A comparison of periodontal disease in HIV-infected children and household peers: a two year report

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Abstract

Purpose: The purpose of this study was to compare the incidence and progression of periodontal disease in HIV-infected children to HIV-negative household peers. This paper reports the findings after two years.

Methods: Children diagnosed as HIV-infected and their household peers were recruited from the Children's Hospital AIDS Program in Newark NJ. A periodontal examination was performed at baseline and at six-month intervals for two years. A total of 121 subjects were examined two years after baseline (68 HIV-infected and 53 controls). These children ranged in age from 2-15 years at baseline.

Results: Plaque assessment (PHP-M) in HIV-infected cases showed a seven-fold increase over controls for the period. However, there were no significant differences between the two groups in changes over the two years for Bleeding on Probing, Gingival Index or Pocket Depths. There was virtually no recession or pathologic mobility in either group. One-fourth of the HIV-infected group exhibited Linear Gingival Erythema at both baseline and year two. Although the number of subjects with LGE did not increase, there was an increase in the severity of LGE at year 2.

Conclusion: This study suggests that in a medically well-controlled HIV-infected population, with the exception of the prevalence of Linear Gingival Erythema, the periodontal findings are similar to their HIV-negative household peers and to the general pediatric population. (Pediatr Dent 22:365-369, 2000)

Recent cross-sectional studies have reported on the prevalence of periodontal disease in HIV-infected adults.[1-5] Robinson et al reported a higher incidence of attachment loss, pocket depth, bleeding on probing and other gingival changes in HIV-positive men compared to HIV-negative controls.[6] One 18-month longitudinal study determined that HIV-positive individuals had progression of periodontal disease while the HIV-negative controls did not.[7] Barr et al also reported similar findings in adult subjects [8].

HIV infection in children exhibits a similar progression as in adults. However, one of the differences seen in children is an increased susceptibility to bacterial infections.[9,10] In the HIV-infected children these infections are more persistent and severe than the general pediatric population. Because of the increased risk in HIV infected adults for periodontal disease, and the increased risk for bacterial infections in HIV infected children, these children may be at greater risk for periodontal disease than their non-infected peers. Several studies have reported on the oral manifestations of HIV infection in children.[11-18] Prevalence of gingivitis ranged from 0 – 48%, however it is not always specified if these represent conventional gingivitis or linear gingival erythema. In studies that specify, the prevalence of linear gingival erythema ranged from 0 – 38%.[16-17] While some of these have described the prevalence of periodontal disease in HIV-infected children, none have compared either the prevalence or the incidence of periodontal disease in HIV-positive children to a sero-negative control group. While HIV-positive adults appear to be at increased risk for more severe periodontal disease, there are no studies addressing this relationship in children. The purpose of this study was to compare the incidence and progression of oral disease in HIV-infected children to an HIV-negative household peer control group after two years. Other papers report on the findings related to caries and orofacial lesions. [19, 20]

Methods

Children diagnosed as HIV-infected, aged 2-15 years, were recruited into this longitudinal study of the oral manifestations of HIV infection. Institutional Review Board approval was obtained for the study. All HIV-infected children were recruited from the Children's Hospital AIDS Program (CHAP) in Newark, NJ. The parents or guardians of children diagnosed with AIDS at CHAP were asked to enroll the child and any HIV-negative children living in the same household in this study on the comparative progression of oral disease in HIV-infected children vs. HIV-negative controls to be conducted at the University of Medicine and Dentistry of New Jersey - New Jersey Dental School (UMDNJ-NJDS). Of the control group household peers, 94% were determined negative by standard Elisa testing and 6% were deemed negative by report.

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Table 1. Distribution of Sample who Participated at Baseline and Year 2 by Age, Gender and Race

	Baseline (N=171)		Year 2 (N=121)	
	HIV-Infected (N=104)	Control (N=67)	HIV-Infected (N=68)	Control (N=53)
Age				
2-5	51 (49%)	19 (29%)	36 (53%)	15 (28%)
6-11	38 (37%)	33 (49%)	24 (35%)	33 (53%)
12-15	15 (14%)	15 (22%)	8 (12%)	10 (19%)
Gender				
Male	51 (49%)	40 (60%)	31 (46%)	32 (60%)
Female	53 (51%)	27 (40%)	37 (54%)	21 (40%)
Race/Ethnic Group				
African-American	82 (79%)	54 (81%)	56 (83%)	44 (83%)
Hispanic	14 (13%)	12 (18%)	9 (13%)	9 (17%)
White	8 (8%)	1 (1%)	3 (4%)	0

All HIV-infected children actively enrolled in the CHAP program, as well as all newly identified cases, were recruited during the one year period from May 1993 to May 1994. The HIV-negative children from these households served as controls and are most appropriately referred to as household peers because the HIV-infected patient was often living with second degree relatives or in foster homes.

All study subjects were given oral examinations that included periodontal indices and measures, dental caries indices, and soft tissue findings, as well as salivary and crevicular fluid samples. No dental radiographs were taken. Demographic data included age, gender, and race, while relevant medical data extracted from the hospital records included CD4 counts and current medications.

The periodontal examination consisted of the following indices: 1) the Modified PHP Index (PHP-M[21]); 2) the Gingival Index (GI, Loe & Sillness[22]); 3) the Papilla Bleeding Index.[23] Additionally, the following aspects of periodontal status were recorded: 1) linear gingival erythema (in mm) 2) pocket depth (in mm) at 4 sites/tooth (MB,B,DB,L); 3) recession (in mm) at the same sites; and mobility. Linear Gingival Erythema (formerly referred to as HIV Gingivitis) is defined as a fiery red linear band 1-3 mm wide on the marginal gingiva. The amount of erythema is disproportional to the amount of plaque present.[24] The GI, PBI and pocket depth components of the periodontal examination were not obtained for any child needing antibiotic prophylaxis. Because of this factor and variability of the cooperation level of the child at each visit, the number of subjects (N) included in each index specific analysis does vary. All periodontal examinations were performed by one of three trained examiners who had been calibrated to an experienced examiner. While none of the examiners were informed of the HIV status of the participants in an attempt to maintain blindness, at times the physical condition of the patient revealed the HIV status.

All subjects were re-appointed for follow-up examinations at six month intervals (± 2 months of the targeted date) over the two year period. The same data set as obtained at the baseline examination was obtained for all subsequent examinations. No interventions, including oral hygiene instruction, were carried out as part of the study. At each semi-annual examination, all children were appropriately referred for dental care and were actively encouraged to obtain dental treatment whenever it was indicated.

Data analysis included descriptive statistics and frequency distributions for demographic data. Comparisons of periodontal findings were performed by ANOVA and Chi square analysis. A level of significance of P=.05 was used in all statistical tests.

Table 2. Descriptive Statistics for Periodontal Indices for HIV-infected Cases and Controls that had any Indices Recorded for Both Baseline and Year 2

	Baseline				Year 2			
	HIV-Infected	SD	Control	SD	HIV-Infected	SD	Control	SD
PHP-M/Total	36.7 (N=62)	8.06	37.6 (N=46)	7.1	36.7 (N=68)	12.1	37.2 (N=53)	5.9
Mean GI	.83 (N=61)	.52	.86 (N=47)	.39	1.12 (N=59)	.28	1.12 (N=53)	.25
Mean PBI	.46 (N=58)	.58	.34 (N=44)	.48	.33 (N=59)	.42	.39 (N=53)	.40
Mean PD	2.11 (N=61)	.31	2.14 (N=45)	.34	2.14 (N=59)	.22	2.29 (N=53)	.21

Table 3. Mean PHP-M Total, Mean Gingival Index, Mean Papillary Bleeding Index, Mean Pocket Depths and Mean Deltas for HIV-Infected Cases and for Controls: Baseline vs. Year 2

	Baseline				Year 2				Delta			
	HIV-Infected	SD	Control	SD	HIV-Infected	SD	Control	SD	HIV-Infected	SD	Control	SD
PHP-M/Total	36.7	8.27	37.6	7.17	40.1	6.11	37.9	5.20	3.49 (N=57)	9.73	.30 (N=46)	8.88
GI	.82	.52	.86	.39	1.14	.25	1.12	.26	.32 (N=54)	.52	.26 (N=47)	.38
PBI	.46	.58	.35	.47	.34	.44	.39	.39	-.13 (N=52)	.64	.05 (N=44)	.40
PD	2.09	.30	2.14	.34	2.16	.22	2.30	.22	.06 (N=54)	.28	.17 (N=45)	.28

Note: This table only includes those cases that had each index recorded at both baseline and year 2.

Results

Recruitment of the 104 HIV-infected children into the study took 12 months. Slightly over 95% of the parents/guardians of the eligible children in the CHAP clinic who were invited into this oral health study agreed to participate. When the baseline examination period (July 1993 through June 1994) was completed, the study consisted of 104 HIV-infected children and 67 of their HIV-negative household peers who had been enrolled as the control group. Ninety-seven percent of the HIV-infected children were perinatally transmitted cases, i.e. vertical transmission; the remaining 3% of the HIV-infected children were infected by blood transfusion. These 171 children ranged in age (at baseline) from 2-15 years. The mean age of the HIV-infected group was 6.6 ±3.7 yrs; 51% were females and 92% were minorities (79% African-American, 13% Hispanic, 8% White). The mean age of the control group was 7.9 ±3.7 yrs; 40% were females and 98% were minorities (81% African-American, 18% Hispanic, and 1% White).

Of these original 171 subjects, 71% (N=121) participated in the Year 2 examinations. The results for this report will be based upon these 121 subjects who attended both the baseline and the Year 2 examinations. Of the 121 subjects examined, 68 were HIV-infected children and 53 were control children residing in the same households. The mean baseline ages for the HIV-infected and control children who participated in the Year 2 examinations were 6.1±3.7 years and 7.9 ± 3.6 years, respectively. Table 1 shows the distribution of the HIV-infected and control subjects by age, gender and race/ethnic group at both the baseline and year 2 examinations. Loss of subjects between these examinations was relatively equally distributed across age, gender and race/ethnic group categories. All but 5 subjects (3 HIV-infected, 2 household peers), participated in each of the 6-month examinations. CD4 and total lymphocyte counts were obtained on 82% (N=85) of the HIV-infected children at baseline. The distribution of the CD4 counts for these children was as follows: 33% had CD4 counts of 0-199, 18% had CD4 counts of 200-499, and 49% had CD4 counts > 500. The mean percent of CD4 to total lymphocytes by age group was: 2-5yrs – 29%, 6-11 years – 27%, 12-15 years – 21%. Analysis of periodontal data relative to CD4 counts could not be included because most CD4 counts for subjects at Year 2 were not available..

Table 2 presents the descriptive statistics for the plaque index (PHP-M), GI, PBI, and pocket depth scores for all cases that had any or all of the indices recorded at baseline or Year two. Table 3 presents statistical analysis only for those cases that had each index recorded for both visits. When plaque was calculated using the total mouth score for PHP-M, mean plaque scores showed a twelve-fold increase for the HIV-infected group (3.75 ± 9.62) as compared to the control group (.30 ± 8.88) over the two year period (see Table 3). However, this difference was not statistically significant. Table 3 also shows the mean GI, PBI, and pocket depth scores for the HIV-infected and control groups at baseline and at Year 2. Despite the observed differences in plaque scores, there were no statistically significant differences between the two groups for these three indices. Table 4 shows the mean GI, PBI, and PD by age groups. There were no statistical differences by age group. Additionally, there was virtually no recession or pathologic mobility at either the baseline or the Year 2 examinations in either group of children. The incidence of conventional gingivitis and periodontitis for each group is shown in Table 5. Once again no differences were seen.

As expected, Linear Gingival Erythema (LGE) was seen primarily in the HIV-infected group, with 25% exhibiting LGE at baseline and at Year 2 examination. Although 2 subjects in the control group were identified as presenting with LGE at baseline, no LGE was seen in the control group at the Year 2 examination. Although there was no increase in the prevalence of LGE, i.e. the number of subjects exhibiting LGE at the Year 2 examination, there was a 1.7-fold increase in the severity of LGE, i.e., the number of subjects who exhibited LGE at 7 or more sites (9% at baseline vs. 15% at the Year 2 examination). There was no correlation between plaque scores and prevalence or severity of LGE. Four cases that presented with LGE at baseline did not exhibit LGE at Year 2. There was one case of HIV-Periodontitis at baseline and two cases at year two.

Discussion

Of the 36 HIV-infected children who did not participate in the Year 2 examinations, 19 died prior to that examination and two were hospitalized. Of the 14 household peers who did not participate in the Year 2 examinations, 3 discontinued the study due to the death of the HIV-infected sibling. The remaining 15 HIV-infected and 11 control subjects were categorized as lost to non-compliance. While the overall attrition rate for the two year period was 1.7 times higher for the HIV-infected cases (35% vs. 21%), the loss due to non-compliance attrition rate (i.e. overall attrition minus illness and death loss of subjects) was similar for the HIV-infected children and the control subjects, i.e. 14% vs. 16%, respectively.

The periodontal findings suggest that there is little difference between the HIV-infected group and the control group either at baseline or after two years. Although the HIV-infected

Table 4. Mean Gingival Index, Mean Papillary Bleeding Index, Mean Pocket Depths and Mean Deltas for HIV-Infected Cases and for Controls by Age Groups: Baseline vs. Year 2

	Baseline				Year 2				Delta			
	HIV-Infected	SD	Control	SD	HIV-Infected	SD	Control	SD	HIV-Infected	SD	Control	SD
GI												
2-5Yrs	.55	.53	.62	.37	1.02	.26	1.01	.24	.50 (N=26)	.61	.42 (N=14)	.33
6-11	1.09	.35	.89	.35	1.18	.17	1.12	.19	.12 (N=20)	.33	.24 (N=24)	.42
12-15	1.12	.34	1.18	.29	1.35	.38	1.26	.36	.23 (N=8)	.47	.07 (N=9)	.21
PBI												
2-5Yrs	.28	.57	.07	.21	.14	.18	.19	.21	-.18 (N=25)	.62	.13 (N=13)	.32
6-11	.64	.57	.31	.28	.40	.34	.36	.35	-.20 (N=20)	.59	.06 (N=24)	.40
12-15	.62	.45	.98	.74	.90	.70	.79	.49	.29 (N=7)	.75	-.18 (N=7)	.49
PD												
2-5Yrs	1.96	.17	1.78	.30	2.03	.14	2.17	.17	.07 (N=27)	.24	.39 (N=12)	.33
6-11	2.22	.36	2.23	.21	2.20	.17	2.29	.21	.01 (N=19)	.33	.08 (N=24)	.20
12-15	2.33	.32	2.36	.32	2.45	.24	2.46	.18	.12 (N=8)	.34	.09 (N=9)	.28

children had a twelve-fold increase in plaque over the control group, this appears to have had little clinical impact since there were no differences in gingival health over time as measured by GI, PBI, pocket depth, recession or mobility. Perhaps this could be explained by medications such as antibiotics and oral rinses that the HIV-infected subjects were taking during the study. Although we would assume that the HIV-infected subjects had more prescribed antibiotics over the two year period, our documentation of these encounters was not reliable enough for us to include. One could assume that an increase in antibiotic usage might explain the lack of periodontal disease in the HIV-infected group. On the other hand, the increase in plaque levels in this group might argue against that assumption. This is particularly confounding because bacterial analysis failed to reveal any specific differences in the periodontopathic flora (data not shown) when the two groups were compared. While both groups had an increased incidence of gingivitis over time, there was little sign of a progression of disease into the periodontal structures over this two year observation period.

However, there was a high incidence of Linear Gingival Erythema in the HIV-infected group, with one-fourth of those subjects exhibiting LGE at both baseline and the Year 2 examination. This is consistent with previous studies. While there was no increase in prevalence, there was a two-fold increase in severity in those cases exhibiting LGE. There were several cases of LGE in the control group at baseline. Possible explanations could include severe inflammation due to eruption of permanent teeth or response to heavy plaque. The etiology of LGE is still unknown and its clinical significance is yet to be determined. There is still a need for further study of Linear Gingival Erythema.

Although there are no recent reports in the literature describing the prevalence or severity of periodontal disease in a cohort of similar age groups as seen in this study, when compared to other epidemiological studies of children in urban settings, the findings in this study are similar. Bimstein[25] stated that more than 70% of children over age seven have gingival inflammation. The NHANES III study only collected data on the periodontal status of subjects 13 years and older.[26] The prevalence of loss of attachment was 2.1% for the age group 13-17 years, with 1.2% of sites exhibiting loss of attachment. Seventy-three percent exhibited gingival bleeding. A study by Houpt et al[27] of 14-19 year old high school students in New Jersey reported similar mean gingival scores. Plaque and bleeding indices in the current study are comparable to or better than those reported by other authors in inner-city junior high and high school cohorts.[28-29]

There may be several explanations for the findings in the current study. This group of HIV-infected children is a medically well-controlled cohort that has regular visits at CHAP. Many of these children are on multiple anti-fungal and antimicrobial medications. This may account for the relatively healthy condition of the periodontium. Another explanation may be that HIV-infected children are not at greater risk for periodontal disease as found in HIV-positive adults. Future studies should be conducted to address these questions. This study suggests that in a medically well-controlled HIV-infected population the periodontal findings are similar to their HIV-negative household peers.

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Table 5. Incidence of Conventional Gingivitis and Periodontitis by HIV Status: Baseline vs. Year 2

	Baseline		Year 2	
	HIV-Infected	Control	HIV-Infected	Control
Gingivitis	32%	22%	29%	43%
Periodontitis	13%	32%	19%	28%

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ABSTRACT OF THE SCIENTIFIC LITERATURE

GENERAL ANESTHETIC COSTS FOR DENTAL SERVICES IN THE MEDICAID-ELIGIBLE CHILDREN

The purpose of this study was to compare types and cost of dental services provided by the Louisiana Medicaid Program rendered to young children who had a general anesthetic (GA) and those who did not. The population consisted of all children aged 1-5 who received a dental service reimbursement from 1996-'97. Of the 40,565 children approximately 5% (2,140) received a GA. Over 60% of this GA group had children under 3 years of age. Also, most of the care was done by pediatric dentist. Over 32% of the total Medicaid dental reimbursement went to the GA group. The mean reimbursement per GA child was eight times greater than of normal care. The average cost was $1,508 to $104. These findings may be lower than in other States. Thus the reduction of treatment needs by doing early intervention should reduce the costs for the Medicaid Program.

Comments: Appropriate early intervention is a logical way to correct a large part of the dental cost. LHS

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