Oral health-related quality of life among low-income adults living with HIV

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Abstract

Objectives: To explore oral health-related quality of life and its correlates among low-income human immunodeficiency virus (HIV)-positive patients receiving primary HIV care.
Methods: Data were from a randomized experimental trial evaluating an intervention to increase use of oral health services by low-income HIV-positive adults. Interviews were conducted in English or Spanish among 594 adults receiving HIV medical care but not dental care. Oral health-related quality of life was measured with the 49-item Oral Health Impact Profile (OHIP-49). Primary predictor variables included measures of HIV disease: duration of HIV infection, CD4 cell count, and HIV viral load. Other predictors included sociodemographic and behavioral factors.
Results: Overall, 62.6 percent of participants had experienced at least one oral health impact very often or fairly often in the 4 weeks preceding the survey, with a mean of 5.8 impacts. The mean number of impacts was significantly higher for women, the unemployed, those living in temporary housing, and current smokers. Neither the prevalence nor the mean number of impacts differed significantly by duration of HIV infection, CD4(+) T lymphocyte cell count, or HIV viral load. In bivariate analysis, women had higher mean OHIP-49 scores than men overall (62.6 versus 50.5, $P < 0.05$) and for most subscales, indicating that women experienced more oral health impacts. In the final multivariate model, significant correlates of OHIP-49 were sex, race/ethnicity, living situation, and smoking status.
Conclusions: Oral health impacts are prevalent among adults in South Florida living with HIV, particularly among women, cigarette smokers, those in prison or other institutional settings, and certain racial and ethnic groups.

Introduction

In the 1990s, it was estimated that more than 90 percent of human immunodeficiency virus (HIV)-positive persons will experience at least one oral manifestation of HIV disease during the course of their infection (1,2). In addition, oral health problems of HIV-positive individuals are often more severe and difficult to treat than those of the general population. Poor oral health can be a contributing factor to opportunistic infections in persons living with HIV/acquired immunodeficiency syndrome (AIDS) (3). Oral pain or discomfort can interfere with adherence to prescribed nutrition and medication regimens essential to the management of HIV and associated conditions (4).

In the first nationally representative study of HIV-positive adults receiving care in the United States, with baseline interviews conducted in 1996-1997, unmet dental needs were more than twice as prevalent as unmet medical needs and were associated with low income and lack of insurance (5,6). Several other studies conducted in the 1990s found similar unmet dental needs among persons living with HIV (7-9). However, there have been few recent investigations of the unmet oral health needs or impacts among low-income persons living with HIV. Almost none of the earlier studies were conducted during the era of highly active antiretroviral therapy (HAART) for HIV, which has dramatically improved the average life expectancy for persons living with HIV (10) and may have changed the implications of HIV infection for

oral health, its related quality of life, and the need for dental services. The present study explored oral health-related quality of life and its correlates among low-income HIV-positive patients who were receiving primary HIV care in South Florida.

Methods

The data for this study were collected as part of a two-arm randomized experimental trial (Project SMILE) to evaluate the efficacy of a brief, client-centered, case management linkage intervention designed to increase the use of oral health services by low-income HIV-positive persons. The results reported here are based on 594 persons who participated in the study's baseline interview; it does not present the results of the interventional study, which will be forthcoming. Baseline interviews were conducted between April 2005 and December 2007 and were conducted in English or Spanish. A small monetary incentive was offered ($25) for completion of the baseline interview. The inclusion criteria for the randomized trial were: a) HIV-positive individuals who had not received oral/dental health services in the preceding 12 months; b) aged 18 years and older; c) currently in HIV primary care; d) eligible for Ryan White Title I funding; e) had plans to remain in South Florida for at least 24 months; and f) could provide names of two verifiable contact persons. Respondents were recruited from five HIV primary care clinics in South Florida, two with on-site dental care and three without on-site dental care. The clinics were diverse with regard to location, race/ethnicity, gender, and HIV risk group.

Oral health-related quality of life was measured by using the 49-item Oral Health Impact Profile (OHIP-49) (11). The OHIP-49 is designed to measure self-reported dysfunction, discomfort, and disability related to oral health. We asked how often in the past preceding 4 weeks the respondent experienced the oral health impact (a symptom or problem) described in each of the items; the response set consisted of never, hardly ever, occasionally, fairly often, and very often. As described by the developers of OHIP-49, the items measure seven subscales of oral health impacts: a) functional limitation; b) physical pain; c) psychological discomfort; d) physical disability; e) psychological disability; f) social disability; and g) handicap. Item weights developed and recommended by the index developers (12) were incorporated, and we computed mean scores for each subscale. The overall OHIP-49 score was calculated by summing the subscale scores. To increase the normality of residuals of OHIP-49 scores to meet the modeling requirements of analysis of variance (ANOVA), a normalized overall OHIP-49 score was calculated by dividing each subscale score by its standard deviation and then summing the normalized subscale scores.

Because we theorized that HIV disease had a direct effect on oral health impacts, the primary predictor variables of interest were measures of HIV disease: a) duration of HIV infection; b) CD4 cell count; and c) HIV viral load. Self-reported data on participants' most recent CD4 cell count were available for 471 participants (79 percent) and self-reported data on most recent viral load were available for 437 participants (74 percent). Laboratory measures of CD4 cell counts and viral load were abstracted from participants' medical records and were available for 237 (40 percent) and 215 (36 percent) participants, respectively. To maximize the number of participants included in the analysis, we verified self-reported values by using used laboratory values for those for whom laboratory measures were available. This was done by using the gamma statistic, an estimator of association for two ordinal-scaled variables that is based on the number of concordant and discordant pairs of observations (13). We found good agreement between self-reported values and laboratory values: overall Cramer's $V = 0.4029$; gamma P-value <0.0001. We therefore used self-reported values of CD4 cell counts and viral load in order to maximize the number of participants included in the analysis. We also included potential confounders and correlates in the analysis, including demographic characteristics (sex, age, and race/ethnicity) socioeconomic characteristics (educational attainment, employment status, annual household income, and living situation), and behavioral factors (use of dental services and smoking status).

Data analysis included bivariate associations between each predictor variable at each OHIP-49 subscale and overall score. Multivariable analysis involved construction of a parsimonious ANOVA model for the normalized overall OHIP-49 score, including main effects and first-order interaction terms.

This study was approved by the University of Miami Institutional Review Board.

Results

The characteristics of the study participants are presented in Table 1. Seventy-one percent were men, with a median age of 44.1 years (range: 19-74 years). The majority were Black/African–American (56.2 percent) or Hispanic/Latino (30.1 percent) people. More than 70 percent of study participants had first tested positive for HIV at least 6 years before the baseline survey. Other sociodemographic characteristics of this study population have been published previously (14).

Table 1 presents data on the prevalence of experiencing oral health impacts and the mean number of impacts experienced within the 4 weeks preceding the interview, overall and by selected participant characteristics. For purposes of simplicity, detailed data for categories are presented only for those variables for which there were statistically significant

Table 1 Selected Characteristics of Study Participants, and Prevalence and Mean [Standard Deviation (SD)] Number of Oral Health Impacts* Experienced "Very Often" or "Fairly Often"

Characteristic	No.	%	Proportion of participants experiencing at least one impact "very often" or "fairly often"		Mean (SD) number of impacts experienced "very often" or "fairly often"‡
			%	***P*-value†**	
Total	594	100.0	62.6		5.8 (8.8)
Sex				0.047	
Female¶	173	29.2	68.8		7.1 $(10.7)_a$
Male	421	70.8	60.1		5.0 $(7.8)_a$
Age				0.517	
Race/ethnicity				0.218	
Educational attainment				0.946	
Employment				0.492	
Annual household income				0.141	
Living situation past 3 months				0.095	
Time since HIV diagnosed (years)				0.969	
Most recent CD4 cell count ($n = 471$)				0.631	
Most recent HIV viral load ($n = 437$)				0.863	
Cigarette smoking				0.015	
Current	37	6.2	75.7		11.3 $(12.6)_{d,e}$
Former	378	63.6	65.1		5.4 $(8.4)_d$
Never	179	30.1	54.8		4.3 $(7.6)_e$
Time since last dental visit				0.448	

* Incorporates suggested item weights (12).

† Chi-square test.

‡ Categories with the same subscript letter differ significantly ($P < 0.05$), Tukey–Kramer method for multiple pairwise comparisons, all main effects of the variables in this table included in ANOVA models, SAS Software Version 9.2, Generalized Linear Model Procedure.

¶ Includes one participant who identified as male to female transsexual.

ANOVA, analysis of variance; HIV, human immunodeficiency virus.

differences among the categories. Overall, 62.6 percent of study participants had experienced at least one oral health impact very often or fairly often in the 4 weeks preceding the baseline survey. Women were more likely than men to have experienced an impact very often or fairly often. The prevalence of frequent impacts in the preceding 4 weeks varied significantly by smoking status, from 75.7 percent among current smokers to 54.8 percent among those who never smoked. Of the 49 oral health impacts included in the OHIP-49, the mean number of impacts experienced by study participants was 5.8 [standard deviation (SD) = 8.8]. The mean number of impacts experienced varied significantly by sex, employment status, living situation, and smoking status. Neither the prevalence of frequent impacts nor the mean number of impacts experienced differed significantly by duration of HIV infection, CD4 cell count, or HIV viral load.

In bivariate analysis, women had higher mean impact scores than men overall (62.6 versus 50.5, $P < 0.05$) and for most subscales (Table 2 provides details for those categorical variables in which there were statistically significant inter-category differences). Non-Hispanic White patients generally had higher OHIP scores than Hispanic/Latino or Black/African–American patients. Although relatively few patients were living in prison or other institutional settings, they had significantly higher OHIP scores overall and for most subscales. There were no significant differences in OHIP scores by duration of HIV infection, CD4 cell counts, or HIV viral load. Current cigarette smokers had significantly higher total OHIP-49 scores (84.9) than did former smokers (54.2) or patients who never smoked (45.3); that pattern persisted for all subscales.

Variables in the final ANOVA model for the overall normalized OHIP score and least square means for each variable category are presented in Table 3. The only significant correlates of OHIP in multivariate modeling were smoking status and an interaction between sex and race/ethnicity. Non-Hispanic White females had significantly higher normalized OHIP scores than non-Hispanic White males, Black/African–American males, and Hispanic males. Current smokers had higher mean scores than did former or never smokers.

Discussion

This study found that oral health impacts were quite prevalent among adults in South Florida living with HIV. Nearly two-thirds of participants experienced at least one impact

Table 2 Mean OHIP Subscale Scores*, by Selected Sociodemographic, HIV-Related, and Behavioral Characteristics

Characteristic	OHIP subscale							Overall OHIP
	FL	P1	P2	D1	D2	D3	H	
Total	11.6	10.0	11.8	7.3	5.6	3.9	3.5	53.7
Sex								
Female	13.0_{a}	11.4_{e}	12.9	8.6_{n}	6.7	5.4_{v}	4.6_{y}	62.6_{β}
Male	11.1_{a}	9.5_{e}	11.5	6.9_{n}	5.2	3.3_{v}	3.1_{y}	50.5_{β}
Race/ethnicity								
Hispanic or Latino	10.6	9.1_{f}	10.8_{j}	6.1	4.8_{q}	3.4	2.8_{z}	47.6_{γ}
White†	13.7	$12.8_{f,g}$	$16.7_{j,k}$	8.7	$8.7_{q,r}$	5.5	5.0	71.2_{γ}
Black or African American†	11.5	9.7_{g}	11.0_{k}	7.7	5.2_{r}	3.8	3.3_{α}	52.2
Other or multiple†	19.3	13.0	18.4	13.9	13.0	6.4	$13.5_{z,\alpha}$	97.5
Living situation past 3 months								
In own home	10.6_{b}	9.5	10.5	6.6	4.7_{s}	3.4_{w}	3.1	48.4_{δ}
In temporary housing	14.4	11.6	14.1	9.2	8.0	6.1	5.3	68.8
In someone else's home	11.8	11.0	14.9	6.3	5.5	3.5	2.7	55.7
In drug treatment facility	14.0	10.5	16.3	10.7	8.5	4.2	4.5	68.7
On the street	10.5	7.5	8.0	9.0	4.7	1.4	0.6	41.7
Jail, prison, other institutional setting	21.4_{b}	15.5	23.4	14.5	15.3_{s}	12.4_{w}	9.9	112.4_{δ}
Cigarette smoking								
Current	$16.5_{c,d}$	$14.1_{h,i}$	$18.5_{l,m}$	$12.3_{o,p}$	$13.2_{t,u}$	6.8_{x}	5.2	84.9_{ε}
Former	11.8_{c}	10.0_{h}	11.6_{l}	7.4_{o}	9.2_{t}	4.0	3.7	54.2_{ζ}
Never	9.9_{d}	9.0_{i}	10.6_{m}	5.9_{p}	8.1_{u}	3.1_{x}	2.6	$45.3_{\varepsilon,\zeta}$

* Incorporates suggested item weights (12).

† Not of Hispanic/Latino origin.

Categories with the same subscript letter differ significantly ($P < 0.05$), Tukey–Kramer method for multiple pairwise comparisons, all main effects of the variables in this table included in ANOVA models, SAS Software Version 9.2, Generalized Linear Model Procedure.

FL, Functional limitation; P1, Physical pain; P2, Psychological discomfort; D1, Physical disability; D2, Psychological disability; D3, Social disability; H, Handicap, OHIP, Oral Health Impact Profile; HIV, human immunodeficiency virus; ANOVA, analysis of variance.

very often or fairly often within the 4 weeks preceding their baseline interview, with a mean of nearly six different oral health impacts experienced at that frequency. The available data suggest that the prevalence of oral impacts is much higher in this HIV-positive study population than in the general population. The 2003-2004 cycle of the National Health and Nutrition Examination Survey (NHANES), conducted among a representative sample of the non-institutionalized civilian US population, included seven items from the OHIP and found a prevalence of 15.3 percent of adults reporting an impact very often or fairly often during the preceding year (15). The prevalence estimate for the general Australian population in that study was nearly the same based on those same seven items (15.7 percent) or on OHIP-14 (16.5 percent), suggesting the seven-item NHANES estimate was probably a good approximation of what would have been found had the OHIP-14 been used in the US survey. For purpose of comparison, the prevalence estimate for having at least one oral health impact within the preceding 4 weeks in the present study, based on the 14 items included in the OHIP-14 (16), was 41.9 percent (39.7 percent among men and 47.4 percent among women) – far higher than the available prevalence estimate for past-year impact in the general US adult population.

Table 3 Least Square Means of Normalized Overall OHIP Score for Variables in the Final Generalized Linear Model

Predictor variable	*P*-value for type III sum of squares	Least square mean
Sex by race/ethnicity interaction	0.0004	
Female, Black/African–American		1.15
Female, Hispanic		1.59
Female, White non-Hispanic		$6.08_{a,b,c}$
Female, other/multiple		–4.69
Male, Black/African–American		0.52_{a}
Male, Hispanic		-0.34_{b}
Male, White non-Hispanic		0.69_{c}
Male, other/multiple		7.01
Smoking status	0.0012	
Current		$3.73_{d,e}$
Former		0.95_{d}
Never		-0.17_{e}

Categories with the same subscript letter differ significantly ($P < 0.05$), Tukey–Kramer method for multiple pairwise comparisons, SAS Software Version 9.2, Generalized Linear Model Procedure.

Model R-square = 0.068.

Based on findings from this study, clinical indicators of HIV disease status were not associated with oral health-related quality of life, as measured by the OHIP-49. Neither duration of infection, CD4 counts, nor viral loads were associated with overall OHIP scores or any of its subscales. In

contrast, sex, race/ethnicity, and living situation were independently associated with OHIP. Smoking status was the strongest correlate of OHIP among people living with HIV in the present study. These findings suggest that the duration or severity of HIV disease, per se, may not be directly associated with oral health-related quality of life during this era of HAART. However, cigarette smoking may be either an independent risk factor for reduced oral health-related quality of life or may serve as a marker for an underlying but unidentified factor.

There are few prior studies of oral health-related quality of life among people living with HIV. The earliest of those, conducted in Australia in the early 1990s, administered the same 49-item OHIP as was used in the present study (17). In that study, the prevalence of each oral health impact was about three to eight times higher among dental patients with HIV than among an age-matched sample of adults from the general population. However, we are unable to compare our findings with that study because of differences in data collection and reporting. To allow comparison with more limited data on quality of life collected as part of a telephone survey of the general population of Adelaide, Coates et al. reported prevalence estimates for just six individual items in the OHIP. In addition, that study reported the proportion of participants that experienced each of the six impacts either occasionally, fairly often, or very often with the preceding year, whereas the present study used a 4-week time frame. The present study intentionally used a time frame of the preceding 4 weeks rather than the preceding 6 or 12 months for two main reasons: a) respondents' recall generally is more accurate for shorter, more recent time frames than for longer, more distant time frames (18,19) and b) these data were collected in the context of an intervention study that sought to increase appropriate and periodic use of dental services, with the intention of examining changes in oral health-related quality of life and other outcome measures at 6-month intervals over the course of 18 months. A longer reference period would reduce the ability to detect changes over time.

The HIV Cost and Services Utilization Study (HCSUS), a national study of the cost, use, and health outcomes of HIV care for US medical patients, also included measures of oral health-related quality of life (20). That study administered a seven-item modified version of the Geriatric Oral Health Assessment Index (21) at one of the rounds of participant follow-up and found statistically significant cross-sectional differences in index scores between subgroups defined by various demographic and risk exposure characteristics. However, most differences were small and generally clustered around the overall mean of 50.0, on an index scale that ranged from 7 to 60 in which higher scores indicated more favorable oral health status. Similar to the present study, Coulter et al. (20) found no significant differences between oral health-related quality of life scores and CD4 cell counts.

The Women's Interagency HIV Study (WIHS), a recent 5.5-year prospective cohort study, administered a 14-item version of the OHIP among a cohort of 597 HIV-positive and 92 HIV-negative women (22). At baseline and throughout the study, HIV-infected women consistently had higher OHIP-14 scores (i.e., poorer oral health-related quality of life) than HIV-negative women. In multivariate analysis that included a number of sociodemographic, clinical, and behavioral variables, HIV status was not a significant correlate of OHIP-14 scores. Consistent with the present study, Mulligan et al. found no independent association between HIV viral load and OHIP-14 scores, but after controlling for viral load, an increase in CD4 cell counts by 1 percent was associated with a 2 percent reduction in OHIP-14 scores, implying a better oral health-related quality of life. Also consistent with the present study, the WIHS found a significant association between cigarette smoking and OHIP-14 scores, independent of HIV status.

The sociodemographic characteristics of the participants in the present study are fairly similar those in other US studies of health service utilization of persons living with HIV. For example, HIV-positive patients in a study of health service utilization conducted at 11 sites across the United States had a nearly identical sex, age, and ethnic distribution compared with participants in the present study: 71 percent were male, 73 percent were aged 31-49 years, and more than 70 percent were Black or Hispanic (23). Similarly, participants in a study conducted in an HIV outpatient clinic in St. Louis, Missouri, were socioeconomically comparable with participants in the present study (24).

Cigarette smoking has major negative effects on a wide range of diseases and conditions, including many oral diseases (25). Smoking appears to interact with immunosuppression to increase the risk for symptomatic HIV-related oral conditions such as oral candidiasis (26-29). Therefore, the higher OHIP scores among current smokers than among former or never smokers may reflect direct adverse impacts of smoking on oral pathology. Conversely, many mental health conditions are far more prevalent among smokers than among non-smokers, including depression and bipolar disorder (30-32). It is possible that smoking may be a marker for underlying mental states that are associated with reduced quality of life, including oral health-related quality of life (33). Future studies should explore the temporal relation and mechanisms for the association between smoking and oral health-related quality of life, for persons with HIV infection and those without.

In summary, this study suggests that oral health impacts are quite prevalent among adults in South Florida living with HIV. Those impacts on oral health-related quality of life among people living with HIV may be more pronounced among women and cigarette smokers.

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