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Original Article

Dentistry Section

Prevalence of Oral Lesions among HIV Positive Patients Attending Antiretroviral Therapy Centre in Rural Area of Western Maharashtra

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ABSTRACT

Introduction: The Oral Manifestations (OM) of Human Immunodeficiency Virus (HIV) is indication of compromised immune status and disease progression. These Oral Lesions (OL) cause morbidity and affect quality of life of the patients.

Aim: To evaluate the association between OM in patients with HIV infection and their level of Cluster of Differentiation 4 (CD4) count.

Materials and Methods: The study was designed as a descriptive, cross-sectional study for a duration of two years which included a total of 565 known HIV-positive individuals visiting the regional Antiretroviral Therapy (ART) centre for counseling and/or on Highly Active Antiretroviral Therapy (HAART) were selected irrespective of age and sex. The OL were diagnosed using the presumptive criteria given by by the European Committee (EC) Clearinghouse, 1993. Oral and systemic manifestations were recorded and associated with CD4 counts. The data collected was subjected to statistical analysis using Statistical Package of Social Science (SPSS) 8.0 software and p-value was considered significant at a level of 0.05.

Results: The male-to-female ratio was almost equal and 95.04% of the patients had reported heterosexual contact as the transmission route. The peak age of occurrence of HIV infection was during 31-40 years with the mean age of males and females 39.26 years and 34.46 years, respectively. Pulmonary tuberculosis (16.11%) and herpes zoster (16.81%) were the most common systemic manifestations. The prevalence of OM reported was 86.01% and was higher in females than in males. Intraoral melanotic pigmentation (50.08%) was the most common finding, followed by periodontitis (36.46%), linear gingival erythema (14.51%), Necrotising Ulcerative Gingivitis (NUG) (4.42%), candidiasis (8.67%), oral ulcers, herpes zoster (5.13%), herpes simplex virus infection (1.17%) and salivary gland disease (SGD) (0.7%). There was a significant association (p=0.0110) between OL and reduced CD4 count.

Conclusion: The OL occur commonly in HIV infection. The decrease in CD4 count is associated with a wide range of OM. The result from this study can be used as predictive marker for oral manifestations in Acquired Immunodeficiency Syndrome (AIDS) based on the level of immune suppression and help in improving their quality of life.

Keywords: Acquired immunodeficiency syndrome, Human immunodeficiency virus, Immunosuppression, Oral manifestations

INTRODUCTION

Acquired Immunodeficiency Syndrome (AIDS) emerged as a pandemic in the last three decades. It is an infection caused by the HIV and is characterised by profound immunosuppression that leads to opportunistic infections, secondary neoplasm and neurologic manifestations [1]. United Nations (UN) AIDS (2018) data suggested that, in 2017, global prevalence of HIV among adults (aged 15-49 years) were an estimated 0.2% which equates to 2.1 million people living with HIV in India, because of its huge population. Despite the active awareness campaigns HIV, marked increase in the new infections and AIDS related deaths are seen which makes HIV infection a major health concern in India [2]. In 2019, approximately 38 million people were living globally with HIV infection and out of this, 7.1 million people were unaware of their HIV positive status and with this rate a major AIDS pandemic threat by 2030 has been predicted by researchers [3,4].

The OL are among the early signs of HIV infection and may suggest a possible HIV infection in undiagnosed cases as well as predict the progression to AIDS in patient who have not received any therapy [5]. For patients on highly active antiretroviral therapy (HAART) the presence of certain OM may also serve as surrogate markers for the efficacy of ART [6]. Even though the prevalence of specific OL like candidiasis, hairy leukoplakia and Kaposi's Sarcoma (KS) has been proven to be lower among patients on HAART, other conditions such as oral warts and salivary gland disease (SGD), as a result of immune reconstitution from the therapy initiation, has been found to be more prevalent in these patients [7-9]. Laboratory parameters such as CD4 Count, T-lymphocyte count and viral load play an important role in evaluating the progression of disease as well as efficacy of antiretroviral therapy. In developed countries, specific OL and systemic manifestations have been documented to be related to immune suppression as indicated by CD4 counts that has been widely studied and reported [5,8].

However, documentation of CD4 count and its association with systemic and OM in India particularly have been sparse. Moreover, considerable regional variations should be expected in the OM of HIV infection, depending on the population studied and clinical heterogeneity. Hence, the present study was designed to evaluate the prevalence of OM and systemic manifestations in HIV-positive patients and to associate with the CD4 count among the HIV population in rural Western Maharashtra of India.

MATERIALS AND METHODS

The present cross-sectional descriptive study was approved by the Institutional Ethical Committee (PMT/PIMS/RC/2015/139 dated 30/10/2015) and was conducted for a period of two years

between January 2016 to December 2017 among the HIV-positive patients visiting the regional ART centre of a Rural Medical College in Ahmednagar district. A total of 565 patients were included in the study and informed written consent was obtained from all the subjects.

Inclusion criteria: HIV-positive individuals visiting the regional ART centre for counseling and/or HAART treatment irrespective of their age and sex. Patients on ART as well as those not on ART were included within the study period.

Exclusion criteria: Those patients not willing to give the consent for the study were excluded.

Study Procedure

A detailed history was recorded from each patient on a case history proforma which included details such as demographic information, mode of transmission of disease, presence of systemic infections and stage of the disease. Although all patients were advised CD4 count, out of 565 patients, CD4 count of 541 patients could be retrieved. Three categories were considered with respect to CD4 count,above 500 was category A, CD4 count between 200 and 499 was category B and below 200 was category C. Personal Protective Equipment as per the standard norms for attending a HIV infected patients were donned. Detailed oral examination was carried out in natural light using disposable gloves, face masks, wooden spatula and sterile pieces of cotton and gauze. Brightly illuminating torch was used wherever necessary. The OL associated with HIV infection were diagnosed based on presumptive criteria given by the EC Clearing house on oral problems related to HIV infection and the World Health Organisation (WHO) collaborating centre on OM of the HIV [10].

STATISTICAL ANALYSIS

Statistical analysis was done using SPSS 8.0 software. Means, standard deviations and percentages of various variables were calculated. A Chi-square test of association was utilised to find out the association between variables with p-value of <0.05 considered as statistically significant. The sensitivity, specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) were assessed for individual OL and OL in general when used as markers of immune suppression.

RESULTS

The study group consisted of 565 HIV seropositive patients, out of which 282 (49.91%) were males, and 283 (50.09%) females. The mean age was 36.85±14.74 (range 8-76 years) [Table/Fig-1]. The maximum numbers of cases were in the age group 31 to 40 years, (43.01%), followed by age group of 21 to 30 years (22.65%). Statistically, significant differences were found in the educational status between the sexes. Overall maximum patients (58.05%) had completed primary school education. Females showed dominance in primary school education status with 71.3%, but secondary school and college education was significantly less as compared to males. Majority of women (52.65%) were housewives/homemakers while males (44.68%) were farmers. Of the 565 patients, 479 were on ART. Heterosexual contact (95.04%) was the predominant mode of transmission of HIV infection; followed by vertical transmission i.e. mother to child (4.96%) [Table/Fig-2].

The mean CD4 count in males was 325.69±240.62, whereas it was 414.23±308.97 in females, statistically the difference was not significant. Out of 541 patients in whom CD4 count was available, 27.73% patients had CD4 count below 200 (Category C), 55.82% patients had CD4 count between 200 and 499 (Category B), and 20.15% had CD4 count above 500 (Category A) [Table/Fig-3] [11].

Age (years)	Males		Females		Total	
	No. of cases	%	No. of cases	%	No. of cases	%
≤20	19	6.73%	9	3.19%	28	4.96%
21-30	29	10.28%	97	34.39%	126	22.30%
31-40	121	42.91%	122	43.10%	243	43.01%
40-50	80	28.37%	42	14.84%	122	21.59%
>50	33	11.71%	13	4.59%	46	8.14%
Total	282	49.91%	283	50.09%	565	100.00%
Mean±SD	39.26±13.68		34.46±12.02		36.85±14.74	

[Table/Fig-1]: Age and sex wise distribution.
Value of χ^2=60.804, p=0.0001, significant

Source of infection	Males		Females		Total	
	Number	%	Number	%	Number	%
Heterosexual	262	92.90%	275	97.17%	537	95.04%
Homosexual	0	0%	0	0%	0	0%
Mother to child	20	7.10%	8	2.83%	28	4.96%
Blood transfusion	0	0	0	0	0	0
Intravenous drug users	0	0	0	0	0	0
Unknown	0	0	0	0	0	0
Total	282	49.91%	283	50.09%	565	100%

[Table/Fig-2]: Mode of transmission of HIV infection.
Value of χ^2=5.456, p=0.0195, significant

CD4 count	Males		Females		Total	
	Number	%	Number	%	Number	%
>500	49	18.01%	60	22.30%	109	20.15%
200-499	138	5.73%	144	53.53%	282	55.82%
<200	85	31.26%	65	24.17%	150	27.73%
Total	272	50.27%	269	49.72%	541	95.75%
Mean±SD	325.69±240.62		414.23±308.97		369.72±429.59	

[Table/Fig-3]: Sex-wise distribution of HIV seropositive patients with their CD4 count.
Value of χ^2=3.888, p=0.1431, not significant

Most common systemic co-infection in HIV-positive male patients was tuberculosis while in female patients it was herpes zoster. The prevalence of systemic co-conditions between males and females was statistically significant (p=0.0180) [Table/Fig-4].

Systemic diseases	Males		Females		Total	
	Number	%	Number	%	Number	%
Tuberculosis	61	21.63	30	10.60	91	16.11
Anaemia	16	5.67	29	10.25	45	7.96
Jaundice	1	0.35	2	0.71	3	0.53
Typhoid	2	0.71	2	0.71	4	0.72
Pneumonia	1	0.35	0	0	1	0.18
Herpes zoster	45	15.96	50	17.67	95	16.81
Malaria	0	0	0	0	0	0
Dermatitis	0	0	0	0	0	0
Others	7	2.48	4	1.41	11	1.95
Total	133	47.15%	117	41.34	250	44.24

[Table/Fig-4]: Prevalence of underlying systemic diseases in HIV seropositive patients.
Value of χ^2=15.308, p=0.0180, significant
Others: Asthma, bronchitis, hypertension, psoriasis, carcinoma cervix and paralysis

Out of total 150 patients in the category C, 74 (13.09%) had systemic manifestations. In the category B, out of 282 patients 117 patients (20.71%) had systemic manifestations, whereas 47 (8.31%) patients out of 109 patients of category A, had systemic manifestations. Statistically, no significant correlation (p-value=0.6229) between the systemic manifestations and CD4 count categories were found [Table/Fig-5].

Systemic diseases	CD4 count					
	>500		200-499		<200	
	Number	%	Number	%	Number	%
Tuberculosis	21	44.68	37	31.62	30	40.54
Anaemia	8	17.70	25	21.36	12	16.21
Jaundice	0	0	2	1.71	1	1.35
Typhoid	0	0	2	1.71	2	2.70
Pneumonia	0	0	0	0	1	1.35
Herpes zoster	16	34.04	46	39.31	26	35.13
Malaria	0	0	0	0	0	0
Dermatitis	0	0	0	0	0	0
Others	2	4.16	5	4.27	2	2.70
Total	47	8.68	117	21.62	74	13.67

[Table/Fig-5]: Association between CD4 count and systemic diseases.
Value of χ^2=3.503, p=0.6229, not significant

The prevalence of OL in the present study was found to be 86.01% (n=486, where 'n' is number of HIV patients having OL). More females (91.13%) than males (80.91%) had OL and this was statistically not significant (p=0.54. Periodontitis was present in 206 patients (36.46%) (102 males and 104 females). Linear Gingival Erythema was present in 82 (14.51%) patients while gingivitis was present in 25(4.42%) patients. A total of 283 patients (50.08%) (140 males, 143 females) had brown to black oral pigmentation. There were more females (9.89%) than males (6.64%) with OC. This difference was statistically significant (p<0.05) [Table/Fig-6].

Type of lesions	Males		Females		Total	
	Number	%	Number	%	Number	%
Candidiasis	21	7.44	28	9.89	49	8.67
a. Erythematous	0	0	0	0	0	0
b. Pseudomembranous	11	3.9	13	4.59	24	4.25
c. Hyperplastic	4	1.42	7	2.47	11	1.95
d. Angular Chelitis	6	2.13	8	2.83	14	2.47
Oral hairy leukoplakia	0	0	0	0.00	0	0
Linear gingival erythema	36	12.77	46	16.25	82	14.51
Gingivitis	13	4.61	12	4.24	25	4.42
Periodontitis	102	36.17	104	36.75	206	36.46
Melanotic hyperpigmentation	140	49.64	143	50.53	283	50.08
Ulcers	14	4.96	15	5.30	29	5.13
Herpes simplex virus infection	3	1.06	7	2.47	10	1.77
Herpes zoster virus infection	19	6.74	10	3.53	29	5.13
Salivary gland disease	2	0.70	2	0.70	4	0.70

[Table/Fig-6]: Prevalence of oral lesions in HIV seropositive patients.
Value of χ^2=18.523, p=0.5479, not significant

In the category of CD4 count below 200 (Category C) out of 150 patients, 126 (23.29%) had one or more oral manifestations. Two hundred forty four patients (45.10%) of Category B (CD4 count-200-499) had OM while 101 (18.67%) patients of Category A (CD4 >500) showed presence of OM. Statistically, there was significant association between CD4 count and OM in the cases of HIV (p=0.0427) [Table/Fig-7].

Oral manifestations	CD4 count					
	>500		200-499		<200	
	Number	%	Number	%	Number	%
No	8	1.48	38	7.02	24	4.44
Yes	101	18.67	244	45.10	126	23.29
Total	109	20.15	282	52.12	150	27.73

[Table/Fig-7]: Association between CD4 count and oral manifestations.
Value of χ^2=6.307, p=0.0427, significant

When the correlation of individual OL with CD4 count was examined using Chi-square test, OC, LGE, Periodontitis, Gingivitis and melanotic oral pigmentation showed statistically significant correlation with lower CD4 cell count (p=0.0110) [Table/Fig-8].

Lesions	CD4 count					
	>500		200-499		<200	
	Number	%	Number	%	Number	%
Candidiasis	12	11.00	17	5.63	20	13.33
Linear gingival erythema	8	7.34	34	11.26	40	26.66
Gingivitis	3	2.75	9	2.98	13	8.67
Periodontitis	37	33.94	79	26.15	90	60.00
Ulcers	3	2.75	18	5.96	8	5.33
Herpes simplex virus infection	5	4.59	2	0.66	3	2.00
Herpes zoster virus infection	5	4.59	19	6.29	5	3.33
Melanotic hyperpigmentation	51	46.79	114	37.79	118	78.67

[Table/Fig-8]: Association between CD4 count and lesions (multiple responses).
Value of χ^2=28.838, p=0.0110, significant

The specificity of OL in general was found to be very high (87.46%) as compared to sensitivity (64.40%). The PPV of OL in general was 47.69% and NPV was 49.86%. In the present study, periodontitis (76.10%) and oral candidiasis (74.47%) were found to have the highest sensitivity, and thus in general are more reliable markers of immune suppression than any other OL in HIV positive patients. Amongst various OM, oral ulcers had the highest specificity (97.53%) followed by Herpes Zoster Virus (HZV) infection (96.47%) and thus individually (specifically) are more reliable markers of immune suppression than any other OL. The HZV infection also had a higher PPV (65.52%) followed by ulcerative gingivitis (52%) when compared individually.

DISCUSSION

The OM seen in HIV patients are well established markers of disease progression, and their presence is an indication of a immunocompromised status. Although, there has been a significant decrease in the prevalence of the OM of HIV documented in Europe and USA in response to ART, in resource-limited countries where accessibility to health care and ART is limited, OM in HIV positive patients continues to place a considerable burden on these country's health systems [12,13].

The mean age of males and females in the present study was 39.26 years and 34.46 years respectively with a statistically significant difference (p<0.05). The peak age of occurrence of HIV infection was during 31-40 years. This finding corresponds with the fact that sexually active age group is more prone to acquire HIV infection. Male-to-female ratio was almost 1:1. Male predominance was reported in various studies from India and other parts of the world [14-20]. whereas a female predominance was reported in a study from the African region [21]. In the present study, the most common transmission mode of the disease was the heterosexual route (95.04%) for both genders and almost 80% of the females had acquired the HIV infection from their spouses. These findings are similar to the findings of other studies from India [14-16]. This may be the reason explaining a higher number of female HIV patients in the present study population compared to developed countries where homosexuality and intravenous drug use were the common routes of HIV transmission. Statistically, there was no significant difference in the mean CD4 counts between males and females (325.69±240 and 414.23±308, respectively; p=0.1431) which is in accordance with the study by Vohra P et al., but is not in accordance with the study by Rangnathan K et al., [15,22].

There is synergistic interaction between HIV and tuberculosis and they accentuate the progression of each other. In India, out of the 5.1 million HIV-infected patients, about half of them are co-infected with Mycobacterium tuberculosis and approximately 2 lacs of these co-infected individuals develop active TB each year in association with HIV infection [14,23,24]. Overall prevalence of TB was 16.11% which was significantly less than the prevalence reported in previous studies, but was more than the prevalence reported in study by Rangnathan K et al., in 2004 [14,15,16,22]. Pulmonary TB (21.63%) was the most common systemic disease found in males which was less than the prevalence reported in the study by Vohra P et al., [22]. The present study demonstrated no significant association between CD4 count and systemic diseases in the cases of HIV (p=0.6229), unlike the finding reported by Vohra P et al., [22].

In the present study, 486 (86.01%) patients exhibited OL associated with HIV infection. Prevalence reported in the present study was comparable with findings in other studies from India, South East Asia and rest of the world, while less prevalence was reported by Mwangosi IE and Majenge JM and Akaji EA et al., [14,15,17,22,23,25-28]. However, most of these studies were hospital-based, and hence do not reflect the prevalence of oral lesions found in the general HIV-infected population because they are mostly hospital-based studies. Unlike the previous studies by Rangnathan K et al., and Campisi G et al., no significant difference was found in prevalence of OL in both genders in the present study [15,29]. Campisi G et al., found higher prevalence of OL in females which is in accordance with our study, whereas Rangnathan K et al., found higher prevalence of OL in males [15,29].

An interesting observation in the present study was the occurrence of intraoral melanotic pigmentation (50.08%), which was the most common finding, as in the study by Denny CE et al., (42.6%) and Dongade S et al., (44.5%) [30,31]. There were no significant differences in the prevalence of intraoral pigmentation between males and females. Common sites of pigmentation were the palate and buccal mucosa. The pigmented areas were dark brown to brownish-black in colour and presented as diffuse or irregular patches. Palate and buccal mucosa were most common sites of pigmentation. Melanotic hyperpigmentation has been reported to be the second common lesion associated with HIV infection (19.54%) by Bodhade AS et al., and the third most common lesion (26.3%) by Ranganathan K et al., [15,16]. Increased melanin pigmentation in skin and oral mucosa have also been reported by various investigators in other countries [32,33]. Some of the reasons that have been put forward to explain the intraoral pigmentation are increased release of Melanocyte-Stimulating Hormone (MSH) due to deregulated release of cytokines in HIV disease; use of melanocyte stimulating drugs such as antiretrovirals, antifungals; and Addison's disease. It has significantly higher rate of detection in developing countries (14%) compared with developed countries (4%) with higher prevalence reported in Asia (21%) compared with other continents (Africa 9%, America 8% and Europe 4%) [34]. Various previous studies on the prevelance of OLs in HIV patients have been mentioned in [Table/Fig-9] [14-17,20,22,25-31,33,35-37].

The EC Clearing house classification criteria identified LGE, periodontitis and NUG as periodontal conditions that are strongly associated with HIV [10]. In the present study, periodontitis was present in 206 patients (36.46%) (102 males, 104 females), LGE was present in 82 (14.51%) patients while gingivitis was present in 25 (4.42%) patients. Periodontal diseases may be the first clinical sign of HIV infection since the immunosuppression and subsequent susceptibility may alter the responses of the oral tissues as well as the microflora which explains the higher prevalence of periodontal

Author/Year/Place of the study	Number of patients	Prevalence of oral lesions (%)	Melanotic hyperpigmentation (%)	Periodontitis (%)	Gingivitis (%)	Candidiasis (%)	Oral hairy leukoplakia (%)	Ulcers (%)	Linear gingival erythema (%)
Moniaci D et al., 1990/Italy [20]	737	40.3	0.4	NR	0.7	23.7	9.9	2.9	NR
Ceballos-Solobrena A et al., 2000/Spain [33]	154	53.2	NR	0.6	0.6	34.4	26.6	NR	NR
Patton LL 2000/North Carolina [36]	606	41.7	NR	3.1	3.1	17.7	17.2	5.4	3.3
Campsi G et al., 2001/Italy [29]	136	47	6.6	4.4	NR	19.8	7.4	3.7	NR
Ranganathan K et al., 2002/ Chennai, South India [14]	300	72	23	8.7	47	55.7	3	3	NR
Ranganathan K et al., 2004/ Chennai, South India [15]	1000	86.6	26.3	33.2	72.3	23.8	2.1	NR	NR
Arotiba JT et al., 2005/Nigeria [37]	205	68.3	7.3	4.9	27.8	60.5	14.2	9.8	NR
Bravo IM et al., 2006/ Venezuela [17]	75	85	38	NR	NR	61	53	5	8
Mwangosi IE and Majenge JM 2011/Tanzania [27]	200	23.5	NR	NR	NR	13.5	1	7	NR
Sharma G et al., 2011/South India [25]	103	80.6	35.9	3.9	9.7	55.2	17.5	4.9	13.6
Bodhade AS et al., 2011/ Nagpur, India [16]	399	76.70	19.5	5.3	8.5	39.3	11.5	NR	10.3
Sandeep K et al., 2014/ Indore, India [35]	126	75	NR	NR	NR	36.5	NR	NR	NR
Denny CE et al., 2016/ Mangalore, India [30]	108	NR	42.6	48.1	18.8	27.8	NR	5.6	2.7
Dongade S et al., 2017/ Karnataka, India [31]	373	NR	44.5	NR	43	64	NR	NR	NR
Vohra P et al., 2019/Vadodra, India [22]	100	84	NR	16.6	10.7	20.2	NR	8.3	NR
Vishnu V et al., 2019/Bhopal, India [26]	320	NR	NR	78.8	NR	20	NR	30.06	NR
Akaji EA et al., 2020/Nigeria [28]	208	40.4	14.1	NR	22.5	41.4	4.7	10.2	23.4
Present study 2018, Loni, Ahmednagar, India	565	86.01	50.8	36.46	4.42	8.67	0	5.13	14.51

[Table/Fig-9]: Studies on prevalence of oral lesions in HIV patients [14-17,20,22,25-31,33,35-37].
NR: Not reported

disease. In addition to this, factors such as tobacco abuse, oral health negligence, side-effects of ART drugs contribute to worsen the periodontal health of these patients. Periodontal disease was about 25% more likely to be encountered in groups on ART compared with those who were not on treatment. It has been also suggested that this condition is associated with aging rather than HIV [15,33]. In the present study, prevalence of periodontal disease was reported to be 36.46% which is similar to studies conducted by Rangnathan K (33.2%) [15]. Bodhade AS et al., and Vohra P et al., reported lower prevalence (5.26%, 16.6%, respectively) while it was higher in studies by Vishnu V et al., Denny CE et al., Sandeep K et al., 71.2%, 48%, 50%, respectively [Table/Fig-9] [14-17,20,22,25-31,33,35-37]. In the present study, 14.51% of patients had LGE and 4.42% had gingivitis, whereas Bodhade AS et al., reported 10.27% and 8.52%, respectively, in their study [16]. Akaji EA et al., reported higher prevalence of LGE (23.4%) [28], while Denny CE et al., reported lower prevalence (2.7%) [30]. Gingival and periodontal diseases have been reported to be the predominant OLs in HIV-positive individuals from southern part of India [14,15]. Factors such as the stage of the disease, the risk group to which the patient belongs and criteria used for periodontal diagnosis also attributed to the varying rate of prevalence of periodontal diseases in HIV-infected patients in the literature.

Since the beginning of the endemic, until the present day. Oral Candidiasis (OC) is the most commonly reported OM of HIV in studies from around the world with highest reported prevalence in Africa (51%) and Asia (39%) [34]. The overall prevalence of OC in the present study was 8.67% which is very less in comparison with various studies [15,16,22,25,28,30]. Reported prevalence of OC in HIV-positive patients ranges from 12% to 84.2% [7,14,36]. The prevalence of OC was 9.89% in women and 6.64% in men, which is not in consistent with the report of Rangnathan K et al., which showed a higher predilection for men [15]. In the present study, the pseudomembranous type was the most frequently encountered variant of oral candidiasis, this is consistent with the findings reported by Rangnathan K et al., Vohra P et al., and Akaji EA et al., while is not in consistent with the reports by Bodhade AS et al., and Moniaci D et al., where the cases of erythematous candidiasis outnumbered those of PC [15,16,20,22,28].

In the present study, ulcers not otherwise specified (UNOS) were reported in 5.13% of OL associated with HIV-infected patients. This frequency is less than the frequency reported by Bodhade AS et al., Tsang PCS and Samaranayake LP (11.8%, 12.3% respectively) [16,37]. Genetic and environmental factors such as poor oral health and malnutrition play a role in precipitating oral ulcers but very few studies were concerned with confounding causative factors when reporting the oral ulcers as an OM of HIV [34].

The prevalence of HSV infection, reported as either herpes labialis, herpetic ulceration or herpes simplex infection in most studies on OM of HIV published since 1980s, increased with time and Asia having the highest occurrence. The present study reported 1.17% of HSV infection which is comparable with the findings in some Indian studies [16,22].

The HIV-infected persons are at risk of recurrences, which may be more severe with increasing immunosuppression [38]. Reactivated herpes zoster infection may be the first clinical sign/evidence of HIV infection occurring at any stage of disease. The HZV infection comprised 5.13% of OL associated with HIV in the present study while 0.3% and 2.3% of herpes zoster was noted by Bodhade AS et al., and Vohra P et al., respectively [16,22].

In previous studies in India, the prevalence of OHL was reported less frequently. Not a single case of OHL was reported in the present study. In two different studies by Ranganathan K et al., the reported prevalence of OHL was 0.33% and 2.7% respectively [14,15]. In contrast, Bodhade et al., found a higher prevalence (11.52%) of OHL in their study [16]. Previous studies have suggested a strong association for a higher prevalence of OHL with homosexual men in the developed countries; this explains the lower prevalence of OHL in the Indian subcontinent. The prevalence may also be affected with the differences in diagnostic capabilities of the investigators, the exact reason, however, is not known. It has been noted that the reported prevalence of OHL has decreased from 26% in the 1980s to about 18% in the 1990s and subsequently to 12% in 21st century [12]. The overall prevalence of OHL decreased considerably in groups on ART (10%) when compared with groups who were treatment naive (18%) [34].

Another similar finding from the present study consistent with other studies from Southeast Asia and Chinese population was the absence of Kaposi's sarcoma (KS). Homosexuality as a possible risk factor for KS has been reported in previous literature [20,34,39,40]. In Asia, where heterosexual practice is the main risk behaviour of HIV transmission, the low prevalence of Kaposi's Sarcoma (KS) is justifiable. The absence of KS in Chinese patients has also been reported [38].

Occurrence of HIV-associated Salivary Gland Disease (HIV-SGD) has been on a decline since 2000 in both developed and developing countries [12]. Previous studies have associated SGD with AIDS and advanced HIV or as a side-effect of ART [34]. Only four cases (0.70%) were found of SGD in the present study, while Bodhade AS et al., reported 0.3% and Akaji EA et al., reported 4.6% of SGD [16,28].

When the presence of OL was correlated with CD4 count, a statistically non significant association was found between occurrence of OL in HIV-positive patients and reduction in CD4 count (p=0.3479). When the correlation of frequently occurring individual OL in the present study with CD4 count was examined using chi-square test, there was a significant association between OL and CD4 count (p=0.0110). This is in accordance with the previous studies [16,22,28].

The sensitivity and PPV of OL in general were (64.40%) and (47.69%) respectively, while specificity (87.46%) was very high in the present study. Patton LL reported a lower sensitivity (58.2%) compared to specificity (70.8%) and a PPV of 60.5%, for OL in general in their study [36]. The sensitivity (81.30%) and PPV (61.70%) of OL in general were very high, while specificity (30.32%) was very low in the study by Bodhade AS et al., [16]. The present study demonstrated the highest sensitivity (76.10%) for periodontitis and for OC (74.47%) than any other oral lesion. Amongst various OL's, oral ulcers had the highest specificity (97.53%) followed by HZV infection (96.47%). The HZV infection had a higher PPV (65.52%) followed by ulcerative gingivitis (52%) when compared individually. These findings are not in accordance with the studies by Bodhade AS et al., and Patton LL as they reported highest specificity and PPV for candidiasis [16,36].

Limitation(s)

The limitations of the study include small sample size, absence of control group and comparisons of OM in patients on HAART and those without it and hence future studies are recommended to study any gender differences and also to study the differences in oral manifestations in adult and paediatric age group.

CONCLUSION(S)

Oral lesions occur commonly in HIV infection. In the present study there was a significant association between frequently occurring individual OL and CD4 count. The decrease in CD4 count is associated with a wide range of OM which can be used as prognostic marker for immune suppression in AIDS patients. Hence a comprehensive oral examination is important in HIV-infected individuals not only for diagnosis but also for monitoring of the disease progression. Hence, oral and dental care should be an integral part of HIV care programs to ensure regular screening for OL and their appropriate early management which will decrease the morbidity and increase the quality of life of HIV seropositive patients.

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