Counseling on Early Childhood Caries transmission by dentists

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Abstract

Objective: High levels of *Streptococcus mutans* on teeth of young children are predictive of Early Childhood Caries (ECC). Transmission from mother-to-child is common and studies have demonstrated treatment of the mother results in less ECC. The objective of this study was to determine how dentists have adopted the practice of counseling about ECC.
Methods: In 2006 as part of a larger study on dental care for pregnant women, we surveyed 829 general dentists in Oregon. The questionnaire contained questions to capture the extent to which general dentists have adopted counseling pregnant women about ECC transmission, to describe personal and practice characteristics, and examine how dentists' views on the ease of adopting of new procedures related to ECC counseling. Multivariate logistic regression was used to identify separate and additive effects of demographic and practice characteristics, attitudes, and beliefs.
Results: The adjusted odds of a dentist who strongly believed in the link between mothers and babies and provided ECC counseling were 1.60 (95% CI 1.3-2.0, $P < 0.01$). The odds of a dentist who reported discussing ECC with staff members and provided counseling were 2.7 (95% CI 1.7-4.3, $P < 0.01$). Male dentists were less likely to counsel patients than female dentists (Adjusted OR = 0.5, 95% CI 0.3-1.0, $p < 0.05$).
Conclusions: The strongest predictors of counseling patients about ECC were dentists' belief in the evidence of caries transmission and dentists' discussion of ECC during staff meetings.

Introduction

Plaque and salivary *Streptococcus mutans* concentrations in very young children are strongly predictive of Early Childhood Caries. The earlier in life a child becomes colonized the more severe the dental caries, although the ecology is complex and diet plays a major role (1,2). Even the earliest white spots can have high *S. mutans* concentrations. Children often receive bacteria from their mother (vertical transmission) or from another child (horizontal transmission) (3-5). In very young children, transmission from mother to child is the most common transmission mode, and several studies have demonstrated that counseling and dental treatment of the mother to prevent or postpone infection of the child results in reduced tooth decay in the child (6-8). In one public health report from one county in the State of Oregon, children in a county where the health department was conducting a program to counsel low-income pregnant women and refer them to dental care were about 1.5 times less likely to have tooth decay at 2 years of age than similar children in comparison counties (9). Moreover, low-income children of mothers who have a regular source of dental care are more likely to receive dental care themselves (10). A study of the use of specific services and treatments to control caries in adult patients identified a pattern in which many dentists adopted regular use of these new practices only after observing these changes in the practices of dental leaders (11). Thus while vertical transmission has been recognized for some time, it is

unclear whether general dentists have applied this information in patient care for pregnant women and mothers of young children, ultimately to benefit their oral health.

In this paper, we report the extent to which general dentists have adopted the practice of counseling pregnant women about the Early Childhood Caries (ECC) transmission from mother to child, describe personal and practice characteristics of dentists who routinely provide this service, and examine how dentists' views on the ease of adopting of new procedures relates to their ECC counseling practices. This research is part of a larger study on dental care for pregnant women (12).

Methods

Survey population, materials, and methods

The Tailored Design Method was used in a cross-sectional survey of general dentists in the State of Oregon (13). The Tailored Design Method is an evidence-based approach to maximize response rates and avoid non-response error in survey research. Specific procedures include including a stamped return envelope, varied contacts with recipients, providing a financial incentive in the same mailings as the survey itself, and personalizing correspondence. Questionnaires were mailed in December 2006 to all 1,604 individuals identified through the master file of the American Dental Association as general dentists. We restricted the mailing to practitioners in solo or partnership practices, associates in incorporated or unincorporated practices, or employees in state or government-run clinics. There were two mailed follow-ups.

The survey contained a total of 54 questions developed by the study team or drawn from previous studies (11,14,15). Specific questions requested demographic information about the dentists and their patients and assessed dentists' attitudes, beliefs, and practices regarding providing counseling to pregnant patients about ECC transmission from mother to child. We asked also about practice ownership, professional training and experience, recent continuing dental education (CDE) and the dentist's feelings about trying new procedures in their practice of dentistry. The questionnaire is available for downloading from the website of the Northwest Center to Reduce Oral Health Disparities at http://depts.washington.edu/nacrohd/OR_Provider_Survey. The Institutional Review Board of the University of Washington approved the study; the elements of informed consent were contained in the cover letter.

Analysis

SAS (Version 9.2, SAS Institute Inc., Cary, NC, USA) was used to conduct statistical analyses. The primary outcome of interest was the percentage of pregnant patients reported by dentists to have ever received counseling about caries transmission from mother to child. We dichotomized this variable to create two groups based on professional recommendations in the literature (16): one group of dentists who reported they counseled at least half of their pregnant patients, and a second group who reported they counseled less than half of their pregnant patients. Descriptive statistics were used to describe the sample, and bivariate analyses (chi-square and *t*-tests) were used to determine whether the provision of ECC counseling practices was related to dentist characteristics, practice characteristics, dentists' beliefs and attitudes, or their willingness to try new procedures. Multivariate logistic regression analysis was conducted to identify the separate and additive effects of demographic and practice characteristics, attitudes, and beliefs on ECC counseling (i.e., counseling 50% or more of their pregnant patients about ECC transmission versus counseling fewer patients). In the first phase of the analyses, models were run with the dentist and practice characteristics that showed an association with ECC counseling in the bivariate analysis at least at a 0.2 significance level, separately and together. Next, each of the beliefs was added to a model that included the dentist and practice characteristics. A final model was fitted that contained dentist and practice characteristics and all dentist beliefs. To be sure that dichotomizing the primary outcome measure did not result in bias, we assessed the same models using the General Estimating Equations method of linear regression.

Several exceptions to the inclusion of dental and practice characteristics were necessary due to high collinearity between several of the characteristics. Specifically, dentist's age at time of survey and years since receiving dental degree were not included in the multivariate models because these variables correlated highly with the number of years in practice. Similarly, the number of dentists and number of chair side assistants in the practice were excluded from the models because these variables were highly correlated with the number of hygienist in the practice. Finally, whether or not the practice accepted capitation payments was not included in the models because it was highly correlated with the percent of patients covered by Medicaid.

Results

Survey respondents and characteristics of their dental practices

The completion rate among eligible participants was 55.2% (829 individuals). The current study focused on 748 who answered the question of interest. There were no systematic differences between respondents and non-respondents in age or years since graduation from dental school. About 77 percent of the respondents graduated from the single dental

school in Oregon, located in Portland. Table 1 gives the personal and practice characteristics of the respondents.

Counseling patients about maternal transmission of ECC

Nearly one-third (31%) of respondents reported they provide counseling on maternal ECC transmission to all their pregnant patients, 29 percent reported they provide it to 50 to 99 percent, 16 percent reported they provide it to 1 to 49% and 24 percent reported they provide no counseling on ECC to their pregnant patients.

Tables 2 and 3 indicate the characteristics of dentists who provide counseling to a majority of their pregnant patients versus those who do not. Dentists who provide counseling to a majority of their pregnant patients were more likely to be female, graduated more recently from dental school or be an associate or employee in a practice with a greater number of dentists and assistants that has a greater proportion of Medicaid and capitation-insured patients. Such dentists have a greater proportion of their female patients who are in their childbearing years. A greater proportion of dentists who provide ECC to a majority of their pregnant patients report holding staff meetings regularly, discussing ECC transmission at staff meetings, providing pamphlets about brochures in the waiting room about ECC, and completing CDE that includes ECC. These dentists more strongly agreed with the evidence for ECC transmission and are more likely to believe it is worth their time to counsel pregnant patients.

Differences in trying new procedures

We asked the dentists to indicate their feelings about trying new procedures in their practice. Overall, 75 percent identified themselves as preferring to wait until others have tried the procedures or wait until they have been established for a while; 17 percent said they enjoyed experimenting with new procedures. Those who described themselves as preferring to wait to adopt new procedures were also less likely to report they counseled the majority of their pregnant patients regarding ECC transmission (71% versus 81%, $P = 0.003$). Dentists who offered counseling to a majority of their patients were more likely to provide oral hygiene instruction to their pregnant patients "often" (90% versus 79% for those offering counseling to less than half their pregnant patients, $P < 0.001$).

The dentists were asked to rate how easy it was for them to incorporate new procedures into the practice (5-point scale where 1 = strongly agree and 5 = strongly disagree). The mean response was a score of 2.1 (SD = 0.95) indicating that most thought it was relatively easy to incorporate new procedures. On the other hand, only one-third of all respondents

Table 1 Dentist and Dental Practice Characteristics of Survey Respondents (n = 748)

	No.* (%) or mean ± SD
Sociodemographics	
Age (years)	46.4 ± 11.9
Sex	
Male	601 (82.1)
Female	131 (17.9)
Years since receipt of dental degree (DMD or DDS)	18.6 ± 12.2
Employment setting	
Sole proprietor	318 (44.1)
Shareholder owner in incorporated dental practice	138 (19.1)
Associate in incorporated dental practice	110 (15.3)
Other (such as an employee)	154 (21.4)
Personal net income (2006 dollars)	
≤$200,000	464 (68.9)
$200,001-$400,000	164 (24.3)
>400,001	46 (6.8)
Effort	
Hours worked chair side per week	31.0 ± 7.6
Weeks worked per year	45.9 ± 8.1
Dental practice characteristics	
Personnel	
Number of dentists other than respondent	2.3 ± 9.1
Dental hygienists	2.6 ± 7.4
Dental assistants	4.0 ± 11.2
Number of operatories available for restorative services	3.9 ± 10.1
Patients seen by respondent per week	52.0 ± 30.1
Pregnant patients seen by respondent per month	2.8 ± 4.3
Percentage of all patients with private dental insurance	61.7 ± 23.5
Respondent accepts capitation fees (yes)	155 (23.2)
Percentage of patients with Medicaid dental insurance	10.9 ± 22.33
Percentage of Medicaid patients on capitation	29.7 ± 35.7
Capitation improves financial stability (1-5; 5 = strongly disagree)	3.9 ± 1.1
Age distribution of patients seen by respondent (%)	
<20 years	26 ± 16
20-44 years	42 ± 15
≥45 years	34 ± 17
Average patient wait in reception (1 ≤ 5 minutes; 2 = 5-15 minutes; 3 = 16-30 minutes; 4 ≥ 30 minutes)	1.4 ± 0.5
<5 minutes	431 (60.5)
5-15 minutes	267 (37.5)
16-30 minutes	13 (1.8)
>30 minutes	1 (0.1)
Typical lead time to schedule new patient exam (1 = 1-2 days; 2 = 3-7 days; 3 = 1-2 weeks; 4 ≥2 weeks)	2.8 ± 1.0
1 or 2 days	69 (9.7)
3 days to a week	227 (31.8)
1 or 2 weeks	230 (32.3)
More than 2 weeks	187 (26.2)

* For some variables, the number of respondents does not sum to 748 because of missing data.

Table 2 Personal and Practice Characteristics of Dentist Respondents Who Provide ECC Counseling to a Majority of Pregnant Patients and Those Who Do Not (n = 748)

	No.* (%) or mean ± SD		
	Counsels <50% n = 297	Counsels ≥50% n = 451	P value
Sociodemographics			
Age (years)	47.4 ± 11.5	45.7 ± 12.05	0.068
Sex			<0.001
Male	257 (88.9)	344 (77.7)	
Female	32 (11.1)	99 (22.4)	
Years since receipt of dental degree	20.3 ± 12.0	17.5 ± 12.3	0.002
Employment setting			0.002
Sole proprietor	149 (51.9)	169 (39.4)	
Shareholder owner in incorporated dental practice	54 (18.8)	84 (19.6)	
Associate in incorporated dental practice	30 (10.5)	80 (18.6)	
Other (such an employee)	54 (18.8)	96 (22.4)	
Personal net income (2006 dollars)			0.520
≤$200,000	179 (66.5)	285 (70.4)	
$200,001-$400,000	69 (25.7)	95 (23.5)	
>400,001	21 (7.8)	25 (6.1)	
Effort			
Hours worked chair side per week	30.6 ± 7.8	31.2 ± 7.5	0.302
Weeks worked per year	46.2 ± 6.6	45.8 ± 8.9	0.538
Dental practice characteristics			
Personnel			
Number of dentists other than respondent	1.3 ± 1.9	3.0 ± 11.6	0.022
Dental hygienists	2.0 ± 1.7	3.0 ± 9.5	0.062
Dental assistants	2.8 ± 3.2	4.8 ± 14.2	0.017
Number of operatories available for restorative services	3.1 ± 1.7	4.4 ± 12.9	0.070
Patients seen by respondent per week	53.2 ± 30.8	51.1 ± 29.6	0.358
Pregnant patients seen by respondent per month	2.4 ± 3.0	3.0 ± 5.1	0.066
Percentage of all patients with private dental insurance	62.8 ± 21.9	60.9 ± 24.5	0.305
Respondent accepts capitation fees (yes)	44 (28.4)	111 (71.6)	<0.001
Percentage of patients with Medicaid dental insurance	7.9 ± 18.8	13.1 ± 24.4	0.006
Percentage of Medicaid patients on capitation	22.4 ± 31.4	33.5 ± 37.3	0.049
Capitation improves stability (1-5, 5 = strongly disagree)	4.0 ± 1.1	3.8 1.1	0.023
Age distribution of patients seen by respondent (%)			
<20 years	24 ± 14	27 ± 17	0.011
20-44 years	43 ± 14	41 ± 16	0.054
≥45 years	35 ± 16	33 ± 17	0.120
Average patient wait in reception	1.5 ± 0.6	1.4 ± (0.5)	0.129
<5 minutes	165 (57.5)	266 (62.6)	0.355
5-15 minutes	115 (40.1)	152 (35.8)	
16-30 minutes	6 (2.1)	7 (1.6)	
>30 minutes	1 (0.3)	0 (0.0)	
Typical lead time to schedule new patient exam	2.7 ± 1.0	2.8 (0.9)	0.107
1 or 2 days	32 (11.1)	37 (8.7)	0.450
3 days to a week	96 (33.3)	131 (30.8)	
1 or 2 weeks	92 (31.9)	138 (32.5)	
More than 2 weeks	68 (23.6)	119 (28.0)	

* For some variables, the number of respondents does not sum to 748 because of missing data.

had adopted digital X-ray technology, and there was no difference in the rating of ease to incorporate new procedures among dentists who had or had not incorporated the digital technology in the office.

Multivariate model

Table 4 provides the results of the final multivariate logistic regression model. The point estimates can be interpreted as

Table 3 Education, Beliefs and Practices Regarding ECC Counseling and Attitudes toward Trying New Procedures among Dentists Who Provide ECC Counseling to a Majority of Pregnant Patients and Those Who Do Not (n = 748)

	No.* (%) or mean ± SD		
	Counsels <50% n = 297	Counsels ≥50% n = 451	P value
Continuing dental education and ECC			
Number of CDE courses in the last 2 years	15.8 ± 20.5	18.8 ± 23.1	0.076
CDE on ECC in the last year (yes)	85 (30.7)	227 (54.3)	<0.001
Dental practice characteristics and ECC			
Holds regular staff meetings (yes)	147 (50.2)	279 (62.8)	<0.001
ECC discussed with staff or colleagues (yes)	80 (29.0)	255 (58.8)	<0.001
Dentist's beliefs about ECC counseling			
Evidence for ECC transmission is tenuous (1-5; 5 = strongly disagree)	3.5 ± 1.1	4.2 ± 0.9	<0.001
It's worth my time to counsel patients on ECC (1-5; 1 = strongly agree)	2.1 ± 1.0	1.6 ± 0.9	<0.001
Patient education materials about ECC			
ECC brochures are available in waiting room (yes)	76 (25.6)	151 (33.5)	0.022
ECC brochures are given directly to patient (yes)	92 (31.0)	229 (50.8)	<0.001

* For some variables, the number of respondents does not sum to 748 because of missing data.

Table 4 Dentist and Practice Characteristics Associated with Dentists Counseling 50% or More of Their Pregnant Patients on Mother-to-Child Early Childhood Caries Disease Transmission: Logistic Regression Odds Ratios

	Point estimate (95% Wald confidence limits)	
Variable	Model 1	Model 2
Sex (0 = female; 1 = male)	0.4 (0.3-0.8)**	0.5 (0.3-1.0)*
Years providing dental services	1.0 (1.0-1.0)	1.0 (1.0-1.0)
Employment setting (1 = sole proprietor, partner or shareholder/owner; 0 = anything else)	1.0 (0.6-1.5)	0.9 (0.5-1.6)
Number of hygienists	1.2 (1.0-1.3)	1.1 (0.9-1.3)
Number of operatories	1.1 (1.0-1.3)	1.2 (1.0-1.4)
Percentage of patients with Medicaid: 1-10%†	1.0 (0.6-1.6)	0.9 (0.5-1.6)
Percentage of patients with Medicaid: >10%*	1.5 (0.8-2.9)	1.1 (0.5-2.3)
Capitation improves financial stability (1-5; 5 = strongly disagree)	0.9 (0.8-1.1)	0.9 (0.7-1.1)
Percentage of patients younger than 15	1.0 (1.0-1.0)	1.0 (1.0-1.0)
Number of continuing dental education (CDE) courses (last 2 years)	1.0 (1.0-1.0)	1.0 (1.0-1.0)
Frequency of staff meetings (1 = regularly; 2 = occasionally; 3 = never)	0.8 (0.6-1.1)	0.9 (0.6-1.3)
Average patient wait in reception (1 = less than 5 minutes; 2 = 5-15 minutes; 3 = 16-30 minutes; 4 = over 30 minutes)	0.7 (0.5-1.0)*	0.7 (0.5-1.1)
Typical lead time to schedule new patient exam (1 = 1-2 days; 2 = 3-7 days; 3 = 1-2 weeks; 4 = more than 2 weeks)	1.0 (0.8-1.2)	0.9 (0.7-1.2)
CDE on Early Childhood Caries (ECC) in the last year (1 = yes; 0 = no)		1.3 (0.8-2.1)
ECC Discussed with staff or colleagues (1 = yes; 0 = no)		2.7 (1.7-4.3)**
ECC Brochures are given directly to patient (1 = yes; 0 = no)		1.7 (1.1-2.7)*
Evidence for ECC transmission is tenuous (1-5; 5 = strongly disagree)		1.6 (1.3-2.0)**
It is worth my time to counsel patients on ECC (1-5; 1 = strongly agree)		0.8 (0.6-1.0)
Control over my clinical decisions (1-10; 10 = very important)		1.2 (1.0-1.5)
Frequency of providing oral hygiene instruction to pregnant patients (1 = often; 0 = not often)		1.7 (0.9-3.1)
Feelings about trying new procedures (1 = I enjoy experimenting with new procedures; 0 = other)		1.2 (0.6-2.2)

* $P < 0.05$; ** $P < 0.01$.

† Reference group is 0% Medicaid patients. Overall P-value for the three category variable is 0.92.

the odds of a dentist counseling 50 percent or more of pregnant patients on ECC transmission after adjusting for the effects of dentist and practice characteristics and dentist beliefs.

The results show that, all other things equal, the practice characteristic most strongly predictive of counseling the majority of pregnant patients is routine discussion of ECC with staff members (OR = 2.7, 95% CI 1.7, 4.3). The odds of

providing counseling to a majority of patients was lower for male dentists than for female dentists (OR = 0.53, 95% CI 0.29, 0.96). Among the beliefs, the strongest predictors were the dentist's assessment of the strength of the published evidence for a link between caries in the mother and her infant (OR = 1.6, 95% CI 1.2, 1.9) and how often the dentist reported providing oral hygiene instruction to pregnant patients (OR = 1.7, 95% CI 0.9, 3.1).

The model was also evaluated using linear regression in which the dependent measure, the percent of pregnant patients that dentists report counseling on transmission, was allowed to be continuous. The results (not shown) are nearly the same as for the dichotomous form of the dependent variable except that, in this model, the variable "It is worth my time to counsel patients on ECC" became strongly significant. That is, dentists who more strongly endorsed this item reported counseling a larger proportion of their pregnant patients.

Discussion

While evidence has existed for several decades that it is possible to prevent or moderate ECC by preventive and restorative care of the mother (6-8), and there is a least one demonstration of this in the United States (9), little is known about the adoption of these professional activities. We surveyed dentists in Oregon to determine their practices and attitudes among US dentists. We found that the strongest predictor of providing counseling on ECC was the dentist's belief in the evidence of transmission of ECC and routine discussion of the topic at staff meetings. Dentists who share these beliefs and practices were likely to provide counseling to a majority of their patients and provide pamphlets or brochures on this topic directly to their patients. Finally, dentists who said they provided oral hygiene instruction to pregnant patients "often" were more likely to provide counseling on ECC transmission, although the differences are small and the relationship was not statistically significant.

To some extent, our findings reflect the phenomenon of waiting to see what other dentists do before acting (11). In the bivariate results, the dentists who might be characterized as "early adopters" of dental technologies in general, were more likely to provide counseling. However, this difference did not persist when the results were adjusted for the effects of other practice characteristics and dentist beliefs. Similarly, receipt of continuing dental education on this topic was predictive of the counseling practice in the bivariate analyses but was not a significant factor in Model 2 once the adjustments were made because pamphlets are likely a mediator between continuing education and counseling. Dentists who thought it was worth their time to counsel were more likely to do so although again the relationship was weak. Interestingly, female dentists were more likely to provide counseling consistently than were their male counterparts even after adjusting the model for other characteristics and beliefs.

Equally surprising was the finding that dentists who reported seeing a greater proportion of Medicaid enrolled patients were not more likely to provide counseling to all their pregnant patients. One possibility is that Medicaid does not reimburse dentists for counseling. This is not likely a factor because neither Medicaid nor other insurers reimburse dentists for counseling. However in Oregon, most Medicaid coverage of low-income pregnant women, new mothers, and children is capitated so one might expect dentists to provide counseling as part of their efforts to prevent disease and reduce their own risk (15). An alternative explanation is these dentists are failing to conduct a full risk assessment. Given the very high disease risk in this population, changes are needed to convince dentists of the quality of the evidence and to incentivize them to adopt appropriate risk assessments (17) and counseling practices (8,18,19).

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