Dental Caries Experience of Female Inmates

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Abstract

Objectives: *The purpose of this study was to determine the extent of dental caries and level of unmet dental need among female offenders in a federal prison in Connecticut.* ***Methods:*** *All inmates admitted into the Federal Correctional Institution at Danbury, Connecticut, from May 31, 1997, to May 21, 1998, were given oral screening examinations (n=500; age range=20–65 years). The data were analyzed in terms of race/ethnicity and age groupings. DMF and D/DF scores were determined.* ***Results:*** *The mean DMFT and DMFS scores were 16.8 and 57.0, respectively; the scores were higher for non-Hispanic whites and Hispanics than non-Hispanic blacks, and increased with age. The mean DT/DFT and DS/DFS scores were 36.8 percent and 36.0 percent, respectively. These scores were higher for non-Hispanic blacks than non-Hispanic whites and Hispanics, and decreased with age.* ***Conclusions:*** *Female prisoners had high levels of dental caries and racial disparities persisted in the prison. [J Public Health Dent 2002;62(1):57-61].*

Key Words: dental, dental caries, prison, survey, DMF index.

There are few studies on the occurrence of dental diseases within the prison population, and the majority of such studies have focused on state institutions. Previous surveys by Cunningham et al. (1) in a state prison in Iowa and Salive et al. (2) in a state prison in Maryland have suggested that while the male prison population does not show significant differences in DMFT scores relative to the nonprison population, there were differences in the individual components of the total caries scores. Inmates showed more missing and fewer filled teeth, and higher levels of unmet needs.

In a study of female inmates housed in a Maryland state prison, Shapiro et al. (3) reported DMFT scores that were higher than those reported in studies of male inmates in Iowa and Maryland state institutions (1,2). Moreover, Makrides found that female inmates in the federal prison system exhibited higher DMFT scores than the male inmates (4).

Oral health research conducted in prison populations typically has focused on male inmates (1,2,5-8). Although there are studies of female inmates in state institutions (3,9), there are no published reports of female inmates in federal institutions. Comparison of federal with state prison inmates is difficult because the sociodemographics and other characteristics of the two populations are different. In the state prison system, the population tends to be younger, the ratio of whites to blacks is lower, the nature of crimes different, and the length of sentences shorter (1,2,8,9). Studies of this subpopulation are important because the female population in federal prisons has been growing at a faster rate than its male counterpart.

The purpose of this survey is to assess the oral health of recently incarcerated females at the Federal Correctional Institution at Danbury, Connecticut. In particular, their oral health was assessed with respect to past and present coronal caries activity, with specific attention devoted to the level of unmet need.

Methods

The Federal Correctional Institution at Danbury houses approximately 1,200 female offenders. The majority of the inmates are classified as low security (70.6%) and minimum security (27.8%). Drug offenses account for the bulk of the crimes (65.6%), and the mean sentence length is 94 months.

All inmates admitted into the institution between the period May 31, 1997, and May 21, 1998, were included in the dental study. The inmates were examined for dental diseases by one dentist (CKH) in the dental clinic of the prison, using a mirror and explorer under ideal lighting conditions. Also, four intraoral bitewing radiographs were taken on each inmate as part of the examination, with the exception of the edentulous subjects. The dental examinations were completed within 14 days of arrival. The examiner was standardized to the Radike criteria for the visual and tactile diagnosis of dental decay (10); however, repeat examinations were not performed and intraexaminer reliability could not be calculated. Proximal decay was diagnosed radiographically and was defined as a radiolucency extending beyond the enamel into the dentin. All 32 teeth were included in the survey. Unless otherwise stated, the results of the study were based on the analysis of 32 teeth. Both primary and secondary caries were noted during data collection, but aggregated in the current analysis. Teeth and surfaces with a combination of decayed and filled surfaces were classified as decayed. Extracted teeth, whether replaced or not, were recorded as missing. Impacted teeth, as evident clinically and/or radiographically, were recorded as impacted.

The subjects were stratified into four racial/ethnic groups (non-Hispanic whites, non-Hispanic blacks, Hispanics, and Asians) and three age groups (18–29 years, 30–39 years, and

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40–65 years). The racial/ethnic groupings were broad, based on the institution records, which reflected the inmates' self-classifications. No distinction was made between white and black Hispanics.

The number of decayed, missing, filled, and impacted teeth and surfaces were determined. Past and present disease experience was analyzed in terms of the number of decayed, missing, and filled teeth (DMFT) and surfaces (DMFS). The level of unmet need was determined by the percent of decayed or filled teeth or tooth surfaces that were decayed (DT/DFT x 100% and DS/DFS x 100%).

The analysis was performed on a personal computer using SPSS statistical software (11). Means and their standard deviations for each of the components of the oral health indices were calculated. Means were compared by race/ethnicity and age groupings using analysis of variance. Adjustment for multiple comparisons was made using the Bonferroni procedure, which adjusts the overall significance level by the number of comparisons being made. The overall significance level was set at $P \leq .05$.

Results

Table 1 shows the distribution of the sample, the mean number of permanent teeth, and the percent female inmates who were dentate, by race/ethnicity and age. Of the 500 inmates, 22 percent were non-Hispanic white, 39 percent were non-Hispanic black, 37 percent were Hispanic, and 2 percent were Asian. The number of Asians was too small for meaningful analysis (n=9), and separate findings will not be provided for them. Twenty seven percent of the population were 18–29 years of age, 38 percent were 30–39 years of age, and 35 percent were 40–65 years of age. The mean age was 36.0 years and age did not differ significantly by race/ethnicity (data not shown).

There were 12 edentulous inmates in the sample, and 97.6 percent of the adults were dentate. The percentage of adults who were dentate was similar among the racial/ethnic groups and decreased with age. The overall mean for the number of permanent teeth present was 24.6, including third molars. When third molars were excluded, the means were strikingly similar across racial/ethnic groups, about 22.8 teeth.

Tables 2 and 3 show the sound, decayed, missing, filled, and impacted teeth and surfaces by race/ethnicity and age. The mean number of sound teeth and tooth surfaces were 15 and 102, respectively. Non-Hispanic blacks had the highest mean number of sound teeth and surfaces, and the mean number of sound teeth and surfaces decreased with age. Bonferroni multiple comparisons of the means for sound teeth revealed that non-Hispanic blacks differed significantly from non-Hispanic whites and His-

TABLE 1
Distribution of Subjects, Mean Number of Permanent Teeth, and Percentage of Dentates by Race/Ethnicity and Age (n=500)

		No. of Permanent Teeth (SD)		
	n (%)	Incl. 3rd Molars	Excl. 3rd Molars	% Dentate
Race/Ethnicity				
Non-Hisp. white	109 (21.8)	23.7 (6.8)	22.7 (6.4)	99.1
Non-Hisp. black	196 (39.2)	25.1 (7.0)	22.9 (6.2)	97.5
Hispanic	186 (37.2)	24.6 (7.2)	22.7 (6.5)	96.8
Age (years)				
18–29	136 (27.2)	28.9 (2.8)	26.5 (2.3)	100.0
30–39	190 (38.0)	25.7 (5.1)	23.7 (4.6)	98.9
40–65	174 (34.8)	20.2 (8.5)	18.9 (7.9)	94.3
Total*	500 (100)	24.6 (7.0)	22.8 (6.3)	97.6

*Includes 9 Asians.

TABLE 2
Mean Number of Sound, Decayed, Missing, Filled, and Impacted Teeth by Race/Ethnicity and Age (n=500)*

	Sound (SD)	Decayed (SD)	Missing (SD)	Filled (SD)	Impacted (SD)
Race/ethnicity					
Non-Hisp. white	13.9 (6.7)	3.3 (3.7)	8.3 (6.8)	6.4 (4.8)	0.1 (0.4)
Non-Hisp. black	16.3 (7.3)	4.3 (3.7)	6.9 (7.0)	4.3 (4.3)	0.2 (0.7)
Hispanic	14.1 (7.0)	2.9 (3.2)	7.4 (7.2)	7.4 (5.7)	0.2 (0.7)
P-value for ANOVA	.002	.0006	.3	.0001	.4
Age (years)					
18–29	19.0 (5.8)	4.4 (4.5)	3.1 (2.8)	5.0 (4.4)	0.6 (1.0)
30–39	15.9 (6.1)	3.7 (3.4)	6.3 (5.1)	6.0 (4.8)	0.1 (0.3)
40–65	10.9 (7.0)	2.5 (2.7)	11.8 (8.5)	6.7 (5.9)	0.0 (0.2)
P-value for ANOVA	<.0001	<.0001	<.0001	.01	<.0001
Total†	15.0 (7.1)	3.5 (3.6)	7.4 (7.0)	6.0 (5.2)	0.2 (0.6)

*Includes third molars.
†Includes 9 Asians.

TABLE 3
Mean Number of Sound, Decayed, Missing, Filled, and Impacted Tooth Surfaces by Race/Ethnicity and Age (*n*=500)*

	Sound (SD)	Decayed (SD)	Missing (SD)	Filled (SD)	Impacted (SD)
Race/ethnicity					
Non-Hisp. white	96.0 (34.4)	6.9 (9.1)	41.5 (33.8)	15.0 (14.3)	0.6 (1.8)
Non-Hisp. black	107.6 (35.1)	8.2 (9.9)	34.3 (35.0)	8.7 (9.7)	1.1 (3.4)
Hispanic	98.8 (36.9)	6.6 (9.7)	37.1 (36.2)	16.3 (15.9)	1.1 (3.4)
P-value for ANOVA	.01	.2	.3	<.0001	.4
Age (years)					
18–29	123.7 (20.0)	8.5 (11.8)	15.4 (13.8)	9.4 (9.2)	3.0 (5.1)
30–39	108.4 (28.3)	7.6 (9.1)	31.7 (25.4)	12.0 (11.4)	0.3 (1.6)
40–65	78.0 (39.1)	5.9 (7.9)	59.0 (42.5)	16.8 (17.6)	0.2 (1.1)
P-value for ANOVA	<.0001	.05	<.0001	<.0001	<.0001
Total†	102.0 (35.8)	7.3 (9.6)	36.8 (35.1)	13.0 (13.7)	1.0 (3.1)

*Includes third molars.
†Includes 9 Asians.

panics while the comparisons for sound surfaces revealed that non-Hispanic blacks differed significantly from non-Hispanic whites only. Differences across all age groups were statistically significant.

Seventy-eight percent of the persons in the sample had one or more untreated decayed teeth (data not shown). The overall means for decayed teeth and surfaces were 3.5 and 7.3, respectively. Non-Hispanic blacks had the highest mean for decayed teeth, compared to non-Hispanic whites and Hispanics. However, there were no significant differences among racial/ethnic groups for decayed surfaces. The number of decayed teeth and surfaces decreased with age. Bonferroni comparisons of the means for decayed teeth revealed that non-Hispanic blacks differed significantly from Hispanics. Female inmates aged 40–65 years had significantly fewer decayed teeth than women in the other age groups, and significantly fewer decayed surfaces than those aged 18–29 years.

Ninety-three percent of the persons in the sample had one or more missing teeth; however, this fell to 78 percent when third molars were excluded from analysis (data not shown). The overall means for missing teeth and surfaces were 7.4 and 36.8, respectively. Racial/ethnic differences were not significant. As expected, the number of missing teeth increased with age. Bonferroni comparisons of the means for missing teeth and surfaces revealed statistically significant differences across all age groups.

TABLE 4
Mean DMFT, DMFS, DT/DFT, and DS/DFS, by Race/Ethnicity and Age (*n*=500)*

	DMFT (SD)	DMFS (SD)	%DT/DFT	%DS/DFS
Race/ethnicity				
Non-Hisp. white	18.0 (6.7)	63.4 (34.8)	34.0	31.5
Non-Hisp. black	15.4 (7.4)	51.2 (35.8)	50.0	48.5
Hispanic	17.7 (7.1)	60.0 (37.6)	28.2	28.8
P-value for ANOVA	.001	.01		
Age (years)				
18–29	12.4 (5.9)	33.3 (20.5)	46.8	47.5
30–30	16.0 (6.2)	51.3 (28.5)	38.1	38.8
40–65	21.1 (7.0)	81.7 (39.2)	27.2	26.0
P-value for ANOVA	<.0001	<.0001		
Total†	16.8 (7.3)	57.0 (36.5)	36.8	36.0

*Includes third molars.
†Includes 9 Asians.

Eighty-three percent of the persons in the sample had one or more filled teeth (data not shown). The overall means for filled teeth and surfaces were 6.0 and 13.0, respectively. Hispanics had the highest mean number of filled teeth and surfaces, followed by non-Hispanic whites and non-Hispanic blacks. The number of filled teeth and surfaces increased with age. Bonferroni comparisons revealed that non-Hispanic blacks had significantly lower means for filled teeth and surfaces than non-Hispanic whites and Hispanics. The 40–65-year-olds had a significantly higher mean number of filled teeth than did the 18–29-year-olds, and a significantly higher mean number of filled surfaces than the other age groups.

Twelve percent of the sample had one or more impacted teeth (data not shown). The means for impacted teeth and surfaces were 0.2 and 1.0, respectively. Racial/ethnic differences were not statistically significant. As expected, the mean number of impacted teeth and surfaces decreased with age. Bonferroni comparisons revealed that the 18–29-year-olds had significantly higher mean numbers of impacted teeth and tooth surfaces than the other age groups.

Table 4 shows the means for DMFT and DMFS scores and the DT/DFT and DS/DFS percentages among the racial/ethnic and age groups. Nearly all (99.6%) of the subjects had one or more decayed, missing, or filled teeth (data not shown). The means for

DMFT and DMFS were 16.8 and 57.0, respectively. As expected, mean DMFT and DMFS increased with age. Bonferroni comparisons revealed that non-Hispanic blacks had a significantly lower mean DMFT than non-Hispanic whites or Hispanics, and a signficantly lower mean DMFS than non-Hispanic whites. Mean DMFT and DMFS differed statistically among all age groups.

The level of unmet need as determined by DT/DFT and DS/DFS (overall, 36.8 and 36.0%, respectively) was highest among non-Hispanic blacks. DT/DFT and DS/DFS percentages were highest among the youngest age group and decreased with age.

Discussion

The prison population is a unique and challenging one with many health problems, including poor oral health. Dental diseases can reach epidemic proportions in the prison setting. Non-Hispanic blacks had the highest mean number of sound teeth, while non-Hispanic whites the lowest. This finding is consistent with other studies of the prison and general population (2,8,9,12).

Seventy-eight percent of the inmates had untreated decayed teeth, a significant level of unmet need and a distinguishing feature of the general prison population (1,2,9). Non-Hispanic blacks and whites did not differ significantly in this respect. However, the mean number of decayed teeth among non-Hispanic blacks exceeded that of Hispanics and is similar to the trend observed by Badner et al. in their study of the female inmate population at Rickers Island Correctional Facility (9). The youngest age group had the greatest percentage of untreated coronal caries; almost half of the caries was untreated among the 18–29-year-olds, while less than one-third of the caries was untreated among the 40–65-year-olds.

Racial/ethnic differences in the number of missing teeth were not statistically significant. There was a continuous and marked increase in the number of missing teeth with age, almost quadrupling from the youngest to the oldest age group.

In terms of filled teeth, Hispanics had the highest mean and non-Hispanic blacks the lowest, with non-Hispanic whites closely related to the former. The higher number of filled teeth among non-Hispanic whites relative to blacks is similar to the trends observed by Badner et al. (9) and Mixon et al. (8). At first glance, it is encouraging that the mean number of decayed teeth was 43 percent lower among those aged 40–65 years compared to those aged 18–29 years (2.5 vs. 4.4). Similar comparisons by age group, however, revealed that while the mean number of filled teeth was 34 percent higher in the oldest, relative to the youngest, age group (6.7 vs 5.0), the mean number of missing teeth was 280 percent higher in the oldest age group (11.8 vs 3.1). These findings suggest that in this population, a large proportion of decayed teeth are ultimately extracted.

The DMFT index projects the extent of past and present dental disease. The mean DMFT score of 16.8 in our study is similar to the DMFT score of female inmates obtained in Makrides' study (4). In that survey of 29 federal prisons, data were collected on 2,070 inmates, both male and female, from March 1994 through May 1994. Makrides reported a DMFT score of 16.0 among female and 13.1 among male inmates. Based upon DMFT scores, more than 50 percent of the teeth had received or needed dental treatment. Non-Hispanic whites had significantly higher DMF scores than non-Hispanic blacks, a finding consistent with other prison-based studies (2,8). However, as demonstrated by our results, one must analyze the individual components of the composite DMF scores to best assess oral health status. With advancing age, the number of permanent teeth decreased and the DMFT scores increased, such that by age 40–65 years, nearly one-half of the remaining teeth had or needed treatment.

When interpreting our findings or comparing them to past or future studies, a number of factors should be considered. First, given the heterogeneity within the prison population in terms of sociodemographic, cultural, and geographic background, diversities persist within the racial/ethnic and age strata as presented in this study, and no doubt vary by prison.

Second, while some studies differentiate non-Hispanic whites and blacks from Hispanics, other studies only differentiate between whites and blacks, and Hispanics are not treated as a distinct and separate group. In this study, race/ethnicity is based on institutional records reflecting the inmates' own classifications. Thus, comparisons of findings among studies should be made with caution.

Third, the criteria used to diagnose dental caries were not entirely consistent with those used in previous surveys. For example, in the current study, radiographs were used to diagnose proximal caries in addition to visual and tactile methods. Other surveys, however, are based on visual and tactile criteria only. It is intuitively obvious that surveys not using radiographs will tend to underestimate caries. Additionally, not all studies included all 32 teeth.

Fourth, while there is no concern with interexaminer reliability because all the examinations were performed by one clinician, repeat examinations were not carried out and intraexaminer reliability could not be assessed. However, the examiner was standardized to the Radike criteria and there were radiographic guidelines for caries assessment. Given the stringency of Radike and radiographic criteria for caries, there probably is still an underestimation of the level of decay in this population.

Fifth, the data for age comparisons are cross-sectional in nature, as opposed to longitudinal, and differences across age strata may result, in part, from cohort effects.

Finally, while DMF scores were used as indices of oral health, the indices have their limitations. In the aggregate forms, they do not differentiate between treated and untreated dental diseases. Therefore, the individual components of the DMF scores should be considered along with the total scores. Also, the missing (M) component of the total score is a composite of extractions due to any number of causes, including caries, periodontal diseases, impaction, trauma, and orthodontic treatment.

In summary, at the time of this survey, the female inmate population located at the Danbury federal prison had high levels of dental disease as measured by the DMF scores. The mean DMFT and DMFS scores were 16.8 and 57.0, respectively. The mean DMFT scores ranged from 15.4 for non-Hispanic blacks to 18.0 for non-Hispanic whites. However, more telling of the extent of untreated disease were the DT/DFT and DS/DFS scores with means of 36.8 percent and 36.0

percent, respectively. The mean DT/DFT, which ranged from 28.2 percent to 50.0 percent by race, not only illustrates the high level of unmet need, but also the disparity within the prison population. The level of unmet need may reflect barriers to care prior to their incarceration. However, it can only be speculated at this point as to whether the barriers were related to physical, financial, or cultural obstacles. Additionally, the problem could be compounded by personal behavior, attitude, and knowledge in seeking and maintaining oral health.

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