

Oral health status and treatment needs among HIV/AIDS patients attending antiretroviral therapy center in Western India: A cross-sectional study

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ABSTRACT

Aims and Objectives: Human immunodeficiency virus infection/acquired immunodeficiency syndrome (HIV/AIDS) is a major public health problem across the globe. Among 37.9 million people are living with HIV in the world and 21.40 lakh are in India itself. The aim of this study was to assess the oral mucosal, periodontal, and dentition status of HIV/AIDS patients attending ART (antiretroviral therapy) center in Jaipur city, India. **Methods and Materials:** A total of 588 HIV/AIDS subjects at the ART center in Jaipur city were examined. Oral mucosal, periodontal, and dentition status was recorded using a modified WHO Oral Health Assessment form 1997. A pilot study was conducted among 50 patients. The data were analyzed using Statistical Package for the Social Sciences (SPSS) software, version 20.0. The statistical tests that were applied for the analysis included Chi-square test, Fisher exact test, and one-way analysis of variance (ANOVA). **Results:** Of 588 study subjects examined, 65.6% were men and 34.4% were women. Candidiasis was the most prevalent oral lesion (32.5%) followed by acute necrotizing gingivitis (26%), hyper melanotic pigmentation (15.8%), and ulcerations (8.7%), respectively. Oral hairy leukoplakia was observed in only 3.9% and not a single case of Kaposi's sarcoma was reported. Buccal mucosa (36.7%) was the most common site of the presence of oral mucosal lesions. The mean decayed, missing, and filled teeth (DMFT) score was 4.03 ± 1.54 . Almost all the subjects needed one or other form of dental treatment. Only 12% of the patients had healthy periodontium. **Conclusion:** Candidiasis was the most prevalent oral lesion. Efforts should be made to meet the increased treatment needs in these patients.

Keywords: Acquired immunodeficiency syndrome, antiretroviral therapy, candidiasis, human immunodeficiency virus

Introduction

Acquired immunodeficiency syndrome (AIDS) is a fatal illness caused by the human immunodeficiency virus, which breaks down the body's immune system, leaving an individual exposed to life-threatening opportunistic infections, neurological disorders, or unusual malignancies.^[1]

The first case of AIDS was reported by CDC (Center for Disease & Control) in 1981 among homosexual men in the USA.^[2]

Globally unprotected heterosexual route is the most common route of transmission of HIV. The other modes of transmission of HIV comprise unprotected penetrative sex between men, injecting drug use, and unsafe blood transfusions or injections.^[1]

According to the UNAIDS (United Nations Program on HIV and AIDS) report in 2019, a total of 37.9 million people are

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living with HIV worldwide and 1.7 million people are newly infected with HIV in 2018. Worldwide, nearly there were 1 lakh death due to AIDS.^[3]

The number of people newly infected with HIV and the number of AIDS-related deaths have declined, adding to the stabilization of the epidemic. In addition, the number of people with HIV receiving treatment has increased to 15.0 million as of March 2015, a 1.4 million increase since June 2014.^[4]

In India, the first HIV case was detected in 1986 among female sex workers in Chennai.^[5] The estimated number of people living with HIV/AIDS in India was 21.40 lakh in 2017. Adult HIV prevalence among 15–49-year old people is estimated at 0.22% (0.16–0.30) in 2017. Nationally, around 69.11 thousand PLHIV died of AIDS-related causes in 2017. At 2.04%, Mizoram had the highest adult HIV prevalence in 2017, followed by Manipur at 1.43% and Nagaland at 1.15%.^[6] India is forecasted to have the third maximal number of estimated people living with HIV/AIDS, after South Africa and Nigeria.^[7]

Under the National AIDS Control Programme, provision of free antiretroviral therapy (ART) for people living with HIV/AIDS was launched on April 1, 2004 in eight government hospitals located in six states. Till October 2016, there were 528 ART centers operating in the country.^[6]

A public health access for the provision of ART implies that ART regimen should be standardized, simple to use, and should have minimum detrimental effects.^[8]

As per the report of RSACS (Rajasthan State AIDS Control Society), 23 ART centers in Rajasthan are functional.^[9]

Oral manifestations are diagnostic and prognostic indicators of HIV-infected people.^[10] Although there are a number of studies on oral manifestations of HIV infection, very little information is available on the Asian population. The oral presentation of the syndrome may not be the same everywhere.

Thus, this study was undertaken to find out the prevalence of oral conditions among HIV/AIDS patients attending ART center in Jaipur city, India.

Methods and Materials

It was a cross-sectional study which was conducted to assess the oral health status and treatment needs of 588 HIV/AIDS patients attending ART center of Jaipur city.

A pilot study was conducted among 50 patients and based on the observations the performa was modified which was used in the study.

Modified WHO Oral Health Assessment form 1997 was used to record the oral mucosal lesion/conditions, periodontal, and dentition status of the study subjects.

The oral cavity was examined using disposable tweezers, disposable mouth mirror, community periodontal index (CPI) probe, and straight probe for the presence of dental caries and oral lesions.

The ethical clearance was granted by the institutional review board and the concerned authorities.

Inclusion criteria

The inclusion criteria of the study included the following:

- i. All the HIV/AIDS subjects present on the days of the study.
- ii. All the subjects who gave verbal informed consent.

Exclusion criteria

The exclusion criteria of the study included the following:

- i. Patients in ICU (intensive care unit), those with dementia.
- ii. Subjects who were not willing to participate.

Standardization and calibration of the examiner were done. The data collected were entered in a spreadsheet program (Microsoft Excel 2007) and then subjected to analysis using Statistical Package for the Social Sciences (SPSS) software, version 20.0 by descriptive analysis. Statistical tests which were applied for the analysis included Chi-square test, Fisher exact test, and one-way analysis of variance (ANOVA). Ethical clearance was obtained from Institutional Ethical Committee dated 16.01.14.

Results

This study was conducted to assess the prevalence of oral mucosal lesion/conditions, periodontal, and dentition status of HIV/AIDS patients attending ART center in Jaipur city, India.

Table 1 shows the distribution of study subjects according to gender. The study population consisted of 588 individuals, of which 386 (65.6%) were men and 202 (34.4%) were women.

Table 2 shows the distribution of study subjects according to different age groups. The study subjects were divided into different age groups of 5–15 years (7.9%), 16–25 years (6.9%), 26–35 years (50.8%), 36–45 years (30.9%), and 46–55 years (3.2%).

Table 3 shows the association of extraoral findings with gender. Among the study subjects 88.9% had normal extraoral appearance.

Table 4 shows the association of oral mucosal lesions/conditions with gender. Candidiasis was the most prevalent oral condition found among 32.5% of the study subjects.

Table 5 shows the association of oral mucosal conditions (location) with gender. Buccal mucosa was the most common site of

presence of oral mucosal conditions among 39.8% male and 30.6% female study subjects.

Table 6 shows the association of periodontal status (CPI) with gender. Approximately 2% of the subjects had a healthy periodontal status. The presence of calculus was the most prevalent finding among 48.9% male and 53.9% female subjects.

Table 7 shows the association of periodontal status (loss of attachment) with gender. The loss of attachment of 0-3 mm was seen among 49.1% subjects. The prevalence of loss of attachment of 4-5 mm among the male and female study subjects was 28.2% and 30.6%, respectively.

Table 8 shows the mean decayed (D), missing (M), filled (F) teeth, and DMFT score according to gender. As far as the decayed, missing and filled permanent teeth are concerned, mean of decayed (D), missing (M), and filled (F) teeth was 3.21 ± 1.205 , 0.72 ± 0.63 , and 0.09 ± 0.41 . The total mean DMFT score was 4.03 ± 1.54 . The mean DMFT score of men was more as compared to women which was statistically significant.

Table 9 shows the number of study subjects with different dental treatment needs. One surface filling treatment was required by 86.7% male and 72% female study subjects, which is statistically

significant. Prosthetic treatment was required by 69.1% male and 73.2% female subjects.

Discussion

This study was conducted to find out the oral mucosal, periodontal, and dentition status of HIV/AIDS patients attending ART center in Jaipur city.

Study consisted of 588 subjects of which 386 (65.6%) were males and 202 (34.4%) were females.

Progression of HIV infection is associated with a range of oral manifestations. This study shows that nearly 71.4% of the patients had one or the other form of oral mucosal conditions. This is in close agreement with the study conducted by Kumar S *et al.*^[11] where 75% of the 126 HIV subjects had oromucosal lesions, Rath H *et al.*^[12] where it was 68.8%, and in a study done by Bodhade AS *et al.*^[13] among 399 HIV-positive individuals where the prevalence of oral mucosal conditions was 76.70%. This finding contradicts with the study conducted by Adebola AR *et al.*,^[14] Sroussi HY *et al.*^[15] and Arendorf TM *et al.*^[16] where the prevalence of oral mucosal conditions was 61.9%, 55%, and 60.4%. The oral lesions may have a negative impact on the nutritional health of HIV-infected individuals by reducing food intake as a result of discomfort during eating.

Lymphadenopathy among the study subjects in this study was approximately 5%. This finding is consistent with the results of the study conducted by Chidzonga MM *et al.*^[17] (7.1%) and contrary to the study done by Rwenyonyi CM *et al.*^[18] (60.8%) and Hodgson TA *et al.*^[19] (38.3%).

Approximately 4.8% of the subjects have abscess which is in accordance with the study done by Kumar S *et al.*^[11] (3.97%).

Oral candidiasis or thrush (32.5%) as the most common clinical finding in our study population. This finding is consistent with the results of the study conducted by Divakar DD *et al.*^[20] (27.3%), Kumar S *et al.*^[11] (36.51%) and in a study done by Ranganathan K *et al.*^[21] where the prevalence of oral

Table 1: Distribution of study subjects according to gender

Gender	Number (%)
Male	386 (65.6)
Female	202 (34.4)
Total	588 (100)

Table 2: Distribution of study subjects according to different age groups

Age groups (years)	Number (%)
5-15	47 (7.9)
16-25	41 (6.9)
26-35	299 (50.8)
36-45	182 (30.9)
46-55	19 (3.2)

Table 3: Association of extraoral examination findings with gender

Extraoral lesion/condition	Male (386) n (%)	Female (202) n (%)	Total (588) n (%)	F	P
Normal extraoral appearance	336 (87.04%)	187 (92.57%)	523 (88.9%)		
Ulceration, sores, erosions, fissures (head, neck, limbs)	2 (0.51%)	0	2 (0.3%)		
Ulceration, sores, erosions, fissures (nose, cheeks, chin)	3 (0.7%)	0	3 (0.5%)		
Ulceration, sores, erosions, fissures (commissures)	23 (5.95%)	9 (4.5%)	32 (5.4%)		
Ulceration, sores, erosions, fissures (vermillion border)	1 (0.25%)	0	1 (0.2%)	0.31	5.98 [#]
Cancrum oris	0	0	0		
Abnormalities of upper and lower lips	0	0	0		
Enlarged lymph nodes (head, neck)	21 (5.4%)	6 (2.97%)	27 (4.6%)		
Other swelling of face and jaws	0	0	0		
Total	386 (65.6%)	202 (34.4%)	588 (100%)		

[#]Nonsignificant, $P > 0.05$

Table 4: Association of oral mucosal conditions with gender

Oral mucosal condition	Male (386) n (%)	Female (202) n (%)	Total n (%)	χ^2	P
No abnormal condition	94 (24.35%)	74 (36.6%)	168 (28.6%)	0.98	0.002*
Malignant tumor (oral cancer)	5 (1.29%)	1 (0.49%)	6 (1.0%)	0.84	0.35
Leukoplakia	23 (5.95%)	0	23 (3.9%)	12.35	0.001*
Liken planus	0	0	0	-	-
Ulceration	28 (7.25%)	23 (11.3%)	51 (8.7%)	2.85	0.09
Acute necrotizing gingivitis	106 (27.4%)	47 (23.2%)	153 (26.0%)	1.21	0.27
Candidiasis	128 (33.1%)	63 (31.1%)	191 (32.5%)	0.23	0.62
Abscess	19 (4.9%)	9 (4.45%)	28 (4.8%)	0.06	0.8
Pigmentation	68 (17.61%)	25 (12.37%)	93 (15.8%)	2.73	0.9
Bald tongue	8 (2%)	12 (5.94%)	20 (3.4%)	6.03	0.01
Angular cheilitis	23 (5.95%)	9 (4.45%)	32 (5.4%)	0.58	0.45
Total	386 (65.6%)	202 (34.4%)	588 (100%)		

*Significant, $P \leq 0.05$ **Table 5: Association of oral mucosal conditions (location) with gender**

Oral mucosal lesions	Male (386) n (%)	Female (202) n (%)	Total n (%)	χ^2	P
Vermillion border	0	0	0	-	-
Commissures	16 (4.14%)	9 (4.45%)	25 (4.3%)	0.03	0.85
Lips	18 (4.66%)	0	18 (3.1%)	9.71	0.002*
Sulci	0	0	0	-	-
Buccal mucosa	154 (39.8%)	62 (30.6%)	216 (36.7%)	5.46	0.06
Floor of mouth	1 (0.25%)	0	1 (0.2%)	0.52	0.45
Tongue	59 (15.2%)	30 (14.8%)	89 (15.1%)	0.19	0.88
Hard and/or soft palate	24 (6.2%)	29 (14.3%)	53 (9%)	10.71	0.001*
Alveolar ridge/gingiva	126 (32.6%)	56 (27.7%)	182 (31.0%)	1.502	0.22

*Significant, $P \leq 0.05$ **Table 6: Association of periodontal status (CPI) with gender**

Community periodontal index (CPI) score	Male [n=386] (%)	Female [n=202] (%)	Total (%)	χ^2	P
0-Healthy	3 (0.77%)	9 (4.45%)	12 (2.0%)		
1-Bleeding	18 (4.66%)	9 (4.45%)	27 (4.6%)		
2-Presence of calculus	189 (48.9%)	109 (53.9%)	298 (50.7%)	24.69	0.001*
3-Pocket 4-5 mm	108 (27.9%)	64 (31.6%)	172 (29.3%)		
4-Pocket 6 mm or more	68 (17.61%)	11 (5.44%)	79 (13.5%)		
Total	386 (65.6%)	202 (34.4%)	588 (100%)		

*Significant, $P \leq 0.05$ **Table 7: Association of periodontal status (LOA) with gender**

Loss of attachment score	Male [386] (%)	Female [202] (%)	Total (%)	χ^2	P
0-Loss of attachment 0-3 mm	167 (43.2%)	122 (60.3%)	289 (49.1%)		
1-Loss of attachment 4-5 mm	109 (28.2%)	62 (30.6%)	171 (29.1%)		
2-Loss of attachment 6-8 mm	49 (12.6%)	9 (4.45%)	58 (9.9%)	34.34	0.001*
3-Loss of attachment 9-11 mm	9 (2.3%)	4 (1.9%)	13 (2.2%)		
4-Loss of attachment ≥ 12 mm	10 (2.59%)	0	10 (1.7%)		
9-Not recorded	42 (10.8%)	5 (2.47%)	47 (8.0%)		
Total	386 (65.6%)	202 (34.4%)	588 (100%)		

*Significant, $P \leq 0.05$

candidiasis was 28.7%. This finding is not in accordance with the result of the study done by Beena JP *et al.*^[22] (11.62%) and Rath H *et al.*^[12] (16.27%).

The prevalence of angular cheilitis was observed in 5.4% of the study subjects which is in accordance with the study done by Divakar DD *et al.*^[20] Beena JP *et al.*^[22] and Bodhade AS *et al.*^[13]

where it was 7.3%, 5% and 4.3%, respectively. This prevalence is not in agreement with the findings of Adurogbangba MI *et al.*^[23] (21%), Naidoo S *et al.*^[24] (11.8%) and Pongsiriwet S *et al.*^[25] (10%).

Melanotic hyperpigmentation was observed among 15.8% of the study subjects which coincides with the findings of de Faria

PR *et al.*^[26] (14%) among 92 subjects with AIDS in Sao Paulo, Bodhade AS *et al.*^[13] (19.5%) and Divakar DD *et al.*^[20] (11.96%). It is known side effect of highly active ART. This finding is not in agreement with the result of the study done by Sharma G *et al.*^[27] (34.6%). Difference in number of subjects with ART in each study cohort may be the reason for the difference in prevalence of pigmentation. The prevalence of mucosal hyperpigmentation can also be linked with increased melanin production in the epithelium associated with increased release of a melanocyte stimulating hormone.^[28]

In this study, the prevalence of ulceration among the study subjects was 8.7% which coincides with the results of the study done by Divakar DD *et al.*^[20] (7.6%) and Beena JP^[22] (11%). This finding is not in accordance with the results obtained by Kiran K *et al.*^[29] (19.50%) and de Francis PR *et al.*^[26] (18.4%).

Not a single case of Kaposi’s sarcoma was reported in this study. The result of this study is consistent with the result obtained by Agbelusi GA *et al.*^[30] Ceballos SA *et al.*^[31] observed Kaposi’s sarcoma in 2.3% of cases—all in homosexual males. The result of this study is consistent with the finding that oral Kaposi sarcoma has not been reported from Asian studies where heterosexual intercourse is the major route of HIV transmission.^[32]

Leukoplakia was observed in only 3.9% of the study subjects. The present finding is in agreement with the results of the study done

by Ranganathan K *et al.*^[21] (3.7%) and Barasch A *et al.*^[33] (2%). According to a study done by Chattopadhyay A *et al.*,^[34] the use of antifungal medication is a strong risk factor for oral hairy leukoplakia.

In this study, acute necrotizing gingivitis was observed in 26% of the subjects. This finding coincides with the results of the studies done by Amadi ES *et al.*^[35] (21.3%) and Adebola AR *et al.*^[14] (21.9%). And contrary to the findings of Galitis ON *et al.*^[36] (8.1%).

The mean DMFT score of the subjects in this study was 4.03 which coincides with the results of the study done by Eldridge K *et al.*^[37] (4.4). The mean DMFT score of this study is not in agreement with the result obtained from the studies done by Tututuku K *et al.*^[38] (1.69), Naidoo S *et al.*^[24] (1.43) and Kumar S *et al.*^[11] (12.83). Higher mean DMFT score of HIV-positive individuals indicates their poor oral health status and warrants the need of special attention toward it.

Almost all the subjects in this study needed one or the other form of dental treatment. Nearly 82% of the study subjects needed one surface filling, whereas 61.9% of the subjects required two or more surface filling. Extraction was another prevalent treatment need (73%).

In this study, the prevalence of periodontal loss of attachment was 49.1% (LOA score 0), 29.1% (LOA score 1), 9.9% (LOA score 2), 2.2% (LOA score 3) and 1.7% (LOA score 4) which is not in accordance with the results reported in the study done by Kumar S *et al.*^[11] where it was 7.1%, 4%, 26.2%, 37.3% and 25.4%, respectively.

The prevalence of periodontal loss of attachment greater than 4 mm among the study subjects in this study was 42.8% which does not coincide with the results of the study conducted by McKaig RG *et al.*^[39] (60%).

In this study, 13.7% of the study subjects had a periodontal loss of attachment 6 mm or more which is does not coincide with the result of the study conducted by Tomar SL *et al.*^[40] (20%).

In this study, the prevalence of pocket depth greater than 4 mm among the study subjects was 42.6% which is not in agreement

Table 8: Mean decayed (D), missing (M), filled (F) teeth, and DMFT score according to gender

	Sex	n	Mean	Std. deviation	F	P
Decayed teeth (D)	Male	386	3.39	1.262	24.19	0.001*
	Female	202	2.88	1.010		
	Total		3.21	1.205		
Missing teeth (M)	Male	386	0.84	0.674	37.99	0.001*
	Female	202	0.50	0.501		
	Total		0.72	0.63		
Filled teeth (F)	Male	386	0.10	0.433	0.45	0.5
	Female	202	0.07	0.372		
	Total		0.09	0.41		
DMFT	Male	386	4.32	1.605	41.88	0.001*
	Female	202	3.48	1.247		
	Total		4.03	1.54		

*Significant, P≤0.05

Table 9: Number of study subjects with different dental treatment needs

Treatment needs	Male [n=386] (%)	Female [n=202] (%)	Total (%)	χ ²	P
No treatment	10 (2.59%)	2 (0.9%)	12 (2.0%)	1.69	0.19
Fissure sealant	20 (5.18%)	2 (0.9%)	22 (3.7%)	6.46	0.01*
One surface filling	335 (86.7%)	147 (72.7%)	482 (82%)	17.62	0.001*
Two or more surface filling	234 (60.6%)	130 (64.3%)	364 (61.9%)	0.78	0.37
Pulp care	151 (39.1%)	98 (48.5%)	249 (42.3%)	4.79	0.02*
Extractions	290 (75.1%)	139 (68.8%)	429 (73%)	2.68	0.1
Prosthesis	267 (69.1%)	148 (73.2%)	415 (70.6%)	1.07	0.31

*Significant, P≤0.05

with the finding reported by McKaig RG *et al.*^[39] where it was 51%.

Vishnu V *et al.*^[41] conducted a study that showed that HIV-positive patients have poor oral health status and also have less awareness about oral health. The use of antiretroviral drugs is also responsible for the development of periodontal diseases, dental caries, and oromucosal lesions.

This information can assist dental professionals, policymakers, and public health officials to meet the needs of people living with HIV/AIDS.

Role of medical professional/physicians

Updated screening recommendations give physicians an important role in assessing HIV/AIDS patients. They should encourage all patients under his/her guidance to conduct a semi-annual oral health examination and to attach to the oral health-care professional's recommendations regarding appropriate follow-up. All medical health-care providers should be aware of oral health referral sources for patients under their care. Documentation that a dental referral was made or that the patient is under the care of a dental professional should be evident within the clinical care plan of the medical record. The medical provider should forward any requested clinical information to the patient's oral health-care provider in a timely fashion.^[42,43]

Conclusion

It can be concluded from this study that oral candidiasis was the most prevalent oromucosal lesion followed by acute necrotizing ulcerative gingivitis. Approximately 2% of the subjects had healthy periodontium and the mean DMFT score was 4.03 ± 1.54 . Oral manifestations are diagnostic and prognostic indicators of individuals infected with HIV. Therefore, individuals infected with HIV should be evaluated carefully for the presence of oral manifestations of HIV infection which often alerts as an early alarm of HIV infection contributing toward early detection and management of HIV infection.

Suggestions

Thus one should know about the importance of good oral health and a dentist should be placed in all the ART centers to give oral health education and to eradicate oral health-related problems and oral infection among these immune suppressive patients. Further studies should be undertaken in various states of India, specifically now, in the era of ART to find out the changing prevalence of oral diseases, oral health status, and treatment needs. Proper coordination between medical and dental health-care professionals is required to ensure regular screening for oral lesions and appropriate early management.

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Conflicts of interest

There are no conflicts of interest.

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