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HIV Disease and Therapy

Oro-facial lesions and CD4 counts associated with HIV/AIDS in an adult population in Oyo State, Nigeria

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OBJECTIVE: The objective of this study was to define the oro-facial lesions associated with Human Immunodeficiency Virus (HIV)/Acquired Immune Deficiency Syndrome (AIDS) in an adult population in Oyo state, Nigeria and to relate these with the level of immune suppression as measured by the CD4 counts.

MATERIALS AND METHOD: The study population consisted of 679 consecutive subjects who were seen at the state-owned blood bank. Information on demography, medical and medication histories were obtained. Oro-facial examinations were carried out according to Greenspan *et al* [*Oral Surg Oral Med Oral Pathol* (1992)73:142–144]. HIV sero-prevalence status was determined for all patients. $CD4^+$ T-lymphocyte count was carried out for those sero-positive for HIV and 31 randomly selected HIV-negative subjects. Data were analyzed using the chi-square test, Fisher's exact test, Student's *t*-test and odds ratio where appropriate.

RESULTS: Eighty-one (11.9%) of the entire study sample were confirmed HIV positive. The prevalence of specific oral lesions by HIV sero-status revealed that pseudomembranous oral candidiasis and angular cheilitis occurred significantly and more frequently in HIV-positive subjects (33.3 and 21% respectively) than those who were HIV negative (4.3 and 1.8% respectively, $P < 0.05$). The mean CD4 count of the HIV-positive subjects was 452 cells mm^{-3}, s.d. 137, while it was 602 cells mm^{-3}, s.d. 251, for the HIV negatives. The difference was statistically significant ($P = 0.000$). Forty-four (66.7%) subjects with CD4 counts <500 cells mm^{-3} had oro-facial lesions whereas among those with CD4 counts >500 cells mm^{-3} only 22 (33.3%) had oro-facial lesions (OR = 4.57).

CONCLUSION: The type of oro-facial lesions most commonly associated with HIV/AIDS in Oyo state, Nigeria, has been shown to be pseudomembranous oral candidiasis. This was followed by angular cheilitis. These lesions, although found in HIV-negative subjects, were in a lower proportion as compared with HIV-positive subjects. Mean CD4 counts were lower in HIV-positive subjects and this was associated with greater prevalence of oro-facial candidiasis and angular cheilitis.

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Keywords: oro-facial lesions; HIV; AIDS; CD4 count; pseudomembranous oral candidiasis; angular cheilitis

Introduction

Human immunodeficiency virus causes devastation to the body by attacking the host's immune system. In a healthy individual, there exists a delicate balance between the complex microbial ecology of the mouth and the body's immune system. On entry into the host's body, the HIV attacks and destroys this delicate balance thereby rendering the host susceptible to a lot of life-threatening opportunistic infections, neurological disorders and unusual malignancies. Oral lesions are known to be common in HIV/AIDS (Greenspan *et al*, 1988; Shiboski *et al*, 1994; Greenspan and Greenspan, 1996) like in many chronic, debilitating conditions (Fiegal *et al*, 1991).

The oral lesions found in Human Immunodeficiency Virus (HIV) can be fungal (Moutoc-Okafor *et al*, 2000; Aarestrup *et al*, 2001), viral (Bader *et al*, 1978; Itin and Lautenschlager, 1997) and bacterial in origin (Pindborg, 1989; Reichart, 1997; Narani and Epstein, 2001). The most common lesions of the oral mucosa, associated with HIV, according to Greenspan and Greenspan (1996), are candidiasis, hairy leukoplakia, herpetic gingivo-stomatitis, aphthous ulceration, necrotizing gingivitis, pigmented macules, Kaposi's sarcoma and periodontal diseases.

Oral manifestations of HIV infection have been widely studied and reported in the developed countries. Epidemiological information from the African subregion on oral lesions associated with HIV are increasing although there are isolated reports coming from the

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different countries (Tukutuku *et al*, 1990; Guthua *et al*, 1995; Arendorf *et al*, 1997; Hodgson, 1997; Jonsson *et al*, 1998; Arendorf and Holmes, 2000; Eyeson *et al*, 2000; Holmes and Stephen, 2002; Kamiru and Naidoo, 2002; Onunu and Obuekwe, 2002). In spite of increasing prevalence of HIV in the largely populated nations (UNAIDS/WHO, 2002 update), documentation of oral manifestation of the infection in Nigeria is sparse.

The objective of this study therefore was to define the oral and facial lesions associated with HIV and their relationship with the level of immune suppression as assessed by the $CD4^+$ T-lymphocyte counts.

Materials and methods

The study subjects comprised those presenting for HIV screening at the Oyo state Central Blood Transfusion Unit (CBTU) between March and July 2002. Apart from a few voluntary blood donors, participants were referred either from the state maternity clinics as part of routine prenatal care, or following suspicion of HIV infection in patients seen at the sexually trasmitted infection (STI) and tuberculosis clinic. Necessary approvals from the state authorities and ethical clearance through the joint ethical committee of the College of Medicine, University of Ibadan and the University College Hospital, were obtained. In addition, informed consent was sought and given by every participant before being included in the sample. Every consecutive subject presenting at the designated center on the screening days was included in the study until the desired sample size was attained.

The questionnaire, which consisted of 40 close-ended questions, divided into six sections was designed to collect information on demography, current medications, and clinical features of AIDS-related complex and also presence of other relevant clinical features. Findings from intra-oral and extra-oral examinations, as well as laboratory investigations were documented on all the subjects.

The presumptive diagnostic criteria described for each lesion, as documented by Greenspan *et al* (1992) and presumed to be adequate for use in epidemiological surveys when a large number of patients are examined briefly, was used in this study.

Prior to conducting the examinations under the study situation, the examiner was trained using the diagnostic criteria. A pretest of the study instrument, involving 20 patients with HIV-associated oral lesions, was carried out at the University College Hospital. Intra-examiner reproducibility was assessed to be about 96% being less than perfect in the ability to consistently pick all the concurrent lesions in cases of multiple lesion presentations.

Subsequently, 5 ml of venous blood was taken for HIV-I and II screening test using the double Enzyme-Linked Immunosorbent Assay (ELISA) method (Bio-Rad, Marnes La Coquette, France; Genie II HIV-I/HIV-II. kit) as prescribed by the World Health Organization (WHO, 1989). Confirmatory testing, using the Western blot technique, was carried out on samples that were reactive and specimens with at least one env and one gag band were considered positive for HIV.

Following this, fresh blood samples were collected from those confirmed positive as well as 31 randomly selected HIV-negative participants and the $CD4^+$ lymphocyte counts were determined by the virus research laboratory of the University College Hospital, Ibadan, by the use of a commercially available kit (Dynabeads T_4-T_8 Quantification Protocol Kit: Dynal ASA, Oslo, Norway). $CD4^+$ cell count assay was carried out within 6 hours of sample collection.

Data were analyzed using Epi Info version 6.0 (Centers for Disease Control, Atlanta, GA, USA). The proportion of HIV/AIDS patients having at least one oro-facial pathology was calculated. In addition, the frequencies of occurrence of the various specific lesions in HIV-positive and HIV-negative subjects were also generated. Associations between some variables such as age, sex, socio-economic status and oro-facial lesions were determined by chi-square test and Fisher's exact test when cell number was low. Furthermore, mean $CD4^+$ lymphocyte count were calculated separately for those sero-positive and negative for HIV and these were related to the presence or absence and type of oral lesion using the odds ratio, where applicable. Differences between mean values were determined by Student's *t*-test.

Results

Six hundred and eighty three questionnaires were administered to subjects at the Oyo State CBTU in Ibadan. All the 683 were examined and screened for HIV by two successive ELISA techniques. Of the 683 subjects, 85 (12.4%) were reactive and were subjected to confirmatory test using the Western blot technique. Confirmatory tests on four of the subjects were indeterminate and these were therefore excluded from the study. Of the remaining 679 subjects, 81 (11.9%) were confirmed positive. Sixty-nine (85.2%) of the confirmed positive had HIV-I, three (3.7%) had HIV-II while nine (11.3%) had HIV-I and II.

Participants were aged between 17 and 78 years, the age distribution is as shown in Table 1. Among the 81 HIV-positive subjects, 39 (48.1%) were aged between 21 and 30 years. Thirty-seven (45.7%) aged 31–40 years, while four (5.0%) were aged between 41 and 50 years. Only one (1.2%) subject was aged above 60 years (62 years).

Respondents were made up of 185 (27.2%) males and 494 (72.8%) females. The preponderance of females in this study can be explained by the fact that the study site is also the screening center for all pregnant women attending all the state's antenatal clinics. In analyzing the distribution of sero-status by gender, however, it was revealed that 38 (20.5%) of all the 185 males were HIV positive as compared with only 43 (8.7%) of all the 492 female subjects who were HIV positive. This shows that in the study sample, the prevalence rate of HIV in males was more than in females.

Sixty three (77.8%) of the HIV-positive subjects were on medications which included antifungal, antibiotics,

Table 1 Age distribution of the total study sample and HIV-positive subjects

Age group (years)	*Total study sample,* n *(%)*	*HIV-positive subjects,* n *(%)*
17–20	26 (3.8)	–
21–30	339 (49.9)	39 (48.1)
31–40	225 (33.2)	37 (45.7)
41–50	52 (7.7)	4 (5.0)
51–60	28 (4.1)	–
61–70	5 (0.7)	1 (1.2)
>70	4 (0.6)	–
Total	679 (100)	81 (100)

Table 2 Prevalence of specific oro-facial lesions in the entire study sample

Specific oro-facial lesions	n *(%)*
At least one oral lesion	131 (19.3)
Pseudomembranous oral candidiasis	53 (7.8)
Gingivitis	29 (4.3)
Angular cheilitis	28 (4.1)
Minor aphthous ulcer	27 (4.0)
Periodontitis	14 (2.1)
Herpes simplex labialis	6 (0.9)
Varicella zoster	3 (0.4)
Major aphthous ulcer	2 (0.3)
Salivary gland disease	1 (0.1)
Hairy leukoplakia	–
Oral Kaposi's sarcoma	–
Oral wart papilloma	–
Herpes simplex intraoral	–

Numbers do not add up because the conditions were not mutually exclusive.

antituberculous and heamatinics, prescribed to them from their referral clinics. None was on ART or HAART.

As seen in Table 2, 131 (19.3%) of the study population had at least one oral lesion. The most common lesion found in all subjects that were examined was pseudomembranous oral candidiasis as 53 (7.8%) of the subjects had the lesion. Twenty-nine (4.3%) had HIV-associated gingivitis, 28 (4.1%) had angular cheilitis, minor aphthous ulcer was found in 27 (4.0%), 14 (2.1%) had severe HIV periodontitis, while six (0.9%) subjects had herpes simplex labialis. Two (0.3%) subjects had major aphthous ulcer, three (0.4%) subjects had varicella zoster virus and one (0.1%) subject had salivary gland disease. Intra-oral herpes simplex, hairy-leukoplakia, oral Kaposi's sarcoma and oral wart were not found in any of the subjects (Table 2).

Table 3 shows the prevalence of having at least one oral lesion in HIV positive to be 46 (56.8%) and 85 (14.2%) in the HIV-negative subjects ($P < 0.001$). The prevalence of specific oral lesions by HIV sero-status reveals that pseudomembranous oral candidiasis (33.3%) and angular cheilitis (21%) appear to significantly occur more in HIV-positive subjects than in those who are HIV negative (4.3 and 1.8% respectively) ($P < 0.001$ in each case).

Table 3 Prevalence of specific oral lesions by HIV sero-status

Oro-facial lesions	*HIV +ve,* n *(%)*	*HIV −ve,* n *(%)*	P *value*
At least one oral lesion	46 (56.8)	85 (14.2)	<0.001
Pseudomembranous oral candidiasis	27 (33.3)	26 (4.3)	<0.001
Angular cheilitis	17 (21.0)	11 (1.8)	<0.001
Gingivitis	1 (1.2)	28 (4.7)	0.238
Periodontitis	2 (2.5)	12 (2.0)	0.671
Herpes simplex intra oral	–	–	–
Herpes simplex labialis	2 (2.5)	4 (0.7)	0.153
Minor aphthous ulcer	1 (1.2)	26 (4.3)	0.236
Major aphthous ulcer	–	2 (0.3)	–
Varicella zoster	1 (1.2)	2 (0.3)	0.252
Hairy leukoplakia	–	–	–
Salivary gland disease	1 (1.2)	–	–
Oral Kaposi's sarcoma	–	–	–
Oral wart papilloma	–	–	–

Total for HIV+ve = 81, HIV−ve = 598.

Figure 1 An HIV-positive subject with concurrent lesions (pseudomembranous candidiasis and angular cheilitis)

On the other hand, herpes simplex labialis, minor aphthous ulcer, major aphthous ulcer, and varicella zoster were found to occur more frequently in those who were HIV negative. The higher prevalence of these lesions in the HIV-negative subjects were, however, not statistically significant ($P > 0.05$).

Figure 1 shows an HIV-positive subject with concurrent lesions of pseudomembranous candidiasis and angular cheilitis and Figure 2, HIV-positive subjects with pseudomembranous candidiasis.

Mean $CD4^+$ T-lymphocyte counts for HIV positive was 452 cells mm^{-3}, s.d. 137 and among HIV negative it was 602 cells mm^{-3}, s.d. 251. This was statistically significant ($P = 0.000$). Fifty-six (69.1%) of the HIV-positive subjects had CD4 counts <500 cells mm^{-3} and 25 (30.9%) had counts >500 cells mm^{-3} (Table 4). On the contrary, a higher proportion, i.e. 21 (67.7%) of those sero-negative for HIV had CD4 counts <500 cells mm^{-3}. Thus a greater percentage of HIV-positive subjects had counts <500 cells mm^{-3}, while a greater percentage (67.7%) of the HIV-negative ones

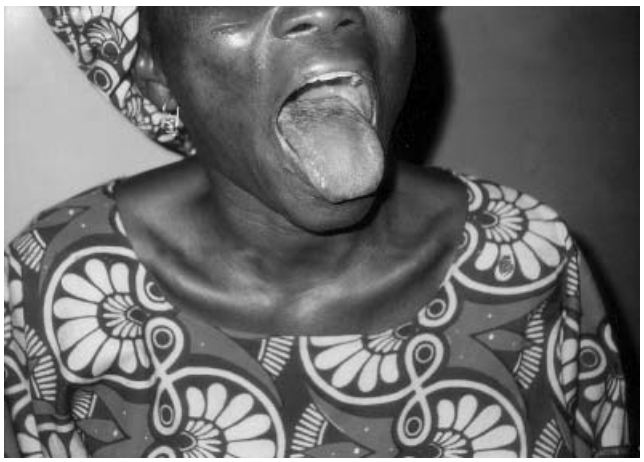

Figure 2 Pseudomembranous candidiasis as seen in HIV-positive patient

Table 4 $CD4^+$ lymphocyte count-grouping according to the sero-status of the participants

	$CD4^+$ count (cells mm^{-3})		
HIV sero-status	*< 500 (%)*	*> 500 (%)*	*Total*
+ve	56 (69.1)	25 (30.9)	81
−ve	10 (32.3)	21 (67.7)	31
Total	66	46	112

OR = 4.70; 95% Confidence Interval, 1.78–12.65; $P = 0.000$.

Table 5 Relationship between oro-facial lesions and $CD4^+$ counts in the study population

	$CD4^+$ counts (cells mm^{-3})		
Oro-facial lesions	*< 500 (%)*	*> 500 (%)*	*Total*
Present	44 (66.7)	14 (30.4)	58
Absent	22 (33.3)	32 (69.6)	54
Total	66 (100)	46 (100)	112

OR = 4.57; 95% Confidence Interval, 1.89–11.20, $P = 0.000$.

had CD4 counts > 500 cells mm^{-3}. This shows that the presence of HIV is associated with lower CD4 counts and this relationship was statistically significant (OR = 4.70, 95% confidence interval, 1.78–12.65, $P = 0.000$).

Concerning the relationship of CD4 count and presence of oral lesions, Table 5 shows that a greater percentage (66.7%) of subjects with lower CD4 counts (< 500 cells mm^{-3}) had oro-facial lesions relative to subjects (30.4%) with higher CD4 count. This relationship was found to be statistically significant (OR = 4.57, 95% confidence interval, 1.89–11.20, $P = 0.000$).

Table 6 shows the prevalence of the specific lesions and their relationship with the CD4 counts. The presence of one or more oro-facial lesions and level of CD4 counts was found to be statistically significant

Table 6 Prevalence of specific oro-facial lesions and their relationship with $CD4^+$ lymphocytes counts

Oro-facial lesions	*< 500 cells mm^{-3},* n *(%)*	*> 500 cells mm^{-1},* n *(%)*	P *value*
Greater/equal to one lesion	44	14 (24.2)	0.000
Pseudomembranous candidiasis	31 (81.6)	8 (20.5)	0.001
Angular cheilitis	16 (88.9)	2 (11.1)	0.004
Gingivitis	1 (100)	–	1.000
Periodontitis	–	2 (100)	0.167
Herpes simplex intra-oral	–	–	–
Herpes simplex labialis	2 (66.7)	1 (33.3)	1.000
Minor aphthous ulcer	1 (100)	–	1.000
Major aphthous ulcer	–	–	–
Varicella zoster	1 (100)	–	1.000
Hairy leukoplakia	–	–	–
Salivary gland disease	–	1 (100)	0.940
Oral Kaposi's sarcoma	–	–	–
Oral wart papilloma	–	–	–

($P = 0.000$). However, only the presence of pseudomembranous candidiasis and angular cheilitis in relation to the level of CD4 counts were statistically significant ($P = 0.001$ and 0.004 respectively). The mean CD4 count of the HIV-positive subjects with pseudomembranous candidiasis was 426 cells mm^{-3}, s.d. 115, and the mean for those HIV positive with angular cheilitis was 388 cells mm^{-3}, s.d. 123. The difference was statistically significant ($P = 0.000$).

Discussion

This study has highlighted the prevalence of oro-facial lesions in HIV-positive subjects in an adult population in Oyo State. It has revealed that 11.9% of subjects screened were sero-positive for HIV infection. This prevalence rate, in comparison with earlier reported data is very high. A sero-prevalence of HIV in Oyo State, based on regular screening of blood donors, antenatal patients and travelers revealed a prevalence of 2.2% in 1996, 3.5% in 1998 and is reported to have risen to 4.2% by 2001 (UNAIDS/WHO, 2002). Although, the rate of HIV infection is said to be rising nationally and in Oyo State, it seems unlikely that 11.9% prevalence rate recorded in this study accurately reflects the true population prevalence rate. The CBTU, apart from screening blood of blood donors, serves as the center for the diagnosis of patients suspected to be HIV positive from the Jericho Chest Hospital and other General Hospitals within Ibadan and its immediate environs. A high proportion of those seen are therefore high-risk patients and this, perhaps, accounts for the higher rate of positives seen. This will appear to buttress the data published on the Epidemiological Fact Sheets on HIV/AIDS and STI, Nigeria, 2002 update in which high risk groups such as STI clinic patients outside the cities had prevalence rates as high as 12% and a range of 5.6–23% (UNAIDS/WHO, 2002). In the same report, HIV prevalence among 25–29-year-old antenatal clinic attendees in 2001 was 6.5% and among TB patients tested in 2000, it was 17% with a range of 4.2–35.1%.

The age distribution of the HIV subjects in this study reveals a high prevalence in the third and fourth decades being 48.1 and 45.7% respectively. This is similar to other studies (Berkley *et al*, 1989; Chidzonga, 2003), In the Ugandan report by Berkley *et al* (1989), people in their third decade were also equally affected.

This is also in congruence with the UNAIDS/WHO (2002) report, which claims that about one-third of those currently living with HIV/AIDS are aged 15–24 years.

In most parts of the world, particularly at the onset of AIDS pandemic, more males are affected than females (Bozzette *et al*, 1988). In most African countries however, women are more affected than men as was the experience in Uganda, Central African Republic, Equatorial Guinea and Gabon (Berkley *et al*, 1990; Butt *et al*, 2001). In this study, although the prevalence rate of HIV sero-positivity in males was found to be more than the females, [as expressed in the proportion of males that are positive, (20.5%) being higher than the comparable figures for females (8.7%)], in absolute numbers however, far more females were found to be carrying the virus simply because of the higher representation of females in this study but, remotely, perhaps because women are known to be more vulnerable in communities where HIV is spread mainly through heterosexual transmission (UNAIDS, 2002).

It was also revealed in this study that 19.3% of the entire study population had at least one type of oro-facial lesion at the time of examination. The prevalence and types of oral lesions were found to vary by sero-status. The HIV-positive subjects were approximately four times more likely to have oral lesions than the HIV sero-negative subjects (56.8% compared with 14.2%) ($P < 0.001$). In a similar study conducted in the US, 40% of those who were sero-positive for HIV had oral lesions but only 23% of those that were sero-negative had oral lesion (Williams *et al*, 1990). In the same way, significant differences in prevalence rates were found between HIV-positive and HIV-negative women for the most commonly occurring oral lesions. The odds of having oral candidiasis were nearly five times higher for HIV-positive than for HIV-negative women. Erythematous candidiasis was 10 times more likely among HIV-positive than HIV-negative ones (Greenspan *et al*, 2000). It is significant to know that in our study and others cited, some individuals, despite not being infected, still had suspicious oral lesions at one time or the other. This fact is informative in the sense that in as much as the appearance of oral lesions should alert the examiner to the possibility of HIV infection, it cannot be pathognomonic of the disease. Screening and confirmatory test are absolutely essential in reaching diagnosis.

Pseudomembranous oral candidiasis was the most common specific oral lesion seen in this study. This finding is similar to many others (Arendorf *et al*, 1998; Schuman *et al*, 1998; Greenspan *et al*, 2000; Chidzonga, 2003; Naidoo and Chikte, 2004). Although it was present in both HIV sero-positive and sero-negative subjects, the proportion of the HIV-positive subjects who had pseudomembranous candidiasis (33.3%) far outweighed the HIV-negative subjects who had the lesion (4.3%) as seen in Table 3. This is also in agreement with the observation of Greenspan *et al* (2000).

Angular cheilitis is defined as fiery red commisures with fissuring or cracking appearance and often associated with *C. albicans* (EEC-Clearing House, 1993). It is one of the lesions strongly associated with HIV and may be seen accompanying any of the intra-oral presentations. A relatively high proportion of the HIV sero-positive subjects in our study sample had angular cheilitis along with pseudomembranous candidiasis, both of which are significantly associated with the infection. Comparable prevalence rates were recorded in some other studies from Africa by Butt *et al* (2001) in Kenya (27.9%) and Kamiru and Naidoo (2002) in Lesotho (14%). Although literature is relatively sparse on angular cheilitis as an oral manifestation of HIV infection, in a few of those in which it was separately reported in the developed countries, the prevalence was relatively lower (Patton, 2000). Angular cheilitis has traditionally been an indicator of nutritional deficiency in poor communities. In view of our present findings that angular cheilitis is significantly associated with HIV infection, there is need to re-orientate the outlook of health care providers to this crucial fact. That is, health care providers should be sensitized to subject all cases of angular cheilitis to necessary diagnostic work-up, treatment and follow-up.

Two (2.5%) cases of herpes simplex labialis were seen in this study. Varicella zoster virus which causes herpes zoster (shingles) is known to occur in the elderly and immunosuppressed. Herpes zoster, although has been associated with more rapid HIV disease progression in some studies (Scully *et al*, 1991), has not been so identified in some others (Moss *et al*, 1988). A case of salivary gland disease was identified in this study and it was characterized by xerostomia.

Oral hairy leukoplakia, which has been discovered as an early sign of HIV infection, was first described by Greenspan *et al* (1987) among young homosexual males. Subsequently, additional cases have been reported from other parts of the world (Eversole *et al*, 1986; Phelan *et al*, 1987; Schiodt and Pindborg, 1987; Coates *et al*, 1996; Patton *et al*, 1998; Kamiru and Naidoo, 2002). Colebunders and Latif (1991) were able to establish that hairy leukoplakia is relatively uncommon in Africa, occurring in only 0.4–10% of African AIDS patients. No case of oral hairy leukoplakia was identified in this study.

Although high prevalence of Kaposi's sarcoma have been documented in studies conducted in some parts of Africa, [Butt *et al*, 2001 (13%); Chidzonga, 2003 (18.3%)], oral Kaposi's sarcoma and oral wart, like oral hairy leukoplakia were not seen in any of the HIV-positive participants in this study.

None of the HIV-positive subjects in this study was known to be on ART on HAART, nevertheless, it is important to note that 63 (77.8%) were on at least one type of medication at the time of examination, such as antifungal, antibiotics, antituberculous and hematinics

for the treatment of opportunistic infections. It is therefore possible that these medications could have masked or affected the manifestation of the oral lesions.

Numerous reports have indicated high prevalence values of periodontal diseases with HIV infections. The periodontal diseases in HIV sero-positive patients span a wide spectrum of lesions ranging from conventional gingivitis and periodontitis to more severe necrotizing ulcerative gingivitis and necrotizing ulcerative periodontitis (EEC-Clearing House, 1991). The prevalence of periodontal diseases in this study (4.3% for gingivitis and 2.1% for periodontitis) is considered remarkably low compared with other studies reporting levels as high as 78.3 and 100% (Ceballos-Salobrena *et al*, 1996; Butt *et al*, 2001). The issue of diagnosis of HIV-associated gingivitis and periodontitis becomes quite a challenge in communities where gingivitis and periodontitis are endemic and highly prevalent. Realizing that the majority, irrespective of HIV sero-status, have some degree of gingivitis and periodontitis actually exert caution on the examiner not to over report. As a consequence only obviously severe cases of periodontal disease were recorded in our study. Furthermore, the consequence of periodontal in HIV infection depends on many factors some of which include the stage of the disease and other factors such as immune status as measured by $CD4^+$ T-lymphocyte cell count. According to Macy and Adelman (1988), the normal $CD4^+$ count ranges between 430 and 1300 cells mm^{-3}, but it is generally above 800 cells mm^{-3} in healthy persons. The $CD4^+$ count for HIV-positive subjects in our study, ranged between 217 and 826 cells mm^{-3} with a mean count of 452 cells mm^{-3}, s.d. 137. The mean $CD4^+$ count for HIV-negative subjects was 602 cells mm^{-3}, s.d. 251. This study in which the levels of $CD4^+$ counts in both the HIV-positive and -negative individuals in Oyo state were measured, should serve as an important reference material as there are no other such record, to the authors' knowledge, largely because the resources are lacking. Moniaci *et al* (1990) observed that oral lesions found among a cohort of 737 persons in Italy infected with HIV were significantly associated with $CD4^+$ count of <300 cells mm^{-3}. In a population of 43 subjects in Greece, Kolokotronis *et al* (1994) found oral hairy leukoplakia to be associated with $CD4^+$ counts <200 cells mm^{-3}. In addition, in a San Francisco cohort of 789 men infected with HIV, Fiegal *et al* (1991) observed that oral hairy leukoplakia, pseudomembranous oral candidiasis and Kaposi's sarcoma were significantly associated with lower $CD4^+$ lymphocyte counts when CD4 categories of <200, 200–500 and >500 cells mm^{-3} were used. By using the same classification, Schuman *et al* (1998), in a multi-center study of 867 women who were HIV sero-positive from the US urban region, in agreement with Fiegal *et al* (1991) found that having oral hairy leukoplakia or pseudomembranous oral candidiasis was significantly associated with low CD4 cell count but not erythematous oral candidiasis. Schuman *et al* (1998) differed from Fiegal *et al* (1991) in finding angular cheilitis and ulcers to associated with CD4 counts <200 cells mm^{-3}. Analysis of oral lesions in 81 HIV-positive subjects and 31 HIV-negative subjects and their CD4 counts in the present study has shown that CD4 counts <500 cells mm^{-3} were significantly associated with having pseudomembranous oral candidiasis and angular cheilitis.

According to Piatak *et al* (1993), the majority of individuals in the intermediate phase of the infection (i.e. $CD4^+$ count of 200–500 cells mm^{-3}) have fewer or no symptoms. Clinical features present during early HIV infections (i.e. $CD4^+$ count >500 cells mm^{-3} may worsen in severity of frequency during the intermediate stage (Hamilton *et al*, 1992). New problems may also develop, including diarrhea, recurrent herpes simplex infection, oral and vaginal candidiasis. It therefore could be either that most of the subjects seen in this study were in the intermediate stage or they could have an interplay of other factors. Report of studies from other parts of the world, show that $CD4^+$ lymphocytes counts of <200 cells mm^{-3} are associated with AIDS-related conditions. In this study, a few of the patients had evidence of AIDS-related complex with fever more than 1 month, persistent diarrhea, weight loss and generalized lymphadenopathy, yet, none of such patients was found to have $CD4^+$ count lower than 200 cells mm^{-3}.

This should raise some questions such as: what exactly are the CD4 count during different stages in HIV infection in different subgroups of Nigerians and the factors that affect level of CD4 count in the same population. All these questions, as much as they need to be addressed, were not part of the objectives of the present study.

Conclusion

This study has shown that the prevalence of oro-facial lesions in HIV-positive subjects in the study population is 56.8%. This is considered to be high, as the prevalence in the HIV-negative subjects is 14.2%.

The type of oro-facial lesion most commonly associated with HIV/AIDS in Ibadan, Oyo state has been shown to be pseudomembranous oral candidiasis, and this is followed by angular cheilitis. Although these lesions were found in HIV-negative subjects, they were in lower proportion as compared with the HIV-positive subjects. Mean $CD4^+$ T-lymphocyte cell count for HIV positive was 452 cells mm^{-3} and among HIV negatives it was 602 cells mm^{-3}. Lower CD4 count (<500 cells mm^{-3}) may be a useful predictor of HIV and low level of $CD4^+$ counts was associated with greater prevalence of oral candidiasis and angular cheilitis.

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