Prevalence of Oral Manifestations and Associated Factors in the HIV Infection at a Reference Hospital from the Health's Unified System, Brazil

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Abstract: The severe control by the Brazilian Ministry of Health on the HIV infection suggests that all the opportunistic infections related to this disease are in a low frequency. This study aimed to characterize the oral lesions profile in patients with HIV/AIDS who presented to the public health system in Goiania, Brazil. An oral clinical examination was developed and was based on the EC-Clearinghouse on oral problems related to HIV infection. A questionnaire was completed, medical data were collected and photos were taken. A total of 201 patients were divided into two groups: Group I (92 HIV-positive patients with CD4+ count above 200 cells/mm^3 and absence of symptoms of AIDS) and Group II (109 HIV-positive patients with CD4+ count below 200 cells/mm^3 and with signs and symptoms of AIDS). The total prevalence for oral manifestations ranged from 19.60% (Group I) to 33.00% (Group II). Periodontitis associated with HIV infection occurred in 5.43% (Group I) and 11.00% (Group II) of patients. Linear gingival erythema occurred in 4.34% (Group I) and 7.34% (Group II) of patients. Erythematous candidiasis affected 4.34% (Group I) and 2.75% (Group II) of patients. Pseudomembranous candidiasis affected 1.83% of Group I patients. A significant association was observed between the occurrence of oral lesions related to HIV infection and age ($p<0.05$; OR 2.82; 95% CI (1.31-6.05)) and between HIV-related oral lesions and prosthesis wearing ($p<0.05$; OR 3.6; 95% CI (1.2-11.4)) in Group I patients. In Group II patients, an association was observed between the presence of caries and HIV-related oral lesions ($p<0.005$; OR 2.4; 95% CI (1.1-5.4)). Dry mouth was the most observed complaint related to antiretroviral therapy (7.80% in Group I and 11.00% in Group II). In conclusion, the Group II presented the highest frequency of lesions, and periodontitis was the most prevalent oral lesion. Age and prosthesis wearing were factors associated with the development of these lesions among Group I patients, while the presence of dental caries was associated with oral lesions in Group II patients.

Keywords: Oral manifestations, mouth disease, AIDS-related opportunistic infections, HIV.

INTRODUCTION

Oral manifestations of HIV infection represent a major proportion of the opportunistic infections that afflict these patients and affect their quality of life [1]. These manifestations are not only important in the early diagnosis of HIV infection but also in monitoring a patient's progression to AIDS. The majority of cases can be diagnosed by their clinical features alone [2].

More than 40 types of oral lesions have been associated with a greater (or even lesser) extent of HIV infection. The most frequent etiological agents for these HIV-associated oral lesions include fungal infections (candidiasis, linear gingival erythema and deep mycoses), bacterial infections (necrotizing gingivitis, necrotizing periodontitis, bacillary angiomatosis and tuberculosis), viral infections (herpes simplex, hairy leukoplakia, warts, herpes zoster and cytomegalovirus ulcers), neoplasms (Kaposi's sarcoma and oral lymphoma) and other causes (nonspecific ulcers, xerostomia, parotid swelling and intraoral pigmentation). It is essential to emphasize that these lesions may also be present in the general population. However, in patients with HIV/AIDS, these lesions have an aggressive, persistent and recurrent behavior [3].

Because there are increasing numbers of patients living with the infection, the number of HIV-positive patients who may seek dental care is increasing. Oral examinations may assist in the early recognition of the disease and aid in the comprehensive evaluation of HIV-infected patients [4].

Strategies for training health-care professionals in the diagnosis of the oral manifestations of HIV are important and necessary to prevent pain, discomfort, malnutrition, weight loss, dehydration, dry mouth, non-adherence to antiretroviral therapy and, sometimes, the eventual death of these patients [5]. The reference centers in diagnosis of oral lesions and preventive measures for these lesions, like oral hygiene instructions and an available access to oral treatment should be part of HIV-patients management developed for a multiprofessional team [6, 7].

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There are few data on the oral manifestations of HIV/AIDS among patients in Brazil, a country considered as a model for addressing this infection. Specifically in the state of Goiás weren't found recent data about these manifestations at the public health system. Therefore, this study was designed to characterize the profile of oral health among patients located in an important unit referenced by the Unified Health System (SUS) of the State of Goiás. This study emphasizes the value in monitoring these oral manifestations to assess the immune status of patients with HIV/AIDS and identifying treatment failures.

MATERIALS AND METHODS

Patients

The study population consisted of 201 consecutive patients of both sexes, aged 18 years and older, who presented to the public clinic of the Hospital das Clínicas, Federal University of Goiás (HC/UFG) between June 2011 and November 2012. The study sample size was calculated based on the variation in the prevalence of oral manifestations described in the literature (22.00% to 78.00%) and by maximizing the sample by 50.00% (with an estimated margin of error of 5.00%). The total number of registered patients at the Clinic of Infectious Diseases, HC/UFG, and the daily patient volume were also considered in calculating the sample size. The study protocol was approved by the Ethics Committee of HC/UFG (CEPMHA, protocol number 051/2011) and all participants assigned a Written Informed Consent (WIC). Patients with 18 years old or more and with a preserved cognitive health were included and those that were hospitalized or with a low cognition status were excluded preserving their condition. This hospital is recognized for its care of individuals with HIV/AIDS and receives patients from all over the state of Goiás. The study participants were divided into two groups to characterize a less severe phase at the infection (the Group I, which consisted of 92 HIV-positive patients with CD4+ cell counts above 200 cells/mm³, and an absence of sign and symptoms of AIDS), and a more severe phase (Group II, which consisted of 109 HIV-positive patients with signs and symptoms of the terminal stage of the disease (a $CD4^+$ cell count below 200 cells/mm^3 and a current or previous opportunistic disease that characterizes AIDS).

Oral Clinical Examination, Data from Medical Records and Research-Specific Questionnaires

To assess previously developed research tools (dental examinations, data collection from medical records and research-specific questionnaires), a pilot study was conducted with 72 patients during the period of June through November of 2011. Patients underwent a clinical examination in a private room in a regular chair under artificial light using a mouth mirror, a dental explorer, a periodontal probe and gauze. Only one dentist conducted the exams. We used a presumptive diagnosis based on the criteria provided by the EC Clearinghouse on Oral Problems related to HIV infection [8]. Lesions were photographed with a professional camera. The presence or absence of any dental lesions, including the occurrence of dental caries, was recorded.

Diagnostic Conclusion

The diagnosis of lesions of the oral mucosa (except dental caries) was confirmed by consensus with the team of infectious disease expertise and histopathological examinations in cases of doubt about the lesion. Xerostomia was confirmed by the viscosity of saliva at the time of the examination and the patient's report. Next, all patients answered a structured record of research, addressing shareholders demographic data, medical and laboratory data (recent viral load, CD4 count, and CD8, registration AIDS-defining illnesses, diagnosis time and route of HIV transmission) collected from medical records. It was registered the presence of alcohol and smoking habits, the presence of dental caries, oral hygiene habits, the use of dental prostheses, access to regular dental treatment and reporting of complaints with the use of antiretroviral therapy.

Statistical Analysis

Data were tabulated in Microsoft Excel 2007 (Microsoft ®, Brazil). Statistical analyses were performed using SPSS for Windows (version 15.0, USA). Descriptive statistical analyses included the frequency of oral manifestations associated with HIV infection and the calculation of mean frequencies and standard deviations for any oral lesion detected. The Fisher exact test was used to compare the prevalence of oral lesions between the two groups. A univariate logistic regression analysis was used to calculate the odds ratio (OR) and its confidence interval (CI) to estimate the strength of association between the presence of HIV-related oral lesions and various traits including gender, age, race, marital status, degree of education, monthly income, use of antiretroviral regimens, $CD4^+$ and $CD8^+$ cell counts, smoking habits, alcohol use, dental hygiene, dental prosthesis use,

opportunity for regular dental treatment and the presence of caries. A significance level of 5.00% was used.

RESULTS

Patient Characteristics

This study enrolled 201 patients with HIV/AIDS who were registered at the Clinic of Infectious Diseases at The Hospital das Clínicas in The Federal University of Goiás. The mean age for the study participants was 34.38 ± 10.96 years for Group I and 40.91 ± 10.66 for Group II. The study population was predominantly male in both groups (75.00% in Group I and 61.50% in Group II). More than 70.00% of the subjects in both groups stated that they were single, and the route of HIV transmission was most frequently due to heterosexual relations among Group II patients (62.40%) and homosexual relations among Group I patients (51.10%). Additional characteristics of the study population are shown in Table **1**.

Oral Manifestations

The prevalence of oral manifestations associated with HIV infection was 19.60% and 33.00% for Groups I and II, respectively. The prevalence of any oral lesion,

Table 1: General Characteristics of the Population HIV / AIDS of Patients Regulated by SUS, Goiás, in the Period of 2011-2012 (n = 201)

	Group I n= 92		Group II n= 109		Total n=201	
	n	%	n	%	N	%
Sex						
Male	69	75,0	67	61,5	136	67,66
Female	23	25,0	42	38,5	65	32,33
Race						
White	35	38,0	42	38,5	77	38,30
Black	18	19,6	27	24,8	45	22,38
Parda	39	42,4	40	36,7	79	39,30
Marital Status						
Married	23	25,0	32	29,4	55	27,36
Single	69	75,0	77	70,6	146	72,63
Schooling						
Fundamental	20	21,7	48	44,0	68	33,83
Medium	41	44,6	43	39,4	84	41,79
Superior	31	33,7	18	16,5	49	24,37
Disease Duration						
< 1 year	40	43,5	20	18,3	60	29,85
1 to 5 years	39	42,4	60	55,0	99	49,25
Above 5 years	13	14,1	29	26,6	42	20,89
ART	24	26,1	101	92,7	125	62,18
Tobaco	20	21,7	26	24,1	46	22,88
Alcoholism	43	46,7	37	33,9	80	39,80
HIV Transmission						
Ignored	5	5.4	9	8,3	14	6,96
Homossexual	47	51,1	28	25,7	75	37,31
Bissexual	12	13,0	4	3,7	16	7,96
Heterossexual	27	29,3	68	62,4	95	47,26

ART: antiretroviral therapy, SUS: Unified Health System.

including those not associated with HIV infection, was 31.52% in Group I and 45.87% in Group II, and there was a statistically significant difference between the two groups ($p < 0.05$). In the Group I, two patients (2.17%) had more than one oral lesion, while in the Group II, nine subjects (8.25%) had more than one lesion. The most prevalent oral manifestation was HIV-related periodontitis (5.43% in Group I and 11.00% in Group II), an aggressive inflammatory infection that leads to the rapid development of severe periodontal tissue disease. Necrotizing ulcerative gingivitis was uncommon (1.08% and 0.92% in Groups I and II, respectively). In Group I patients, the $CD4^+$ lymphocyte count in cases of HIV-related periodontitis varied between 281 and 741 cells/mm^3, and the viral load ranged between 1487 and 185.845 viral particles /mm^3. In Group II patients with HIV-related periodontitis, the $CD4^+$ cell count ranged between 161 and 837cells/mm^3, and the viral load ranged between an undetectable level and 189 viral particle/mm^3.

The second most frequent oral lesion was linear gingival erythema, an erythematous halo located in the marginal gingiva, especially around the anterior teeth (4.34% in Group I and 7.34% in Group II). The prevalence of erythematous candidiasis (EC) was 4.34% for Group I and 2.75% for Group II. Only Group II patients showed the pseudomembranous form, with a frequency of 1.83%. Angular cheilitis was present in Group I (4.34%) and Group II (1.83%) patients. The

Table 2: Prevalence of Oral Manifestations in HIV $^+$ / AIDS Patients, Regulated by SUS-Goiás, in the Period of 2011-2012 (n = 201)

Oral Manifestations	Group I n= 92		Group II n= 109		p
	n	%	n	%	
HIV-RELATED ORAL MANIFESTATIONS	18	19.60	36	33.0	0,032
ANY ORAL MANIFESTATION	29	31.52	50	45.87	0,038
LESIONS WITH FUNGAL ORIGIN:					
Pseudomembranous Candidiasis	0	-	2	1.83	0,192
Erythematous Candidiasis	4	4.34	3	2.75	0,539
Angular Cheilitis	4	4.34	2	1.83	0,297
LESIONS WITH VIRAL ORIGIN:					
Herpes Zoster	0	-	1	0.92	0,357
Oral Hairy Leukoplakia	1	1.08	0	-	0,275
LESIONS WITH BACTERIAL ORIGIN:					
Linear Gingival Erythema	4	4.34	8	7.34	0,372
Necrotizing Ulcerative Gingivitis	1	1.08	1	0.92	0,904
Periodontitis HIV- Related	5	5.43	12	11.00	0,157
SALIVARY GLAND LESION:					
Ranula	1	1.08	0	-	0,275
Xerostomia	1	1.08	7	6.42	0,060
LESIONS UNRELATED TO HIV					
Classic Gingivitis	0	-	1	0.92	0,357
Classic Periodontitis	11	11.95	17	15.59	0,458
Caries	35	38.04	45	41.28	0,640
Argirose	0	-	1	0.92	0,357
OTHER LESIONS:					
Pericoronaritis	0	0	1	0.92	0,357
Úlcers	1	0,98	3	2,75	0,400
Hyperpigmentation	0	-	1	0.92	0,357

p significance level, SUS: Unified Health System.

presence of erythematous candidiasis (EC) was associated with $CD4^+$ cell counts between 443 and 741 cells/mm^3 in Group I patients. The related viral load ranged from 10.897 to 116.231 viral particles/mm^3 in the Group I patients. In Group II patients, the presence of EC was associated with $CD4^+$ cell counts ranging from 57 to 420 cells/mm^3, and the viral load ranged from an undetectable level to 231.810 viral particles/mm^3. The pseudomembranous form, present only in patients of the Group II, was associated with $CD4^+$ cell counts between 120 and 526 cells/mm^3 and a viral load ranging from an undetectable level to 750 viral particles/mm^3.

Herpes simplex lesions were not found. Herpes zoster was observed in only 0.92% of Group I patients, and buccal hairy leukoplakia (LPB) was observed only in Group II patients (1.08%) and was associated with a $CD4^+$ cell count of 361 cells /mm^3 and a viral load of 86.721 viral particles/mm^3.

Other Manifestations

Ulcers, sores, hyperpigmentation or pericoronitis were rarely observed. The dental needs of patients were important for both groups. In Group I, 38.04% of patients had at least one carious lesion, while in Group II, 41.08% of patients had caries. Classical periodontitis was observed in 11.95% of Group I patients and in 15.59% of Group II patients. Classic gingivitis affected only Group II patients (0.92%) (Table **2**).

Antiretroviral Therapy and Oral Adverse Effects

Treatment with antiretroviral drugs caused unpleasant oral effects as reported by the study patients. Xerostomia was the most frequently reported adverse oral effect in both groups (7.60% in Group I and 11.00% in Group II). The antiretrovirals used by the study patients who reported xerostomia included zidovudine, lamivudine, efavirenz, biovir and lopinavir with ritonavir. Taste disturbance was reported by 4.30% and 5.50% of Group I and II patients, respectively. The occurrence of nausea was reported by 4.30% of patients in both groups. Nausea and taste perversion occurred with the use of the previously listed antiretroviral drugs, with the exception of lopinavir associated with ritonavir.

Association between the Occurrence of Oral Manifestations and Relevant Factors

There were no statistically significant associations between the presence of oral lesions and the $CD4^+$ T-

Table 3: Association Between the Presence of Oral Manifestation Related to HIV with $TCD4^+$ Lymphocyte Count, TCD8 Lymphocyte Count with Age in the GroupI Patients Regulated by SUS-Goiás in the Period of 2011 to 2012 (n=92)

Variables	Oral Manifestation							
	Absent		Present		p	95% CI		
	n	%	n	%		OR	Min	Max
CD4								
< 200 cells/mm³	-	-	-	-				
200 a 349 cells/mm³	20	27	2	11,1				
350 a 500 cells/mm³	22	29,7	9	50				
> 500 cells/mm^3	32	43,2	7	38,9				
Total	74	100	18	100	0,580	1,21	(0,62-	2,34)
CD8								
<500 cells/mm³	2	2,7	0	0				
500 a 749 cells/mm³	11	14,9	3	16,7				
750 A 1000 cells/mm³	20	27	6	33,3				
>1000 cells/mm³	41	55,4	9	50				
Total	74	100	18	100	0,933	0,97	(0,52-	1,83)
Age								
18 to 39 years old	54	73	8	44,4				
40 to 49years old	17	23	6	33,3				
≥50 years old	3	4,1	4	22,2				
Total	74	100	18	100	0,008	2,82	(1,31-	6,05)

OR: Odds Ratio, CI: Confidence Interval, *p*: significance level.

lymphocyte count, the viral load, the disease duration, the use of antiretroviral therapy or the route of HIV infection (p > 0.05). Age was significantly associated with the presence of HIV-related oral manifestations (p < 0.05; OR 2.82; 95% CI (1.31 - 6.05)) in Group I patients (Table **3**). Also in this group, there was a statistically significant association between the use of dental prostheses and the presence of oral manifestations (p < 0.05; OR 3.3; 95% CI (1.2 - 11.4)) (Table **4**). In Group II patients, the occurrence of HIV-related oral lesions was significantly associated with the presence of dental caries (p < 0.05; OR 2.4; 95% CI (1.1 - 5.4)) (Table **5**).

DISCUSSION

The results of this study allowed us to characterize differences in the occurrence of oral manifestations

Table 4: Association between the Presence of Oral Manifestations Related to HIV with Regular Dental Treatment, Use of Prostheses and Caries Presence in the Group I Patients Regulated by SUS-Goiás in the Period of 2011 to 2012 (n=92)

Variables	Oral Manifestation							
	Absent		Present		p	95% CI		
	n	%	n	%		OR	Min	Max
Regular Dental Treatment								
No	39	52,7	13	72,2				
Yes	35	47,3	5	27,8				
Total	74	100	18	100	0,141	0,43	(0,14-	1,32)
Use of Prostheses								
No	63	85,1	11	61,1				
Yes	11	14,9	7	38,9				
Total	74	100	18	100	0,027	3,6	(1,2-	11,4)
Caries								
No	47	63,5	10	55,6				
Yes	27	36,5	8	44,4				
Total	74	100	18	100	0,534	1,39	(0,49-	3,95)

OR: Odds Ratio, CI: Confidence Interval, *p*: significance level.

Table 5: Association between the Presence of Oral Manifestation Related to HIV with Regular Dental Treatment, Use of Prostheses and Caries Presence in the Group I Patients Regulated by SUS-Goiás in the Period of 2011 to 2012 (n=109)

Variables	Oral manifestation							
	Absent		Present		p	95% CI		
	n	%	n	%		OR	Min	Max
Regular Dental Treatment								
No	49	67,1	28	77,8				
Yes	24	32,9	8	22,2				
Total	73	100	36	100	0,253	0,58	(0,23-	1,47)
Use of Dental Prostheses								
No	53	72,6	23	63,9				
Yes	20	27,4	13	36,1				
Total	73	100	36	100	0,353	1,5	(0,64-	3,51)
Caries								
No	48	65,8	16	44,4				
Yes	25	34,2	20	55,6				
Total	73	100	36	100	0,035	2,4	(1,1-	5,4)

OR: Odds Ratio, *p*: significance level, CI: Confidence Interval.

between HIV patients with a less severe infection (Group I) and patients with a more advanced stage of the disease (Group II). The use of internationally recognized diagnostic criteria gave credibility to the data collected. The number of patients evaluated in this study was lower than the 605 examined patients in a study from Africa [9] and the 300 patients seen by the University Hospital of the Federal University of Rio Grande do Sul [10]. However, the sample size was well above the 87 examined patients in a study from Thailand [11] and the average age was similar to Cambodian and Thai investigations [12, 13].

The predominance of males in this investigation was similar to that observed in studies in Africa (58.00%), Rio Grande do Sul (58.00%) and Paraiba (58.01%) [4, 10, 14]. In contrast, an assessment of HIV/AIDS in Uganda, Africa included a higher percentage of female patients [9]. The marital status of the participants has been minimally discussed. However, the majority of Thai subjects in the two evaluated groups from different regions were married (58.00% versus 26.00%) [13]. Regarding the likely route of HIV transmission, the results were similar to findings from studies conducted in a city in southern Brazil (75.00% were heterosexual) and in India (59.8% were heterosexual) [10, 15]. A study at the University Hospital of Minas Gerais found one of two groups to be infected predominantly through heterosexual relationships, similar to the findings for Group II patients in this study, while the second group was infected predominantly through homosexual relationships, as observed for the Group I patients in this study. Contact *via* blood was not reported, despite being an important route of infection in the Minas Gerais study, causing more than 30% of HIV infections [16].

The use of antiretroviral therapy (ART) was nearly 100% among patients in the Group II, demonstrating the easy access to these drugs by patients, as regulated by the Unified Health System. In comparison, none of the patients with HIV/AIDS that were evaluated in Vietnam were under antiretroviral therapy [17] and only approximately 15.00% of the examined patients in India were receiving ART [18]. It is widely accepted that the use of antiretroviral drugs promotes a noticeable improvement in the prognosis of HIV infection by modifying AIDS-associated pathology, including manifestations in the oral cavity. Thus, oral manifestations start appearing casually presentation [19].

The general and individual prevalence of oral manifestations in HIV infection detected was lower than reported in a survey of 154 HIV^+ patients in Cuba, with a prevalence of 40.90% for any oral lesion [20] and a study of 76 HIV^+ patients evaluated in Aracaju (Brazil), with a prevalence of 57.89% [21]. Moreover, in another Brazilian study that was conducted in Recife (Brazil), 33.50% of the HIV^+ patients examined presented with one or more oral manifestations associated with HIV [22]. Patients with advanced stages of HIV infection had less competent immune systems, which are less effective at reacting to opportunistic agents; this observation may explain why the prevalence of HIV-related oral manifestations in the Group II was almost twice as high as the Group I.

HIV-related periodontitis can be explained by a number of factors, such as the marked immunodeficiency in HIV/AIDS patients, a reduced lymphocyte response against pathogenic agents and the presence of bacterial pathogens on the gums. This condition facilitates the production of pro-inflammatory cytokines that increase the chance of periodontal damage. These alterations appear early in the course of HIV infection [23]. The findings about periodontitis are consistent with those from studies with Nigerian (14.00%) [4] and Indian (85.00%) patients with HIV/AIDS who had periodontitis [23]. The occurrence of necrotizing ulcerative gingivitis in both groups was consistent with an evaluation of Nigerian patients [4]. The linear gingival erythema affected almost twice as many patients in Group II compared with Group I, but had not been observed in India [23]. These results were consistent with studies in Brazil, where periodontal disease associated with HIV was present in 11.00% and 9.00% of the investigated patients [24], showing a clear reduction in the occurrence of these lesions once they started treatment with non-nucleoside inhibitors analogs of the reverse transcriptase [25].

Different forms of candidiasis affecting the oral cavity had a somewhat low prevalence in this study compared to studies in Africa (55.10%), Brazil (59.00%) and Thailand (55.10% of the northern population and 25.00% of the southern population) [2, 10, 13]. In addition, an investigation of 76 Brazilian patients with HIV/AIDS detected a 26.30% prevalence of pseudomembranous candidiasis cases [21]. The erythematous candidiasis has remained the most prevalent process in the oral cavity even with the use of highly active antiretroviral therapy (HAART) [19]. Combination therapies with protease inhibitors provide

a reduction in the exoenzyme production by Candida species, especially by Candida albicans, reducing the ability of these fungi to become aggressive in HIV^+ patients. The HIV-positive patients have more C. albicans proteolytic enzymes than HIV-negative patients. This feature facilitates the colonization of the oral cavity with these strains of fungi, increasing the prevalence of erythematous candidiasis [26]. In Nigerian patients, more than 80.00% of the subjects with candidiasis also presented with angular cheilitis. This situation can be explained by the action of HIV in patients with a poor nutritional status, as observed for patients from Lagos (Nigeria) and for patients in many poor African countries [4].

Regarding oral viral lesions, this study differed from research conducted in Nigeria in 700 patients, where a 23.00% prevalence of herpes zoster lesions was observed, although only 35 (5.00%) of the patients were HIV-positive [4]. In Brazil, only 8.30% of patients had lesions of herpes labialis [14]. Oral hairy leukoplakia results confirmed previous findings in Barcelona [19] and suggested a reduction in the appearance of this entity. The presence of this lesion has been related to a $CD4^+$ cell count below 300 cells/mm^3, and a viral load increase is considered a reliable marker for the progression of HIV infection [27].

The salivary gland diseases manifested primarily as xerostomia, which occurred in some individuals receiving antiretroviral therapy. No cases of Kaposi's sarcoma were diagnosed, confirming similar studies in Brazil and Nigeria [10, 28]. These results are in contrast to an African survey in Zimbabwe where this neoplasm was diagnosed in 18.60% of the examined patients [2].

Classic periodontitis, unrelated to HIV infection, is quite prevalent in the general population and in affected study patients in both groups. The high prevalence of caries in the study population, especially in Group II, demonstrated the inaccessibility to regular dental treatment. A similar result (34.40% of individuals with multiple cavities) was observed in Spain [19]. This situation is of concern because it affects the quality of life of these patients by adversely affecting their ability to eat appropriately.

Among the adverse oral effects reported by patients, those caused by antiretroviral therapy affected both groups. In the Group II, more than 90% of patients were on antiretroviral therapy. A higher prevalence of xerostomia (47.80%) was detected among Spanish patients on HAART [19]. This condition can compromise the patient's oral health by facilitating the emergence of infections and caries lesions. Nausea, aphthous ulcers and taste disturbances occurred in a similar prevalence reported in other research study conducted in Brazil [25]. Melanotic hyperpigmentation, a dark staining of the oral mucosa, was infrequent; however, other studies have shown contradictory results, with this lesion having a prevalence of 34.00% and 19.00% in India and Nigeria, respectively [18, 28]. The introduction of HAART changes the prevalence of oral manifestations in patients even after only one month of treatment, although the positive effect of this therapy does not seem to provide sufficient protection against lesions induced by the human papillomavirus (HPV) [29].

The absence of a statistically significant association between the occurrence of oral manifestation related to HIV and the $CD4^+$ lymphocyte count was opposite to that which was observed in other studies [13, 21, 24]. One African study found an association between $CD4^+$ cell counts of <500 cells/mm^{-3} and the emergence of oral candidiasis [30]. No statistically significant association between oral lesions and viral load was observed in this study, which is in contrast to the results obtained from another Brazilian study [24] that found a greater number of oral lesions associated with viral loads above 10.000 copies/mm^3. A significant association with the presence of oral lesions and age in the Group I differed from Brazilian research that did not find such an association [24]. The use of dental prostheses associated with the presence of HIV-related oral manifestations in Group I corroborates findings from another Brazilian study, which suggested that the rough surface of the resin used for dental prostheses accumulate microorganisms, especially Candida albicans. These devices therefore require careful hygiene to prevent the buildup of bacterial plaques that may function as niches for opportunistic pathogens [26].

In the Group II, the presence of caries was significantly associated with the onset of HIV-related oral lesions, possibly due to the virulence of microorganisms involved in cariogenesis and the severe disruption of the immune system in these more advanced stages of HIV infection.

A statistically significant difference between the HIV^+ and AIDS Groups is not surprising because the immune status of patients with AIDS sharply deteriorates during advanced stages of HIV infection.

In conclusion, Group II patients were more affected than Group I patients by oral lesions. In addition, periodontitis was the most prevalent oral lesion. Age and prosthesis-wearing were influential factors for the development of these lesions in Group I patients, while the presence of caries influenced oral lesion development in Group II patients.

One limitation of this study was the difficulty in confirming the presumptive diagnosis by means of laboratory tests, which may lead to misdiagnosis. However, oral lesions associated with HIV are easily diagnosed during a clinical examination, which minimizes the possibility of misdiagnosis. In addition, we must consider the region-specific geographic aspects and health policies for a study population. Ideally, there should be standard methodologies for similar investigations across geographic locations, which would reduce discrepancies and residual differences in the results.

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CONFLICTS OF INTEREST

The authors declared no conflicts of interest

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