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Oral Manifestations of HIV Infection and Dental Health Needs of Children with HIV Attending HIV Treatment Clinics in Western Cameroon

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ABSTRACT

Background and Objective: Highly active antiretroviral therapy (HAART) has reduced morbidity related to HIV infection, but HIV infection remains a public health in the era of HAART. The aim of this study was to investigate the oral manifestations of children living with HIV in the city of Bafoussam, Cameroon.

Methods: A cross-sectional study was carried out between February and April 2022 on children living with HIV/AIDS. A pretested questionnaire and data capture sheet were used to collect participants' data after an interview and clinical examination.

Results: We recruited 163 children, including 89 (54.6%) boys and 74 (45.4%) girls aged 1–18 years. All participants presented with HIV-1 serology, 143 (88%) at WHO stage 1, all were on HAART, 62 (38%) had been on treatment for six years, 144 (89%) had a viral load of less than 1000 copies/ml, none of the children had an infection opportunistic and only 31.3% were taking cotrimoxazole as prophylaxis, 3 (1.8%) had dermatosis and 20 (12.3%) adenopathies. A third 49 (30%) had mucosal pathologies, 30 (19%) gingivitis, 15 (9%) candidiasis oral, and 40 (24.5%) caries pathology. There was a statistically significant association between viral load and caries pathology. Oral hygiene was poor and 151 (92.6%) of the children had never consulted a dental surgeon.

Conclusion and Global Health Implications: This study reveals that irrespective of compliance with HAART, some oral pathology related to HIV still persists. Therefore, early initiation to HAART and improvement of oral hygiene can further reduce these pathologies.

Keywords: HIV, HAART, Pathology, Oral Manifestations, Children, Bafoussam

INTRODUCTION

Pandemics like the Human Immunodeficiency Virus (HIV)/Acquired Immune Deficiency Syndrome (AIDS) and the Coronavirus Disease 2019 (COVID-19) have created untold suffering affecting the quality of lives of people worldwide due to their high morbidity and mortality. HIV infection still persists with dramatic physical, social, and economic consequences. The survival of HIV-infected children remains a public health problem worldwide, especially in sub-Saharan Africa (SSA). In 2018, nearly 37.9 million people were living with HIV globally, including 1.7 million children and adolescents under the age of 15, the majority of whom were in SSA. It has been estimated that 67% of the 38.4 million people living with HIV (PLWHIV) globally in 2021 were

from SSA and that SSA is home to nearly 90% of all children and adolescents living with HIV.[1,2] Cameroon remains one of the most affected countries in SSA, with 27,000–41,000 children under 14 living with HIV.[2]

Children with poor oral health are 12 times more likely to have reduced activity than those with good oral hygiene. This is accentuated by the fact that HIV infection damages the immune system of children, exposing them to many systemic diseases such as tuberculosis, malaria, and other oral pathologies.[3,4] These oral pathologies remain one of the most frequent manifestations in HIV-positive pediatric patients and they often represent the first form of onset of immunosuppression.[4]

Most children living with HIV have acquired HIV infection through mother-to-child transmission (MTCT), and in the absence of antiretroviral therapy (ART), half of them die before their second birthday.[5] Infants and young children infected with HIV have exceptionally higher morbidity and mortality. Between 52% and 75% of the children die before the age of two and five years, respectively, in the absence of any intervention.[6] It has been recommended that ART should be initiated for all children living with HIV regardless of WHO clinical stage or at any CD4 cell count.[3] However, only 52% of all children aged 0–14 years living with HIV had access to treatment globally in 2021.[1,3]

ART is highly effective at inhibiting HIV replication but it is not curative. The objective of ART is to control HIV replication in order to prolong survival and also decrease the incidence of opportunistic oral lesions.[4,5]

Oral candidiasis, oral hairy leukoplakia, Kaposi's sarcoma, and linear gingival erythema are the most common oral lesions in HIV-positive children.[4–6] Infections are mainly fungal (candidiasis), viral (herpes, shingles, human papillomavirus infections), and less often bacterial (streptococci).[5] A study conducted in Kinshasa in the Democratic Republic of Congo (DRC) in 2018 showed that oral candidiasis had a prevalence of 14.9%, with 9.5% with pseudomembranous candidiasis being the most predominant.[6] In the Republic of Chad, it was reported that the overall prevalence of yeast colonization and symptomatic oral candidiasis in HIV-infected patients was 25.1%. Oral candidiasis was higher in patients who were not on Highly Active Antiretroviral Therapy (HAART).[7] A similar study carried out on children living with HIV in Cameroon at the Kumba District Hospital showed that *Candida species* were present in 42.86% of the samples and *Candida albicans* was the most prevalent, with pregnancy, oral hygiene, and antibiotic usage significantly associated with oral candidiasis in HIV patients.[8]

Children infected with HIV are considered to be at high risk of dental caries in developing countries, and their care needs are therefore significant.[7] A study in Cameroon showed that the prevalence of dental caries was 66.7%, presenting a higher prevalence of caries in HIV-infected children as compared to HIV-negative children.[8] Oral diseases secondary to HIV/AIDS may cause pain and discomfort making it difficult to eat and therefore affecting the quality of life of the patient. In children, the disease usually progresses faster and the course is more severe than in adults, resulting in a high mortality rate due to the immaturity of the immune system.[7] Maintaining good oral health and adherence to treatment may improve the quality of life of HIV-infected children.[9–12] The objective of our study was to describe the clinical oral manifestations of HIV in children attending HIV clinics at the Bafoussam health district of Cameroon.

METHODS

The methodology section of this study was formulated following the STROBE reporting guidelines.

Study Design and Study Site Description

This was a cross-sectional study conducted between February 2022 and May 2022 at three different hospitals (Regional Hospital, Djeleng District Hospital, and Nfamla District Hospital) in the city of Bafoussam. The Bafoussam Regional Hospital is a category 2 hospital located in the Western Region of Cameroon. It is the main referral hospital for HIV patients in the Western Region. The Djeleng District Hospital and the Famla District Hospital are approved HIV treatment centers.

Sampling and Eligibility Criteria of the Study Population

Children aged 1–18 years infected with HIV and followed up at the three selected hospitals, who gave their assent or consent from parents or guardians to participate in this study, were selected for the study. Children whose medical conditions did not allow oral examination, whose medical records were incomplete, and questionnaires that were not completely filled were excluded. The convenience sampling technique was used in recruiting participants as all patients who came for consultation in the selected clinics and were willing to participate in the study were recruited.

Data Collection Instrument and Technique

An anonymous questionnaire was used in collecting the personal data of patients, and a data extraction sheet was used in collecting data on the clinical observation of the patients. The interest as well as the objectives of the study were presented to the parents or guardians as well as to the children of age to understand in order to obtain their written, free, and informed consent.

The data collection was carried out in two steps: (i) an anonymous questionnaire was issued to collect personal information such as age, residence, initiation of treatment, oral hygiene habits, and duration of treatment; and (ii) a data extraction sheet was used in collecting data from the patients' medical records and also from clinical examination of the patients that was carried out to establish the oral pathologies present in these patients. Viral load (values were also recorded if they were done within six months), the clinical stage of HIV/AIDS according to the WHO, and the current treatment were obtained from the child's medical records.

An extra oral examination was carried out to look for cervico-facial lymphadenopathy, possible facial asymmetry, dermatoses commonly associated with HIV, and salivary gland pathologies. Intra-oral examination took place in two stages: (i) Examination of the dental soft tissues and the mucous membranes in different areas like the labial commissures, the inner faces of the cheeks and lips, the lower and upper vestibule, the tongue, the gums, the hard and soft palate, and the oropharynx; and (ii) The hard tissues in the dental arches were examined with the help of a mirror and a dental probe in order to detect possible caries, and the DMFT index of Klein and Palmer was used to establish the state of dental caries. The DMFT index was classified according to the WHO global data for dental caries[11] as follows:

DMFT 0–1.1: very low level

DMFT 1.2–2.6: low level

DMFT 2.7–4.4: medium level

DMFT 4.5–6.5: high level

DMFT > 6.5: very high level

The texture, color, and contour of the gingiva were recorded. The periodontium was examined using a WHO periodontal probe and a dental mirror to assess the condition of the gums (healthy, inflamed, bleeding on probing), presence of tartar, and periodontal pockets and periodontal treatment need using the CPITN (Community Periodontal Index and Treatments Needs) index[12] following standard procedures [Table 1].

Table 1: The CPITN index.

Score	CPI code	Treatment needs
0	Healthy tissues	No treatment
1	Bleeding on probing (BOP)	Oral hygiene instructions
2	Supra and subgingival calculus Marginal iatrogenic irritation	Oral hygiene + scaling
3	Shallow pocket up to 5 mm	Oral hygiene + scaling + root debridement
4	Pocket greater than 6 mm	Teaching oral hygiene + scaling + root debridement + complex therapy

CPITN: Community periodontal index and treatments needs, CPI: Community periodontal index.

Data Analysis

The data collected were entered using CSPro software version 7.5 and analyzed using SPSS software version 25 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). Univariate data were presented in the form of tables and figures. Bivariate analysis was carried out to establish the statistical relationships between variables. Differences were considered statistically significant for p values < 0.05.

Ethical Considerations

Ethical clearance was obtained from the institutional review board of the Université des Montagnes (authorization No 2022/17/UDM/PR/CIE) and permission to conduct this study from the regional delegation of the Ministry of Public Health for the Western Region (No. 58/L/MINSANTE/DRSPO/SDDM/BAAF) and the various hospitals where this study was carried out.

RESULTS

Sociodemographic Profile

We recruited 163 children comprising 89 (54.6%) males and 79 (45.4%) females. A quarter, 22 (12.8%), were aged 1–6 years, 61 (36.8%) from the 7–12 age group, and 71 (42.9%) from the 13–18 age group.

The majority, 148 (90.8%), of the children were attending school and 15 (9.2%) were out of school [Table 2]. All the

Table 2: School attendance and place of residence.

Variables	Frequency	Percentages
School attendance		
Attending school	148	90.8
Out-of-school	15	9.2
Educational level (n = 148)		
Kindergarten	31	20.9
Primary	65	43.9
Secondary	51	34.5
High school	1	0.7
Place of residence		
Family house	162	99.4
Orphanage	1	0.6

children out of school were supposed to be in primary school.

A third, 65 (43.9%), of the children were in primary school, 51 (34.5%) in secondary school, 1 (0.7%) in high school, and 65 (43.9%) lived in their family homes [Table 2].

Oral Hygiene

The majority, 135 (82.8%), of the children brushed their teeth daily, 109 (80.7%) brushed with toothbrush and toothpaste, 98 (72.6%) brushed in the morning before meals, and 118 (87.4%) brushed without assistance. The majority, 151 (92.6%), had never consulted a Dentist [Table 3].

HIV Serology and Treatment

All the children presented with HIV type 1 stage 1 were on ART and 114 (69.9%) had no mucosal pathologies. Prior to the initiation of ART, the majority, 62 (38.0%), had been on treatment for 6–10 years. The majority, 145 (88.9%), of the children had a viral load of less than 1000 copies/ml, none suffered from any opportunistic infection, and 31.3% were taking cotrimoxazole tablets as prophylactic treatment [Table 4].

Oral Pathologies

A third, 49 (30.1%), of the children, had oral mucous membrane pathologies like gingivitis 31 (19.2%), oral candidiasis 15 (9.2%), black tongue, and oral warts. Gingivitis was common in 11 (6.7%) children in the 7–12 years age group, 19 (11.0%) aged 12–18 years, while six (3.6%) had oral candidiasis in the 7–12 age group and 8 (4.9%) children in the 12–18 age group.

Two-thirds, 119 (73%), had healthy gingiva, 40 (24.5%) had at least one carious pathology, and all the children had a DMFT index below 1.2 [Table 5]. There was a significant relationship between the oral pathologies encountered and the viral load.

There was a strong relationship between viral load and dental caries p = 0.01 [Table 6].

Table 3: Oral hygiene practices.

Variables	Frequency	Percentages
Oral hygiene		
Practice tooth brushing	135	82.8
Do not brush	28	17.2
Equipment used for brushing (n = 135)		
Toothbrush + toothpaste	109	80.7
Toothbrush alone	13	9.6
Toothbrush + salt	5	3.7
Toothbrush + bicarbonate	5	3.7
Toothbrush + charcoal (ash)	3	2.2
Timing of brushing (n = 135)		
In the morning before meals only	98	72.6
Morning before meals and in the evening at bedtime	30	22.2
In the evening at bedtime only	3	2.2
In the morning after meals and in the evening at bedtime	3	2.2
Morning after meal only	1	0.7

Table 4: Serology and treatment.

Variables	Frequency	Percentage
Type of HIV		
Type 1	163	100
Type 2	0	0.0
WHO Classification of HIV		
Stage 1	148	88
Stage 2	16	10
Stage 3	4	2
HAART treatment		
Yes	163	100
No	0	0.0
Duration of Treatment (years)		
1–5	46	28.2
6–10	62	38.0
> 11	55	33.7
Viral Load (copies/ml)		
Less than1000	145	89.0
Greater than1000	18	11.0
Prophylactic treatment		
Yes	51	31.3
No	112	68.7

HAART: Highly active antiretroviral therapy.

DISCUSSION

This study revealed that cervico-facial lymphadenopathy, dental caries, gingivitis, oral candidiasis, and linear gingival erythema were the common oral manifestations of HIV/AIDS among these children.

Detection of HIV Status

In this study, the mean age of first disclosure of HIV status of our study population was 12 years. This corroborates with a

Table 5: Dental caries and periodontal diseases.

CPITN	Frequency	Percentages
Healthy gingiva	119	73
Bleeding on probing	25	15.3
Presence of supra and subgingival calculus	19	11.7
Carious pathology		
Yes	40	**24.5**
No	123	75.5
Age	**DMFT index**	
1–6	0.61	-
7–12	1.03	-
13–18	0.87	-

CPITN: Community periodontal index and treatments needs, DMFT: Decayed, missing, filled teeth.

Table 6: Distribution of viral loads according to the presence or not of the caries pathology.

Variables	Presence of caries pathology	Absence of carious pathology	OR (95% CI)	p-value
Viral load less than 1000 copies/ml	32 (22.1)	113 (77.9)	0.283 (0.104-0.773)	0.018
Viral load greater than 1000 copies/ml	9 (50.0)	9 (50.0)	-	-

OR: Odds ratio, CI: Confidence interval.

study that was carried out in Ghana by Gyamfi et al. (2017)[13] where the mean age of children infected with HIV/AIDS was 13 years old.[13] This might be because very few children living with HIV are actually aware of their diagnosis and are mostly recruited at a later age.[13] Most HIV-exposed infant's access to early infant diagnosis (EID) was through the prevention of mother-to-child transmission (PMTCT) service points.[14] A study in Cameroon revealed that more than half of children newly identified as HIV positive were tested at non-PMTCT service points. The highest EID positivity yields were found in non-PMTCT service points.[14] In Nepal, compulsory screening of neonates leads to early diagnoses of HIV-infected children in postnatal clinics with an early disclosure of 18 months.[15] Strengthening HIV testing in non-PMTCT service points may help identify additional infected children and improve the timely initiation of treatment and care.[14] Late diagnosis of HIV infection could lead to early manifestations of oral pathologies, especially if the patient is not exposed to ART.

Oral Health-Seeking Behavior

A recent study on the oral health-seeking behavior of primary school children in Cameroon revealed that only 7.7% of the children had ever been to a dentist.[16] In this study, 92.6% of the children have never been to a dentist, depicting poor oral health-seeking behavior among HIV-infected children. This might be because of the dependence on traditional medicines, the high cost of dental treatment, and inadequate access to oral healthcare services.[17]

Clinical and Immunological Information

In this study, all the children had HIV-1 serology which is asymptomatic, and the majority had the WHO stage I while 10% had stage II (early symptoms). This could be explained by the fact that all the children were on ART for more than six years and none of the children suffered from any opportunistic infection. Because of the clinical or immunological benefits of HAART, the WHO recommends definitive initiation of ART in adults and adolescents in clinical stage 4, consideration of therapy initiation for those in clinical stage 3, and antiretroviral use for those in clinical stage 1 or 2 only if the CD4 count is greater than 200 per cubic mm.[18]

Oral Manifestations

Since the introduction of HAART, the prevalence of oral mucosal lesions has decreased, though it remains high. In this study, half of the children had at least one pathology of the oral mucosa. This is in contrast to that found in children in India where oral pathologies were found in a quarter of the children on HAART.[19] In the same study, oral manifestations included dental caries, periodontal diseases, candidiasis, hyperpigmentation, ulcerative stomatitis, and one case of mucocele. These manifestations were compared with HIV-positive children not receiving HAART and HIV-negative children to find manifestations were statistically significant.[19] In this study, other soft tissue pathologies encountered among the children included gingivitis and oral candidiasis. It has been reported that the prevalence of gingivitis is higher than that of oral candidiasis.[20] This study confirms that ART is satisfactory in reducing opportunistic infections in general and particularly oral pathologies in children, especially if the patient is exposed for a longer period of time. A recent study in Cameroon revealed that most patients on cotrimoxazol developed resistance to the medication. This implies that the use of HAART could be the reason for lower oral pathologies. These oral manifestations can be further reduced if the oral hygiene is improved. In this study, cotrimoxazol was used as prophylactic treatment.[20]

Our study also revealed that a quarter of the children had dental caries and all had a DMFT index below 1.1, which is very low. Kikuchi et al. (2021) in Cambodia reported a DMFT index of 7.7 among children with dental caries. They highlighted that the adjusted regression analysis showed that dental caries in permanent or deciduous teeth were positively associated with detectable viral load.[21] In this study, the association between the viral load and the carious pathology was significant. Therefore, the children who had a viral load of less than 1000 copies/ml had less chance of having the carious pathology. This is similar to the suggestions of Kikuchi et al. (2021) who found that in children with a detectable viral load, dental caries in permanent or temporary teeth were positively associated with nonsuppression of the viral load (> 1000 copies/ mL).[21] Therefore, the low viral load in this study could be responsible for the low DMFT index. This could be the reason why a majority of the children did not need periodontal care because of their healthy periodontal tissues and negligible gingival bleeding on probing. Improving the oral hygiene of these children will go a long way to improve their oral health status.

Limitations

This study is limited in the fact that it is a cross-sectional study, which measures the disease impact and the impact of interventions at a particular point in time. A longitudinal cohort study is recommended for future studies in children with HIV/AIDS, especially in the era of HAART, to clearly evaluate the exposure and the outcome of HAART in these children.

CONCLUSION AND GLOBAL HEALTH IMPLICATIONS

All the children recruited were on HAART and the common extra-oral manifestation was cervicofacial lymphadenopathy, while intra-oral pathologies in decreasing order were dental caries, gingivitis, oral candidiasis, and linear gingival erythema. There was a strong association between the viral load and the caries pathology. Therefore, children who had a viral load lower than 1000 copies/ml had less chance of having dental caries while the association between the various pathologies of the mucous membranes encountered and the viral load, respectively, was not significant ($p < 0.05$). Early diagnosis of HIV disease in pregnant women and in children is very important in their oral health well-being, as early initiation of children into HAART will reduce oral pathologies related to HIV/AIDS.

Key Messages

- Children on highly active antiretroviral therapy (HAART) still present with cervico-facial lymphadenopathy dental caries, gingivitis, oral candidiasis, and linear gingival erythema. Therefore a multidisciplinary approach should be used in the management of patients with HIV.
- Early infant diagnosis (EID) of HIV and early initiation of children reduces the burden of oral diseases. Therefore, the Ministry of Public Health should reinforce EID for early initiation of children to HAART.
- Noncompliance to HAART and lack of follow-up may lead to the manifestations of oral HIV lesions; therefore, managers of HIV treatment centers should ensure good follow-up for adherence to HAART and ensure compulsory routine dental checkups for children on HAART to improve their oral hygiene.

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COMPLIANCE WITH ETHICAL STANDARDS

Conflicts of Interest

The authors declare no competing interests.

Financial Disclosure

Nothing to declare.

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There was no funding for this study.

Ethics Approval

Ethical clearance was obtained from the institutional review board of the Université des Montagnes (authorization No 2022/17/UDM/PR/CIE).

Declaration of Patient Consent

Children who gave their assent or consent from parents or guardians to participate in this study were selected.

Use of Artificial Intelligence (AI)-Assisted Technology for Manuscript Preparation

The author(s) confirms that there was no use of Artificial Intelligence (AI)-Assisted Technology for assisting in the writing or editing of the manuscript and no images were manipulated using the AI.

Disclaimer

None.

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