidity.

**Materials and methods:** We conducted a retrospective cohort study of 15 years duration from 2010 to 2024 in children from ages 6 weeks to 15 years at Bamenda Regional Hospital (BRH), Nkwen District Hospital (NDH), Saint Mary Soledad Catholic Hospital and Nkwen Baptist Hospital. Data was collected using pre-designed questionnaires designed for the study. Data collected was entered to a computer and analyzed with statistical software.

**Results:** A total of 378 files were retrieved. Children were predominantly between the ages of 1-3 years (45.0%), with a female predominance of 55.8%, mother-to-child transmission was the principal mode of transmission (93.1%). The proportion of children living with HIV with respect to the total number of people living with HIV (PLHIV) at the day care centre was at 2.7%. The most common clinical manifestations were cough (19.6%) and fever (13.0%). Majority of the children were regular on antiretroviral treatment (69.6%), 2.9% were lost to follow up, 6.9% defaulted and 18.0% were transferred-out to other treatment centers. The mortality rate was 2.6%.

**Conclusion:** HIV in children remains a public health concern accounting for 2.7% of the total number of people living with HIV, with cough and fever being the most common clinical features. Majority of these children were stable on treatment. The overall mortality in our study was 2.6%.

**Keywords:** children, HIV, prevention of mother to child transmission, Outcome, Bamenda, Cameroon

## Résumé

**Profil des enfants infectés par le VIH dans quatre hôpitaux de la municipalité de Bamenda, Cameroun**

**Introduction:** Selon l'Organisation mondiale de la santé (OMS), en 2023, 39,9 millions de personnes vivaient avec le VIH dans le monde. Les enfants ne sont pas exemptés, avec environ 1,4 million d'enfants (0-14 ans) vivant avec le VIH. Le principal problème du VIH pédiatrique reste l'insuffisance de la prévention de la transmission de la mère à l'enfant (PTME) bien qu'il soit largement évitable. Une prise en charge inappropriée du VIH chez les enfants entraînera une augmentation de la mortalité et de la morbidité.

**Matérielles et méthodes :** Nous avons mené une étude de cohorte rétrospective sur une durée de 15 ans, de 2010 à 2024, chez des enfants âgés de 6 semaines à 15 ans à l'hôpital régional de Bamenda, à l'hôpital catholique Saint Mary Soledad, à l'hôpital de district de Nkwen et à l'hôpital Baptiste de Nkwen. Les données ont été collectées à l'aide de questionnaires pré-testés conçus pour l'étude.

**Résultats :** Au total, 378 dossiers ont été récupérés. Les enfants étaient principalement âgés de 1 à 3 ans (45,0 %), avec une prédominance féminine de 55,8 %, et la transmission de la mère à l'enfant était de 93,1 %. La proportion d'enfants vivant avec le VIH par rapport au nombre total de personnes vivant avec le VIH dans le centre de jour était de 2,7%. Les manifestations cliniques les plus fréquentes étant la toux (19,6 %) et la fièvre (13,0 %). La majorité des enfants ont été stables au traitement (69,6 %), 2,9 % ont été perdus de vue, (6,9 %) ont fait défaut, (18,0 %) ont été transférés, nous avons un taux de mortalité de (2,6 %).

**Conclusion :** Le VIH chez les enfants reste un problème de santé publique, représentant 2,7 % du nombre total de personnes vivant avec le VIH. La toux et la fièvre étant les caractéristiques cliniques les plus courantes. La mortalité globale dans notre étude était de 2,6 %.

**Mots clés :** enfants, VIH, prévention de transmission mère- enfant, devenir, Bamenda, Cameroun

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## What is known on this topic

- The most common mode of transmission of HIV in children is mother to child transmission
- Symptoms of HIV infection in children vary greatly and mostly include; slowed growth, enlarged lymph nodes
- Inappropriate prevention and treatment of HIV in children increases mortality and morbidity

## What this study adds

- The proportion of children living with HIV with respect to the total number of people living with HIV is 2.7%
- The most common clinical manifestations were cough and fever.
- The mortality rate in this context was 2.6%

## 1 | INTRODUCTION

According to World Health Organization's (WHO) 2023 statistics, an estimated 88.4 million people were infected with HIV resulting in 42.3 million deaths from HIV/AIDS-related illnesses since the epidemic began [1]. In 2023, 39.9 million people were living with HIV globally, with an estimated 1.3 million newly infected people. Children are not exempted, with approximately 1.4 million young lives, aged (0–14 years) living with HIV infection across the globe [1]. Majority of HIV infected children got infected by their mother via perinatal transmission during pregnancy, delivery, or postpartum through breastfeeding [2]. Other children and adolescents living with HIV infection acquired the infection by having unprotected sexual contact, sharing infected needles, blood transfusion [3]. Children born with HIV infection often don't show symptoms for the first few months even without antiretroviral therapy (ART). Common symptoms of HIV infection include; slowed growth, enlarge lymph nodes, repeated episodes of bacterial infections, recurrent diarrhea, lung infections, enlargement of the liver or spleen, anemia, heart conditions, hepatitis, and opportunistic infections [3].

HIV/AIDS is a significant contributor to illnesses and death in children, especially in Africa. Of the 1.4 million children with HIV, 76 000 [53 000–110 000] children died from HIV-related causes in 2023 [1]. One of the biggest challenges with pediatric HIV remains the inadequate prevention of mother-to-child transmission (PMTCT) despite being highly preventable. These growing children face ongoing challenges including managing complex treatment regimens for life as well as dealing with psychosocial, mental and neuro-cognitive issues. Barriers to effective management include delayed diagnosis in infants, limited availability of pediatric-friendly formulations, and limited access to skilled health personnel [4].

In 2023, Cameroon reported an HIV/AIDS prevalence rate of 2.1% . According to 2018 data,

pediatric prevalence was 0.2% [5]. The prevalence of HIV in the North West Region of Cameroon in 2018 was estimated at 4%, higher than the national prevalence of 2.7% [6].

Although HIV in children is a global health problem with distinct epidemiological attributes depending on the socio-economic demography, very few studies have been on carried out in recent years on the profile of children with HIV infection and to the best of our knowledge no studies have been done to evaluate the outcome of children infected with HIV in the North West region of Cameroon. Therefore, this study aims at assessing the profile of HIV infected children in Bamenda, North West Region of Cameroon.

## 2 | MATERIALS AND METHODS

### Study design and period

We conducted a retrospective cohort study of 15 years duration from 1st of January 2010 to 31st December 2024 in children from ages 6 weeks to 15 years using hospital files. This study was conducted for 5 months, from 1<sup>st</sup> of January 2025 to 31<sup>st</sup> May 2025.

### Study setting

This study was carried out in four pediatric HIV treatment centers in Bamenda. These facilities are Bamenda Regional Hospital (BRH), Nkwen District Hospital (NDH), Nkwen Baptist Hospital, and Saint Mary Soledad Catholic Hospital.

These hospitals serve urban and semi-urban populations and are the main referral centres for paediatric care in the Bamenda municipality. Bamenda is the 3<sup>rd</sup> largest region in Cameroon after Yaounde and Douala. Bamenda has a population of more than 630,000 inhabitants over a surface area of 22.9 km<sup>2</sup>

Each paediatric unit is staffed with medical doctors, nurses, and equipped with basic emergency and monitoring facilities.

### Study population

All children aged 6 weeks to 15 years diagnosed

of HIV and being followed up in the pediatric HIV treatment centre with complete information in the files. Children living with HIV with no confirmatory HIV test done were excluded from our study.

### Sample size and sampling

A conservative non probability sampling technique was used for files that met selection criteria during the period of study.

The minimum sample size for the statistical significance of our study was calculated following Cochran's formula for cohort studies.

$$n = \frac{Z^2 (p(1-p))}{e^2}$$

n = Sample size

z = Z-score corresponding to the desired confidence level = 1.96

p = Nkenfou et al in a multi centric study in Cameroon in 2024 found that the prevalence of HIV in children was 16.09% and therefore P=0.1609[7].

e = 5% (0,05)

This gave a minimum sample size of 207 participants.

### Data collection

Data were extracted from hospital records using a structured and pretested questionnaire designed for the study. Variables collected included socio-demographic characteristics (age, sex, residence, parental occupation, education), clinical presentation (cough, vomiting, watery stool, pruritus, lymphadenopathy), comorbidities and outcomes.

#### Study variables

- *Independent variables:* socio-demographic factors, Stages of HIV, clinical presentation, and comorbidities.
- *Dependent variables:* Treatment, and outcomes.

### Data management and analysis

Data were entered into Kobo tool box, cleaned, and analysed using R version 4.3.3. Continuous variables were expressed in means and standard deviations while categorical variables were

expressed in frequencies and percentages. A p-value <0.05 was considered statistically significant.

### Ethical considerations

Ethical clearance was obtained from the Institutional Review Board of the Faculty of Health Sciences, University of Bamenda. Administrative authorization was also granted by the Regional Delegation of Public Health and the directors of the participating hospitals.

## 3 | RESULTS

We retrieved a total of 378 files from 2010 to 2024 across four pediatric treatment centre in Bamenda. 199 from the Regional hospital Bamenda, 135 from Nkwen Baptist Hospital, 22 Saint Mary Soledad Hospital, 22 Nkwen District Hospital.

### Sociodemographic characteristics of the children

The children's ages ranged from 6 weeks to 15 years, with a mean age of 2.79, with majority of children aged 1 to 3 years (45.0%). We had more females (55.8%), giving a sex ratio of 1.26. Also, the majority of children lived in urban areas (80.4%) and were not in school (55.8%) (Table I).

Table I. Sociodemographic characteristics of the child (N=378)

Variables	Frequency (N = 378)	Percentage (%)
<b>Age (years)</b>		
[1-3[	170	45.0
[3-5[	90	23.8
[5-7[	22	5.8
[7-9[	31	8.2
[9-11[	49	13.0
[11-13[	8	2.1
[13-15]	8	2.1
<b>Sex</b>		
Female	211	55.8
Male	167	44.2
<b>Level of education</b>		
None	211	55.8
Nursery	49	13.0
Primary	108	28.6
Secondary	10	2.6
<b>Residence</b>		
Rural	74	19.6
Urban	304	80.4

**Sociodemographic characteristics of the caregiver**

The primary care givers were mothers (74.3%), aged 15 to 47 with a mean of 32.18, and 72.2% of them in the 30 to 39 age range . Also, majority of the caregivers were HIV positive (83.1%), living as a couple (65.1%), having liberal profession (75.7%), and attained at least primary education (45.8%).

**Proportion of HIV infected children**

Majority of the children were receiving treatment at Regional Hospital Bamenda (52.6 %), Nkwen Baptist Hospital (35.7%), Saint Mary Soledad Hospital (5.8%), and Nkwen District Hospital (5.8%). The overall proportions of children living with HIV with respect to the number of people living with HIV was 2.7% (Table II).

Table II. Proportion of HIV infected children with respect to the number of people living with HIV in the day care centre (N=378)

Characteristic	Number of children with HIV N= 378 (%)	Number of adults with HIV N = 13857 (%)	Percentage of children with respect to adults (%)
<b>Hospital</b>			
Mbingo Baptist Hospital	135 (35.7)	5762 (41.6)	2.3
Nkwen District Hospital	22 (5.8)	924 (6.6)	3
Regional Hospital Bamenda	199 (52.6)	6606 (47.7)	2.3
Saint Mary Soledad Catholic Hospital	22 (5.8)	565 (4.1)	2.2
<b>Overall proportion</b>	<b>378</b>	<b>13857</b>	<b>9</b>

**Cumulative Number of children initiated on treatment yearly (N= 378)**

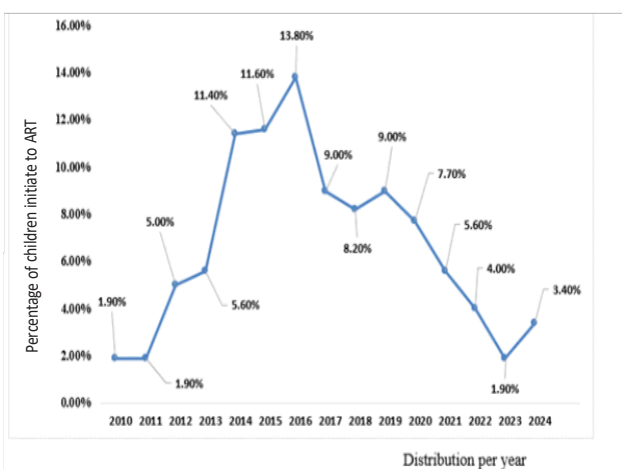


Figure 1. Cumulative yearly distribution of HIV infected children (N = 378)

The trends of HIV varied throughout the study, with the peaks in 2016 (13.80%) followed closely by 2015 (11.80%) (Figure 1).

**Past history of HIV infected children.**

Majority of the children got infected through mother to child transmission (93.1%), with circumstances of diagnosis being PMTCT (43,4%)

**Clinical presentation of child (N=378)**

Out of the 378 participants, 243 were asymptomatic (64.3%). Cough was the most common clinical finding (19.6%) followed by fever (13.0%), skin rashes at (10.8 %), lymph nodes (7.9%) ( Table III).

Table III. Clinical symptoms at presentation

Variables	Frequency N=378	Percentage (%)
Asymptomatic	243	64.3
Cough	74	19.6
Fever	49	13.0
Skin rashes	41	10.8
Lymphnodes	30	7.9
Diarrhoea	27	7.1
Weight loss	25	6.8

**WHO Clinical staging and opportunistic infection**

More than half of the children were at WHO clinical stage I (65.6%), followed by clinical stage 3 ( 14. 3%). Majority of the children had no opportunistic infection (94.2%), 22 (5.8%) of the children had opportunistic infection. (Table IV).

Table IV. WHO Staging and clinical presentation

Variable	Frequency	Percentage(%)
<b>Stage of HIV</b>		
Stage 1	248	65.6
Stage 2	48	12.7
Stage 3	54	14.3
<b>Opportunistic infection</b>		
No	356	94.2
Yes	22	5.8
<b>If opportunistic infection (n = 22)</b>		
Oral candidiasis	13	59.1
<i>Pneumocystis jirovecii</i>	2	9.0
Tuberculosis	4	18.2
Extra pulmonary TB	1	4.5
Cryptococcus	1	4.5
Herpes infection	1	4.5

## Treatment regimen

Regarding treatment, most of the children were on first line treatment with the most common regimen being TDF/3TC/DTG (28,3%), followed by ABC / 3TC /LPV/r (20.9%), and ABC/3TC / EFV (17.7%)

## Viral load suppression after initiation to treatment

After initiation on anti-retroviral treatment, most of the children had viral suppression after 6months and 12months at 78.0% and 77.0% respectively. Also, others had high viral (greater than 1000 copies) despite treatment at 6months and 12months (13.2%), (4.8%) respectively (see Table V).

Table V. Viral load suppression after initiation to anti-retroviral treatment

Variables	Frequency (N = 378)	Percentage (%)
<b>Viral load at 6 months (cp/ml)</b>		
[0-41)	295	78.0
[41 -1000)	50	13.2
[1000 -1e+05)	18	4.8
[1e+05 - 9.688e+06]	15	4.0
<b>Viral load at 12 months (cp/ml)</b>		
[0- 41)	291	77.0
[41-1000)	51	13.5
[1000 -1e+05)	23	6.1
[1e+05-9.688e+06]	13	3.4

## Outcome

Majority of children (69.6%) were stable after antiretroviral treatment initiation while 2.9% were lost to follow up, 6.9% defaulted and 18% were transferred to other health facilities. Ten cases of death were registered giving an overall mortality rate of 2.6%.

## 4 | DISCUSSION

The age distribution results showed that HIV infected children were predominantly between 1 to 3years (45.0%), with a mean age of 2.79. These results align closely with those from a study by Bashir et al in Pakistan in 2023 who reported that children diagnosed with HIV were predominantly under the age of 4 [8]. This is expected because the principal mode of transmission is from mother to child, hence the virus is being detected early in these children leading easier access to HIV services.

Overall, our study included slightly more girls (55.8%) than boys. This female predominance is consistent with other literature reports by McLige et al in central Kenya in 2022 with a female predominance of 52.7% [9] and in Ethiopia in 2022, where 58.13% of the children were females[10]. This aligns with the proportion of females to males in the general population of Cameroon from 2013-2023.

As regards the caregiver characteristics, most of the caregivers of these children were their mothers, 83.1% of the participating children had HIV-positive mothers, this is slightly lower than a study in DRC which recorded 91.2% of mothers being positive [11]. These results supported the notion that vertical transmission is the primary mode of transmission in children, aligning with WHO expert's opinion. The caregiver age ranged between 30 to 40 years (72.2%) with a mean age of 32.18, which is different from that found by Nkenfo et al in 2023 in the North region of Cameroon where majority of the mothers were within the age range of 25 to 35 years[12]. This mean age is a sexually active age in women increasing the chances of getting pregnant and having HIV infected children

In our study children under the age of 15 accounted for about 2.7% of all people living with HIV which is slightly lower than that reported by UNICEF in 2025, where children under age 15 accounted for about 3% of all people living with HIV[13]. This can be explained by the rapid progress in the attainment of the 95-95-95 targets adopted by UN member states in 2021 aimed at accelerating the progress in testing, treatment, and viral load suppression to eradicate AIDS epidemic by 2030 not leaving out the Global Alliance to End AIDS in children.

In our study we saw an increasing trend in number of children diagnosed and initiated on treatment from 2010 ( 1.9 %) to a peak in 2016(13.8%) and then a decline from 2017(9.0%) to 2023(1.9%), then another rise in 2024(3.4%). The decline from 2016 to 2023 may be attributed to PEPFAR (The President's Emergency Plan for AIDS Relief) support which focused on prevention of mother to child transmission, providing treatment and care to children and families affected by HIV

[14]. Other technical and financial partners such as International AIDS Society, children momentum project, the global fund to fight AIDS, have helped to enhance HIV case finding, providing guidelines and funding for HIV prevention, ARV treatment regimens and care in children and women living with HIV. Also, the implementation of the Universal Test and Treat policy adopted in Cameroon in 2016 could account for this decline. In addition, this decline could be explained by the overall decline of HIV prevalence in Cameroon from 4.3% in 2011 to 3.3% in 2017, to ( 2.6%) in 2022[15].

The most common mode of transmission of HIV was from mother to child at 93.1% which is similar to that reported by Swati in India, where the predominant route of transmission of HIV to the child was by perinatal transmission (92.72%)[16].

This can be explained for by the fact that the risk of mother-to-child transmission depends on the viral load of the mother, mode of delivery, and use of antiretroviral drugs by the mother which often might not be properly followed up. The findings emphasize the need for proactive intervention to prevent mother-to-child transmission of HIV by ensuring follow up pregnant women during antenatal visit and implementing preventive strategies in the delivery room.

All the children had HIV-1(100%). These findings are not surprising considering that HIV 1 is the more rapidly replicating type with a higher risk of transmission. Mother-to-child transmission of HIV-2 is rare thus responsible for very little or no cases of paediatric infection.

Most of the patients (64.3%) were asymptomatic, 35.73% were symptomatic with the most frequent clinical manifestations being cough (19.6%), fever (13.0%) and skin rashes (10.8%). In Pakistan, Fever was the most reported symptom as found in 55% of the cases followed by cough (39%) and diarrhoea (29%) [8], In India failure to thrive (45%), recurrent respiratory infections (42%) and bacterial skin infection (36%) were the most frequent [17]. The finding in our study can be explained by the fact that children born with HIV infection seldom have symptoms during the first few months' even if they are not yet onART.

Most of the children were in WHO clinical stage I (65.6%) which is similar to that of a study by Berihun et al in Ethiopia in 2023 where 94.1% of the children

were in WHO stage I [18]. This differs significantly with a study by Mazosa et al in Tanzania where the most common WHO clinical staging was stage IV (79.6%) [19]. During the study period, 5.8% had opportunistic infection far lower than a study by Kerebeh et al in Ethiopia where 27.80% of children living with HIV developed opportunistic infection [20]. Of all types of opportunistic infection occurring during the study period, oral candidiasis (59.1%), tuberculosis (18.2%), Pneumocystis jirovecii (9.0%), extra pulmonary TB (4.5%) were the most common, this differs from a study in Ethiopia in 2023 where majority of the opportunistic infection were pneumonia (32.14%), followed by tuberculosis (19.64%), herpes zoster (14.28%), oral candidiasis (11.60%) [20]. This can be explained by the fact that children within this study were initiated on treatment late (8years old) whereas in our study these children were initiated early, before opportunistic infection could set in.

In our study, the majority of the children had viral load less than 1000 copies at 6months (78.0%) and 12 months (77.0%). This is similar to a study in Ethiopia in 2023 where more than half of the participants (52.2 %) had  $\leq 1000$  copies/mL viral load at baseline[21]. This can be explained by early initiation to treatment, regular follow up, treatment adherence, and effective treatment regimens. More than half of the children were stable to treatment (69.6%), 2.9% were lost to follow up, 6.9% defaulted and 18.0% transferred out. We had 10 children who died with an overall mortality rate of 2.6%. Kerebeh et al in Ethiopia in 2024 reported that 3.47% were lost to follow-up, 11.66% were transferred out into other health facilities, and a mortality rate of 1.74%[20]. This can be explained by the fact that many children with HIV are being identified early, prompt management is introduced, regular follow up, treatment adherence and effective treatment regimens have enabled these children to be healthy despite being infected.

## 5 | CONCLUSION

HIV in children remains a public health concern especially among females within the age range of 1

to 3 years. The proportion of children with HIV was low compared to people living with HIV with an increasing trend from 2010 to 2016 and a decreasing trend between 2017 to 2023. The most common clinical manifestations were cough and fever, and the mortality rate was low.<sup>‡</sup>

### ► Abbreviations

HIV- Human Immunodeficiency Virus.

PMTCT – Prevention of mother to child transmission

PLHIV – People Living with Human

Immunodeficiency Virus.

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### ► Authors contribution

CA - conceptualization and design

CA, NF, AL, SN - data collection and analysis

CA, AL, SN - drafted the manuscript

CA, NF, AL - literature review and revision

CA, NF - Revised the final manuscript

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### ► Competing interests

The authors declare no competing interests.

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