

Greater severity and extent of periodontal breakdown in 136 south Indian human immunodeficiency virus seropositive patients than in normal controls: A comparative study using community periodontal index of treatment needs

Ranganathan K¹, Magesh KT¹, Kumarasamy N², Suniti Solomon², Viswanathan R¹, Newell W Johnson³

¹Department of Oral Pathology, Ragas Dental College and Hospital, Chennai, India,
²YRG CARE, VHS Hospital, Chennai, India, India,
³School of Dentistry and Oral Health, Griffith University

ABSTRACT

Apart from the more or less distinctive forms of periodontal disease associated with human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome there remains considerable uncertainty as to whether or not conventional destructive periodontitis is exacerbated in HIV positive individuals. This is especially so in developing countries, from which few studies have been reported. The present study compared the severity and extent of periodontal breakdown in 136 HIV positive individuals from Chennai, South India, with 136 age-matched controls from the same low socio-economic and ethnic group. All surfaces of all teeth were scored for the community periodontal index of treatment needs (CPITN). Statistical analysis was performed using SPSS™ package. The results of the present study show that CPITN is a simple, useful technique to assess periodontal status in immunosuppressed patients and that periodontitis is associated with immunosuppression and oral candidiasis. The assessment of periodontal status could thus be a useful tool in minimally invasive screening of populations for HIV disease, especially in those parts of the world, like India and Africa, with high prevalence and rising incidence.

Key words: Community periodontal index of treatment needs, human immunodeficiency virus seropositive patients, periodontal breakdown, south Indian

Received : 21-06-06
Review completed: 02-08-06
Accepted : 09-08-06
PubMed ID : ???

INTRODUCTION

Human immunodeficiency virus (HIV) infection/acquired immune deficiency syndrome (AIDS) is a major global pandemic. The Indian sub-continent with a population of one billion is estimated to have 3-5 million people infected with HIV and National AIDS Control Organization, Government of India (NACO) describes HIV infection as the most serious public health problem facing the nation.^[1]

Oral lesions are important in the management of HIV/AIDS patients and also play an important role in the early diagnosis and monitoring of these patients.^[2-5] Periodontal changes form an important part of the wide spectrum of oral lesions seen in HIV infection and lesions such as linear gingival erythema, necrotising ulcerative gingivitis and necrotising ulcerative periodontitis are characteristic manifestations in this infection. In 1983 Winkler *et al.* observed an unusually aggressive periodontitis in HIV infected homosexual men in California.^[6]

Since then periodontal diseases have been the focus of several studies,^[7-9] but there has been little recent progress.^[10,11]

At the Fourth International Workshop on Oral Manifestations of HIV infection, it was emphasized that a greater understanding of the nature and severity of periodontal diseases among people with HIV in developing countries is necessary. This information would determine which periodontal lesions had diagnostic and prognostic value in relation to HIV/AIDS and which should be targeted with regards to treatment in the resource-poor regions of the world.^[12,13]

Reports on the association between HIV infection and periodontal diseases describe prevalence rates ranging from 1-66% for gingivitis and 0-91% for periodontitis.^[5,14-19] This wide variation may be due to differences in selection criteria, degree of immunosuppression, co-morbidity and smoking, for example,^[10,19] but especially due to the different criteria used by the investigators to diagnose periodontal disease.^[20] Robinson has addressed this latter problem. He discusses in detail the various clinical criteria used by the different classifications for diagnosis of periodontal diseases and suggests

Correspondence:
Dr. K. Ranganathan,
E-mail: ran2@vsnl.com

those likely to be useful to assess the periodontal changes in HIV infected patients.^[21]

Since periodontal status closely reflects the immune status of an individual, its study is important in HIV infection.^[22] Deterioration of the immune system in HIV infection consequent to the depletion of CD4+ T cells adversely affects the host defence in the dento-gingival region and increases susceptibility to periodontal damage.^[23] The marked immune deficiency associated with this infection and absence of adequate priming of neutrophils due to a reduced Th1-T lymphocyte response act directly or in concert with sub gingival bacterial pathogens to produce pro-inflammatory cytokines, which increase the occurrence of periodontal damage. As these changes occur early in the course of the HIV infection, periodical assessment of periodontal status could be useful in the management of these patients.

Numerous reports have documented the relationship between immunosuppression and periodontitis; however, there has been no standard means of periodontal assessment in these studies. We have used the established community periodontal index of treatment needs (CPITN) in the present study to both assess and establish baseline values of periodontal status.

The aims of this study were:

- 1 To ascertain and compare the periodontal status in HIV seropositive patients and presumed HIV seronegative patients from Chennai, South India, by using a standard periodontal index: CPITN
- 2 To ascertain if any correlation exists between CD4+ T cell counts and periodontal status in HIV seropositive patients from Chennai, South India.

MATERIALS AND METHODS

136 HIV seropositive patients attending RAGAS-YRG CARE (Center for AIDS Research and Education), Chennai, South India, were enrolled. All attended or were referred because of known or suspected HIV disease. A trained counselor confirmed sources of infection. Confirmation of HIV sero-status for all patients was by enzyme-linked immunosorbent assay (ELISA) (Merind Diagnostics, Belgium) and Western blot (Biotechnology kit, Singapore). CD4 cell counts were performed for 72 patients who could either afford the expense or were funded by projects requiring specific criteria.

136 control patients (presumed seronegative) were recruited from outpatients presenting for routine dental treatment at the Ragas Dental College and Hospitals, Chennai, South India.

As both the institutions serve low income groups within the population, the majority (>90%) of subjects in both case and

control groups were from the lower socio-economic strata. Patients with smoking and betel nut/ pan chewing habits were excluded from both the groups.

Methods

A thorough history was taken. Trained dental surgeons and physicians performed clinical oral and systemic examinations, respectively, and the findings were recorded in as standard format. Clinical diagnosis of oral lesions was based on the criteria established by the EC Clearing House and WHO^[24] and as reported by us earlier.^[5]

Periodontal Index: The CPITN, as described by WHO and reviewed by Page and Morrison,^[25] was ascertained by dental surgeon KT Magesh who had been trained for two months in the Department of Periodontology, Ragas Dental College and Hospital, until his technique was standardized, so as to produce reproducible results. To avoid inter-examiner variations only the author² performed these assessments.

Statistical analysis

All data were entered into MSTM Access database and analyzed using the SPSSTM package. Mann-Whitney U Wilcoxon Rank sum W test, ANOVA and logistic regression analyses were performed to explore associations; conventional *P* values of <0.05 were regarded as statistically significant.

RESULTS

Table 1 gives the details of the patients and controls. All the 136 patients had acquired the infection through heterosexual contact. 32% complained of an oral problem at the time of initial presentation to the HIV physician. The case and control groups were closely matched for age, though the patient group had a higher proportion of men.

Table 2 lists the systemic and oral lesions in the HIV seropositive patients. Among the seronegative controls 113 (83.1%) had gingivitis and 117 (86%) had periodontitis. There were no cases of linear gingival erythema.

Table 3 shows the number of sextants affected by the different CPITN scores in the study groups. These data were analyzed using Mann-Whitney U Wilcoxon Rank sum test; *P*<0.05 was considered statistically significant.

Table 1: Age and gender distribution of human immunodeficiency virus seropositive patients and controls

Gender	Age and gender distribution					
	HIV sero positive			Controls		
	<i>n</i>	Age	SD*	<i>n</i>	Age	SD*
Male	95	28.4	4.8	70	28.2	4.3
Female	41	31.1	5.8	66	30.2	5.5
Total	136	29.8	5.3	136	29.2	4.9

*SD - Standard deviation, HIV - Human immunodeficiency virus

Table 2: Systemic and oral lesions in human immunodeficiency virus seropositive patients

Systemic lesions	Number of patients (n=136) (%)
Aids-related complex (ARC)*	41 (30.2)
Pulmonary tuberculosis	28 (20.6)
Dermatological lesions	16 (11.8)
Genital ulcers	11 (8.1)
Cervical lymphadenopathy (non-specific)	8 (5.9)
Hepato-splenomegaly	2 (1.5)
<i>Pneumocystis Carinii</i> pneumonia	2 (1.5)
Toxoplasmosis	1 (0.7)
Asymptomatic	44 (32.4)
Oral lesions	
Periodontitis	126 (92.7)
Conventional gingivitis	121 (89)
Pigmentation	54 (39.7)
Candidiasis	39 (28.7)
Ulcers	6 (4.4)
Oral hairy leukoplakia	5 (3.7)

*ARC: Includes group of symptoms - weight loss, loss of appetite, fever, headache, and diarrhea, consequent to the immunosuppression

CD4 cell counts were available for 72 HIV seropositive patients. 25 patients had CD4 counts <200 and 47 had CD4 counts >200. Among the 72 HIV seropositive patients with known CD4 counts, 78% had some lesion at the time of examination. 22 (31%) patients complained of a group of unrelated symptoms that fall under the category - AIDS-related complex. 20 (28%) patients had pulmonary tuberculosis and 9 (13%)

patients had skin lesions due to the immunosuppression. The most common oral lesion was periodontitis (85%). This was followed by gingivitis (89%), pigmentation (38%), candidiasis (33%), ulcers (6%), and oral hairy leukoplakia (4%).

Table 4 shows the number of sextants affected by the different CPITN scores in the study groups. These data were analyzed using Mann-Whitney U Wilcoxon Rank sum test; *P*<0.05 was considered statistically significant.

When the oral and systemic lesions and the mean CD4 cell counts in the 72 patients were analyzed, and the significance level was determined by ANOVA, the occurrence of periodontitis and candidiasis with low CD4 counts was statistically significant (*P*<0.05 significant). Logistic regression analysis [Table 5] was used to identify CD4 count as a significant determinant of the occurrence of periodontitis with other lesions. The likelihood occurrence of other manifestations with periodontitis was significant for candidiasis and pulmonary tuberculosis.

DISCUSSION

All the 136 HIV seropositive patients in the present study had acquired their infection by heterosexual contact, consistent with our earlier report.^[5] Of the 136 HIV seropositive patients,

Table 3: Number and percentage of sextant affected by different community periodontal index of treatment needs scores in human immunodeficiency virus seropositive and control group

HIV status	No. of patients (n)	No. of sextants (nx6)	No. and percentage of sextants that contain the different CPITN scores as highest scores				
			0	1	2	3	4
Seropositive	136	816	21 (2.6)	24 (2.9)	132 (16.2)	407 (49.9)	231* (28.4)
Controls (seronegative)	136	816	23 (2.8)	74 (9.1)	241 (29.5)	406 (49.8)	72* (8.8)

*Statistically significant difference, HIV: Human immunodeficiency virus, CPITN: Community periodontal index of treatment needs, Figures in parentheses are in percentage

Table 4: Number and percentage of sextants affected by different community periodontal index of treatment needs scores in patients with known CD4 counts

CD4 status	No. of patients (n)	No. of sextants (nx6)	No. and percentage of sextants that contain the different CPITN scores as highest scores				
			0	1	2	3	4
CD4 <200	25	150	0	0	25 (16.7)	62 (41.3)	63 (42.0)
CD4 >200	47	282	7 (2.5)	15 (5.3)	92 (32.6)	122 (43.3)	46 (16.3)

CPITN: Community periodontal index of treatment needs, Figures in parentheses are in percentage

Table 5: Logistic regression analysis of the likelihood occurrence of various systemic and oral lesions with periodontitis in the CD4 ascertained group (n=72)

Dependant variables	B	SE	P	Significance	Odds ratio
Periodontitis vs Gingivitis	-0.0001	0.0021	0.9449	NS	0.9999
Periodontitis vs Pigmentation	-0.0013	0.0013	0.3128	NS	0.9987
Periodontitis vs Oral candidiasis	-0.0029	0.0016	0.0530	S	0.9981
Periodontitis vs Oral hairy leukoplakia	-0.0039	0.0041	0.3348	NS	0.9961
Periodontitis vs Pumonary tuberculosis	-0.0040	0.0018	0.0269	S	0.9960
Periodontitis vs Dermatological lesions	-0.0006	0.0018	0.7590	NS	0.9994
Periodontitis vs AIDS-related complex	0.0015	0.0013	0.2236	NS	1.0015
Periodontitis vs asymptomatic	-0.0009	0.0016	0.5912	NS	0.9991

P at 0.05 level considered significant, B: Parameter estimates, SE: Standard error, NS: Not significant, S: Significant, AIDS: Acquired immunodeficiency syndrome

one third were asymptomatic at the time of presentation and in the remaining two thirds, ARC, oral candidiasis, pulmonary tuberculosis, skin lesions and genital/oral ulcers were the most common presentations.

The high prevalence of oral lesions in studies conducted in dental institutions has been attributed by Eyeson *et al.*^[19] to the fact that these patients are dentally aware or have presented because of oral problems. Oral lesions were a presenting symptom in 32% of the present cohort who had not presented primarily to a dental institution.

Conventional gingivitis was present in almost all subjects in both patient and control groups, an unsurprising finding in this socio-economic group. It is of interest that LGE was not seen, unlike in our earlier report where a prevalence of 47% in the HIV positive cohort was described. This might be explained by the regular prophylactic use of clotrimazole, which is routinely given by our physicians to early-diagnosed HIV patients before referral for oral care. It is also likely that greater experience and tighter diagnostic criteria have led to a reduction in such diagnoses. Indeed Robinson *et al.*^[13] argue that this condition was much misdiagnosed in the past. Since the threshold chosen for periodontitis absent/present diagnosis was very low, it is not surprising that was almost universally present in both groups. Importantly, however, CPITN revealed a statistically greater severity and extent of conventional periodontal breakdown in the patient cohort than in the matched controls.

This increase in periodontal tissue damage with immunosuppression due to HIV has been reported by other investigators^[20,26] in an Australian and in a Scottish population, respectively, though it has not been widely documented in other populations and never reported before from a developing country. The work of Barr *et al.*^[8] in New York City remains, a decade later, still the only well-conducted longitudinal study that revealed a faster rate of periodontal disease progression: indeed, in a recently conducted longitudinal study in London it was found that there was no convincing evidence for accelerated breakdown.^[11] However the present findings from South India are important: at least 95% of these patients had not received anti-retroviral therapy and we are likely to see a more typical natural history. Longitudinal follow-up of these patients will be informative.

CD4 status was available for 72 patients. The prevalence of both periodontitis and gingivitis was significantly greater in the CD4<200 group (92% and 96%, respectively) than in the CD4>200 group (81% and 85%, respectively). Comparison of the CPITN scores in these patients revealed that the patients with CD4<200 had more sextants (42%) with a CPITN score of 4 than the patients in the CD4>200 group.^[16] This is similar to other reports of increase in probing depths with increasing immunosuppression in HIV disease.^[27,28]

Analysis of the CD4 counts, and the oral and systemic lesions showed that periodontitis and oral candidiasis were significantly associated with lower CD4 counts. Occurrence of periodontitis with other oral and systemic lesions was analyzed and the odds ratio computed. This revealed that the occurrence of pulmonary tuberculosis and oral candidiasis simultaneously with periodontitis was statistically significant. Oral candidiasis as a marker of immunosuppression has been confirmed by many investigators.^[4,5,29] The presence of candidal colonization in the subgingival plaque of HIV seropositive patients has been documented by many investigators.^[30-32] It has been suggested that oral candidal infection plays an important role in the clinical manifestation of periodontitis associated with immunosuppression and that oral candidiasis may be a better predictor of periodontitis than CD4 cell counts. In our present study both CD4 cell count and oral candidiasis were strongly related with periodontitis.

The present study suggests that CPITN is a simple, useful technique to assess the periodontal status in immunosuppressed patients. Also, periodontitis is strongly associated with CD4 cell immunosuppression and oral candidiasis.

The assessment of the periodontal status could, thus, be a useful tool in minimally invasive screening of populations for HIV disease, especially in those parts of the world like India and Africa with high prevalence and rising incidence.

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How to cite this article: Ranganathan K, Magesh KT, Kumarasamy N, Solomon S, Viswanathan R, Johnson NW. Greater severity and extent of periodontal breakdown in 136 south Indian human immunodeficiency virus seropositive patients than in normal controls: A comparative study using Community periodontal index of treatment needs. *Indian J Dent Res* 2007;18:55-9.

Source of Support: Nil, **Conflict of Interest:** None declared.