

ORIGINAL REPORT: EPIDEMIOLOGIC RESEARCH

Maternal Factors Associated with Early Childhood Caries in Urban Latino Children

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Abstract: *The objective of this investigation was to describe maternal psychosocial, behavioral, and acculturation factors associated with early childhood caries in a sample of urban Latino mother-child dyads. A cross-sectional survey was conducted with 100 mothers whose children (under the age of 6 y) were patients at the Dental Center at Children's Hospital Colorado in Aurora, Colorado. All children participating in the study received an oral examination to measure decayed, missing, filled, surfaces (dmfs). Participating mothers were given the option to sign the consent form and complete the survey in English or Spanish, according to their preferred language. The survey used demographic, behavioral, knowledge, and several psychosocial variables. Bivariate analysis was conducted with dmfs as a dependent variable. The associations between independent variables and dmfs were modeled using negative binomial regression. Mean \pm SD dmfs for the entire sample was about 11 ± 16.85 . The mothers who spoke Spanish had*

children with significantly ($P = 0.046$) higher dmfs scores (15.2) compared to mothers who spoke English (7.56). Preference of Spanish language was significantly associated with self-efficacy ($P = 0.0043$), oral health knowledge ($P = 0.0024$), and 3 subscales of the health belief model: perceived severity ($P = 0.057$), perceived barriers ($P = 0.0002$), and perceived susceptibility ($P = 0.008$). Both in the univariate and the multivariate models, oral health behavior and preferential use of Spanish remained significantly associated with higher dmfs scores. Results of this study demonstrate that maternal oral health behaviors and preferred language are significant factors associated with early childhood caries in urban Latino children.

Knowledge Transfer Statement:

Results of this study indicate that maternal oral health behaviors and the level of acculturation are significantly associated with caries in urban Latino children. Caries prevention efforts in this population could use

this information to tailor oral health messaging according to the level of acculturation in mothers.

Keywords: dental caries, acculturation, oral health behaviors, psychosocial factors, health beliefs, self-efficacy

Latino children experience one of the highest levels of early childhood caries (ECC) among groups that have been compared to the general US population. In a report on Healthy People 2020 objectives, it was observed that 20% of Hispanic children ages 3 to 5 y had untreated decay, compared with 11% of non-Hispanic white children (Dye et al. 2012). Untreated caries in Hispanic children between the ages of 6 and 9 y is about 26% (Dye et al. 2012). Disparities in the oral health of Latino children may have multiple origins, including parental risk factors related to oral health behavior and knowledge, specific cultural and linguistic considerations that affect adherence to recommended health and oral health behaviors, and barriers to quality health care (Hoeft et al. 2010; Farokhi et al. 2011; Telleen et al. 2012; Valencia et al. 2012).

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Mother's education and maternal psychosocial factors, including, stress, oral health beliefs, fatalistic attitudes, and cultural factors, have been associated with early childhood caries (ECC) and with dental health services utilization (Reisine and Litt 1993; Finlayson et al. 2007; Kim Seow 2012). The literature related to oral health behavior and knowledge of Latino groups is scant, and additional investigation is needed to assess the behavioral and psychosocial factors in Latina mothers that may be the underlying determinants of their behaviors related to their children's oral health (Hoeft et al. 2010; Hoeft et al. 2011). Studies that reviewed risk factors for ECC in Latino children have reported that Latina mothers had limited knowledge of dietary and oral hygiene practices and that mothers may be uncertain about the etiology of dental caries (Hoeft et al. 2010; Farokhi et al. 2011). Cultural differences and variation in oral hygiene and preventive practices may lead to reduced utilization of dental services and affect adherence to recommended oral health behaviors by Latina mothers (Tiwari et al. 2017).

The objective of this study is to describe the oral health status of urban Latino children and associated maternal factors, including oral health behaviors, knowledge, attitudes, and beliefs and preferred language related to their children's oral health of these urban Latinas.

Methods

Study Design

A cross-sectional survey was conducted with 100 mother-child dyads whose children were patients at the Dental Center at Children's Hospital Colorado in Aurora, Colorado. Methods employed in this study are consistent with the STROBE guidelines for cross-sectional studies.

Participants

One hundred dyads consisting of Latina mothers who were at least 18 y of age with a child under the age of 6 y were enrolled at the Dental Center at

Children's Hospital Colorado. Latino families make up about 50% of the patient population at the dental center. The study enrolled mothers who were primary caregivers to maintain reliability.

Measures

The questionnaire used in this study is a portion of the Basic Research Factors Questionnaire (BRFQ), which captures parental dental knowledge, attitudes, behaviors, and other psychosocial measures (Albino et al. 2017). The BRFQ was developed as a collaborative effort involving 3 Centers for Research to Reduce Oral Health Disparities: the University of Colorado Denver, Boston University, and the University of California San Francisco (UCSF), funded by the National Institute of Dental and Craniofacial Research. The BRFQ is available in English and Spanish and is being used by all 3 centers in diverse populations.

Oral health behavior

Twelve items were used to obtain an overall behavior score that represented the percentage of oral health behavior items answered with an "adherent" response. *Adherent* is defined as following recommended oral health behavior as defined by the study instrument.

Oral health knowledge

Fourteen items were used to measure knowledge, with the overall oral health knowledge score represented as the total percentage of oral health knowledge items answered correctly.

Knowledge on dental utilization

Five items measured parental knowledge on the utilization of oral health services for their children.

Oral health locus of control

Nine items captured parents' attitudes about who or what has control over their child's oral health outcomes. Three subscales represent the extent to which participants believe control of their

child's oral health outcomes lies with the mother (internal locus of control [LOC]), the dentist (powerful other LOC), or chance factors (chance LOC).

Health belief model

Sixteen items were used to explain health behavior. The model predicts that behavior is a function of 4 subscales consisting of perceived susceptibility, perceived severity, perceived barriers, and perceived benefits.

Self-efficacy

Fourteen items were used to represent parents' confidence that they could successfully engage in the recommended oral health behaviors for their child.

Preferred language

This was measured using preference for English or Spanish. When the mothers were approached to discuss the study, they were asked if they wanted to hear about the study details and whether they wanted to complete the consent process in English or Spanish.

Demographics

Data were collected on the mother's age, income, education, and employment, as well as household size, the number of minors in the household, and the number of years the family has lived in that house.

Data Collection

The study was approved by the Colorado Multiple Institutional Review Board. The mothers were prescreened using the health records for their children who were patients at the dental center. As only Latina mothers were eligible for the study, prescreening enabled appropriate enrollment. A member of the research team approached mothers in the waiting area, and the study procedure was explained. If they agreed to participate, they were moved to a quiet room to complete the consent procedure and the survey. Participating mothers were given the option to sign the consent form and complete

the paper-based survey in English or Spanish. Certified translators provided study information to Spanish-speaking mothers. All children participating in the study received an oral examination to measure decayed, missing, filled, surfaces (dmfs). A calibrated dentist conducted visual screenings of the children's teeth to count dmfs. Examinations were conducted in the dental clinic using a mouth mirror and an overhead light attached to the dental chair (A-dec LED Dental Light, model 576L). Teeth to be examined were brushed, dried with gauze, and then evaluated for the presence of decayed, missing, and filled surfaces. Dental caries detection and measurement criteria used in this study were those described by Pitts (2004). The findings were charted using an electronic dental research record system (Caries Research Instrument [CARIN]). Description of the sample size is provided in the Appendix.

Statistical Analysis

For descriptive statistics, categorical variables were summarized with counts and percentages, and continuous variables were summarized with means and standard deviations. If missing data were present in the continuous variables, the mean \pm SD is preceded by the number of present observations. Associations between preferred language and each variable were tested using *t* tests and Fisher exact tests.

Overall behavior and knowledge scores were calculated as the percentage of individual items answered correctly (0–100). Overall oral health locus of control and health belief model score and their subscales were calculated as the mean responses, implying values of 1 through 5. The knowledge of dental utilization score was calculated as the sum of correct answers to Likert-type questions, and the overall score was calculated as the mean response (1–5).

The associations between independent variables and dmfs were modeled using negative binomial regression. Confidence intervals were estimated using the profile likelihood method and hypothesis

Table 1.

Summary of Decayed, Missing, Filled Tooth Surfaces (dmfs) by Child Sex and Age.

Variable	Value	dmfs, Mean \pm SD
Sex	Male	10.1 \pm 15.4
	Female	11.2 \pm 18.6
Age	1	1.3 \pm 2.3
	2	4.5 \pm 4.4
	3	6.4 \pm 14.6
	4	10.2 \pm 12.7
	5	20.0 \pm 23.6

tests using the likelihood ratio method. Bivariate associations and associations adjusted for age, sex, education, and language were tested. A significance level of <0.05 was used in all hypothesis testing and confidence intervals. Data cleaning and analysis were conducted using R version 3.3.1 (R Core Team 2013).

Results

A total of 100 mother-child dyads were enrolled in the study. The response rate of invited mothers was 83.3%. Survey data and dmfs scores were completed for 99 dyads. Mean \pm SD age of the children in the study was 3.99 ± 1.11 y. There were 46 female and 53 male children. Mean \pm SD age of the participating mothers was 29.54 ± 9.62 y. Forty mothers spoke Spanish and 59 mothers spoke English. Sixty-six percent of the children in the study had some caries experience, and 34% of the children were caries free (dmfs = 0); 62% of these children had mothers whose preferred language for communication was English. Mean \pm SD dmfs for the overall sample was 10.65 ± 16.87 . Female children had slightly higher dmfs scores (11.24) than did males (10.13). The dmfs scores increased with age for all children (Table 1).

In the bivariate model (Table 2), dmfs scores were significantly higher (15.20 ± 21.48) for children of Spanish-speaking mothers compared with children of mothers who spoke English (7.56 ± 12.11).

Mothers who spoke English had higher educational attainment ($P = 0.0342$), higher self-efficacy scores ($P = 0.0043$), and higher scores for 2 constructs of the health belief model, perceived severity (4.29; $P = 0.057$) and perceived susceptibility (3.34; $P = 0.0080$), and lower scores for perceived barriers (1.89; $P = 0.0002$). Mothers who spoke English had a higher mean score on knowledge of dental services utilization (3.67; $P = 0.0024$) compared with Spanish-speaking mothers (3.15).

In the univariate models, significant associations were found between dmfs and age, language (preference for Spanish), and oral health behavior scores (Table 3). For every 1-y change in age, dmfs increased by 1.637 times ($P = 0.0020$). For children of Spanish-speaking mothers, dmfs increased by 2.01 times compared to children of English-speaking mothers ($P = 0.0441$). The association between oral health behavior and dmfs shows approximately a 22.4% lower increase in dmfs for each additional question answered correctly (0.776; 95% confidence interval [CI], 0.638–0.946; $P = 0.0126$).

In the adjusted models, the association between the behavior score and dmfs remained significant after adjusting for age, sex, education, and the primary language (Table 4). The estimate moderated slightly to 0.838 (95% CI, 0.703–0.999; $P = 0.0490$), a 16.2% lower increase in dmfs for every additional correct response versus 22.4% in the

Table 2.
Bivariable Relationship between Dental Caries (dmfs) and Independent Variables by Language.

Variable	Value	Overall	English (n = 59)	Spanish (n = 40)	P Value
Age, y		4.0 ± 1.1	3.9 ± 1.1	4.1 ± 1.2	0.6232
dmfs		10.7 ± 16.9	7.6 ± 12.1	15.2 ± 21.5	0.0461
Child sex	Female	46 (46.5)	27 (45.8)	19 (47.5)	1.0000
	Male	53 (53.5)	32 (54.2)	21 (52.5)	
Mothers' age		29.5 ± 9.6	28.2 ± 9.8	31.8 ± 9.1	0.0830
Mothers' education	HS or more	57 (57.6)	39 (66.1)	18 (45.0)	0.0342
	Less than HS	37 (37.4)	17 (28.8)	20 (50.0)	
	Missing	5 (5.1)	3 (5.1)	2 (5.0)	
Mothers' employment	Employed <32 h/wk	11 (11.1)	7 (11.9)	4 (10.0)	0.6051
	Employed ≥32 h/wk	24 (24.2)	16 (27.1)	8 (20.0)	
	Full-time student	3 (3.0)	3 (5.1)	0 (0.0)	
	Homemaker	45 (45.5)	24 (40.7)	21 (52.5)	
	On medical leave	1 (1.0)	1 (1.7)	0 (0.0)	
	Part-time student	2 (2.0)	1 (1.7)	1 (2.5)	
	Missing	13 (13.1)	7 (11.9)	6 (15.0)	
Household size		4.8 ± 1.4	4.7 ± 1.5	4.9 ± 1.2	0.4426
Household income	\$10,830–\$14,569	4 (4.0)	3 (5.1)	1 (2.5)	0.3419
	\$14,570–\$18,309	4 (4.0)	3 (5.1)	1 (2.5)	
	\$18,310–\$22,049	5 (5.1)	2 (3.4)	3 (7.5)	
	\$22,050–\$25,789	5 (5.1)	3 (5.1)	2 (5.0)	
	\$25,790–\$29,529	15 (15.2)	12 (20.3)	3 (7.5)	
	\$29,530–\$33,269	2 (2.0)	0 (0.0)	2 (5.0)	
	\$33,270–\$37,009	4 (4.0)	3 (5.1)	1 (2.5)	
	\$37,010	2 (2.0)	2 (3.4)	0 (0.0)	
	Missing	58 (58.6)	31 (52.5)	27 (67.5)	
	Household minors		2.7 ± 1.4	2.6 ± 1.4	2.7 ± 1.3
Years in household		4.3 ± 3.5	4.6 ± 3.7	3.8 ± 3.3	0.2716
Oral health behavior		45.0 ± 15.6	47.1 ± 15.0	41.8 ± 16.2	0.0988
Oral health knowledge		86.8 ± 9.7	87.5 ± 7.7	85.7 ± 12.2	0.3995
OHLOC (3 subscales)		2.9 ± 0.7			
Internal OHLOC		4.3 ± 1.0	4.4 ± 0.7	4.1 ± 1.3	0.1655
External-powerful others OHLOC		2.2 ± 1.0	2.2 ± 1.0	2.3 ± 0.9	0.6971

(continued)

Table 2.
(continued)

Variable	Value	Overall	English (<i>n</i> = 59)	Spanish (<i>n</i> = 40)	<i>P</i> Value
External-chance OHLOC		2.2 ± 1.1	2.1 ± 1.0	2.2 ± 1.2	0.6227
Self-efficacy		4.2 ± 0.7	4.3 ± 0.6	3.9 ± 0.8	0.0043
Knowledge on dental utilization		3.5 ± 0.8	3.7 ± 0.5	3.2 ± 0.9	0.0024
Health belief model (4 subscales)					
Perceived severity		4.2 ± 0.9	4.3 ± 0.9	3.9 ± 0.8	0.0574
Perceived barriers		2.1 ± 0.7	1.9 ± 0.6	2.4 ± 0.7	0.0002
Perceived susceptibility		3.1 ± 0.9	3.3 ± 0.8	2.8 ± 1.0	0.0080
Perceived benefits		4.2 ± 1.0	4.3 ± 0.7	4.0 ± 1.2	0.1951

Continuous variables are presented as mean ± standard deviation. Categorical variables are presented as *n* (%). dmfs, decayed, missing, filled tooth surfaces; HS, high school; OHLOC, oral health locus of control.

univariate model. Age was significantly and positively associated with dmfs in all models. Preference of Spanish language was significantly associated with dmfs in most models, showing increased dmfs for Spanish-speaking patients. Sex was not significantly associated with dmfs in any model (Appendix Table 2).

Discussion

In this study, two-thirds of the Latino children had dental caries experience (dmfs >0). Children of Spanish-speaking mothers had dmfs scores approximately twice as high as children of English-speaking mothers. In the univariate models, dmfs was significantly associated with age, preference for Spanish language, and oral health behavior scores. Maternal oral health behavior scores were significantly associated with an increase in dental caries in Latino children, and this association still held even when controlling for language preferences. For each additional oral health behavior question answered correctly by the participating mother, the dental caries experience was reduced by 22.4%. This reduced to about 16% after adjusting for age, sex, education, and the primary language.

Oral health behavior items were questions about oral hygiene

maintenance for the child, including frequency of tooth brushing, use of fluoridated toothpaste, supervision while tooth brushing, and frequency of consuming sugary foods and drinks. Latina mothers in this study demonstrated an overall oral health behavior score of 44%, reflecting low adherence to recommended oral health behavior. Although mothers demonstrated higher mean scores of oral health knowledge (87%) about feeding practices, oral hygiene maintenance, and supervised tooth brushing for their children, they seemed not to have been able to transfer this knowledge into oral health behaviors. The oral health behavior measures from the BRFQ survey have been used in several populations within the United States, and the measure is associated with dental caries in other populations. A study conducted in a Southwestern tribe with American Indian (AI) children, which used the same oral health behavior measures, demonstrated that lower caregiver oral health behavior scores were significantly associated with increase in dmfs in children (Tiwari et al. 2014). Another report involving the same AI population described that parents of caries-active children had overall oral health behavior scores of

50% and the oral health knowledge score of 74% (Albino et al. 2014). Another study conducted in the Northern Plains tribe reported a baseline oral health behavior score of 66% and oral health knowledge of 77% (Tiwari et al. 2016). An additional study reported on the knowledge scores of Latino parents using the BRFQ knowledge measure; the overall parental oral health knowledge score was 80% (Hoeft et al. 2016). This study also reported the BRFQ oral health behavior score of 44%, which only included questions on oral hygiene. The knowledge scores reported among these various populations are quite high (approximately between 70% and 85%), but the behaviors score range between 45% and 65%. Underlying psychosocial constructs, such as oral health locus of control, sense of coherence, or parental self-efficacy, might affect the oral health specific behaviors in parents (Albino and Tiwari 2016). A qualitative study conducted with urban Latina parents in Denver described some of these underlying factors for low adherence to recommended oral health behaviors. Lack of self-confidence in engaging in oral hygiene activities was reported by most parents, and in addition, it was seen that dentists, physicians, and the schools were held responsible

Table 3.
Univariate Association between dmfs and Independent Variables.

Primary Predictor	Estimate	2.5%	97.5%	P Value
Age	1.637	1.202	2.226	0.0020
Child sex (female)	1.109	0.554	2.245	0.7691
Language (Spanish)	2.011	1.019	4.085	0.0441
Oral health behavior	0.776	0.638	0.946	0.0126
Oral health knowledge	0.949	0.784	1.127	0.5615
OHLOC (3 subscales)				
Internal OHLOC	1.391	0.805	2.263	0.2260
External-powerful others OHLOC	1.114	0.757	1.660	0.5864
External chance OHLOC	1.004	0.732	1.414	0.9817
Self-efficacy	0.962	0.492	1.775	0.9052
Knowledge on dental utilization	1.547	0.830	2.744	0.1643
HBM perceived severity	0.746	0.511	1.055	0.0996
HBM perceived barriers	1.274	0.808	2.072	0.3034
HBM perceived susceptibility	1.183	0.763	1.823	0.4515
Education	0.814	0.395	1.620	0.5602
Employed	1.280	0.633	2.717	0.4977
Household income	0.893	0.649	1.259	0.5084

For interpretability, oral health behavior and knowledge were modeled as the count of correct responses. 2.5 and 97.5 are the confidence intervals. dmfs, decayed, missing, filled tooth surfaces; HBM, health belief model; OHLOC, oral health locus of control.

Table 4.
Association between Oral Health Behavior and dmfs, Adjusted for Age, Sex, Education, and Language.

Model	Predictor	Estimate	2.5%	97.5%	P Value
Oral health behavior	Behavior	0.979	0.959	1.000	0.0490
	Age	1.599	1.201	2.127	0.0015
	Sex (female)	0.912	0.463	1.789	0.7875
	Language (Spanish)	1.994	1.054	3.860	0.0338
	Education (> HS)	0.898	0.440	1.800	0.7627

2.5 and 97.5 are the confidence intervals. dmfs, decayed, missing, filled tooth surfaces; HS, high school.

for teaching oral hygiene to children, validating an external oral health locus of control (Tiwari et al. 2017).

In this study, differences in dental caries, maternal oral health behaviors, and some maternal psychosocial

variables were seen in relation to preference of language. English-speaking Latina mothers had higher self-efficacy scores; they felt more confident that they could take their children for preventive visits, maintain their oral

hygiene, and control the consumption of sugary foods and drinks. They also demonstrated higher knowledge about dental utilization and the importance of preventive visits, rather than just taking the child to the dentist when he or she

has obvious dental problems. English-speaking Latina mothers perceived their children to be susceptible to caries, understood the severity of the disease, and perceived fewer barriers to accessing care for their children. Language has been used as proxy to measure acculturation, and it can be presumed that mothers who spoke English were more acculturated and thus more inclined to use preventive dental services (Tiwari and Albino 2017). A few oral health studies that have used language as a proxy measure have demonstrated that preference for English language may increase the chances of using dental health services and can positively affect the oral health of children (Telleen et al. 2012; Finlayson et al. 2014). The level of language abilities has been seen as a critical factor in oral health behaviors and access to care in Latino communities (Patrick et al. 2006). For Spanish-speaking caregivers, limited proficiency in English can cause inability to communicate with health care professionals and to understand the preventive oral health measures and ultimately may lead to less trust in health care providers (Mouradian et al. 2003; Graham et al. 2005).

Another speculation for these differences in dental caries and oral health behaviors in relation to preference of language can be due to confounding variables such as differences in oral health literacy or socioeconomic status. Some studies have speculated that income and education can play a significant role in acculturation of a family, which can affect the oral health of their children (Telleen et al. 2012; Tiwari and Albino 2017). However, this study has identified some underlying factors, such as behavior, self-efficacy, and oral health-related attitudes, that may shed some light on the difference between the English-speaking and Spanish-speaking mothers. Additional research will be directed at confirming these initial observations.

These observations in this study may have clinical implications for improving patient-provider communications and increasing prevention efforts in these

high-risk communities. The importance of oral health behaviors in preventing dental caries in children cannot be underestimated, and dental teams should work with mothers in bringing about behavior change related to oral hygiene and feeding practices in children. Increasing the cultural competency of dental teams and tailoring oral health messages according to the level of acculturation and motivation of the parents may help to improve the oral health behaviors (Tiwari and Albino 2017). In addition, using community health workers or *promotoras* can be a critical piece in engaging Latinas in oral health prevention activities for their children and bridging the language and cultural gaps (Hoefl et al. 2016).

Limitations of this study include the relatively small sample size, which was a convenience sample from a clinically based population. Participants represented mothers of patients at the Dental Center of Children's Hospital Colorado, which is located in an urban area and may not be representative of the overall Latino population.

Author Contributions

T. Tiwari, contributed to conception, design, data acquisition, analysis, and interpretation, drafted and critically revised the manuscript; A.R. Wilson, J. Albino, contributed to conception, design, data acquisition, analysis, and interpretation, critically revised the manuscript; M. Mulvahill, N. Rai, contributed to data acquisition, analysis, and interpretation, critically revised the manuscript. All authors gave final approval and agree to be accountable for all aspects of the work.

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References

- Albino J, Tiwari T. 2016. Preventing childhood caries: a review of recent behavioral research. *J Dent Res.* 95(1):35–42.
- Albino J, Tiwari T, Gansky SA, Barker JC, Brega AG, Gregorich S, Heaton B, Batliner TS, Borelli B, Gultman P, et al. 2017. The Basic Research Factors Questionnaire for studying early childhood caries. *BMC Oral Health.* 17(1):83.
- Albino J, Tiwari T, Henderson WG, Thomas JF, Bryant LL, Batliner T, Braun PA, Wilson A, Quissell DO. 2014. Learning from caries-free children in a high caries American Indian population. *J Public Health Dent.* 74(4):293–300.
- Dye B, Li X, Thornton-Evans G. 2012. Oral health disparities as determined by selected Healthy People 2020 oral health objectives for the United States, 2009–2010. Hyattsville (MD): National Center for Health Statistics.
- Farokhi MR, Cano SM, Bober-Moken IG, Bartoloni JA, Cunningham SE, Baez MX. 2011. Maternal acculturation could it impact oral health practices of Mexican-American mothers and their children? *J Prim Care Community Health.* 2(2):87–95.
- Finlayson TL, Siefert K, Ismail AI, Sohn W. 2007. Psychosocial factors and early childhood caries among low-income African-American children in Detroit. *Community Dent Oral Epidemiol.* 35(6):439–448.
- Finlayson TL, Gansky SA, Shain SG, Weintraub JA. 2014. Dental utilization by children in Hispanic agricultural worker families in California. *J Dent Oral Craniofac Epidemiol.* 2(1–2):15.
- Graham MA, Tomar SL, Logan HL. 2005. Perceived social status, language and identified dental home among Hispanics in Florida. *J Am Dent Assoc.* 136(11):1572–1582.
- Hoefl KS, Barker JC, Masterson EE. 2010. Urban Mexican-American mothers' beliefs about caries etiology in children. *Community Dent Oral Epidemiol.* 38(3):244–255.
- Hoefl KS, Barker JC, Masterson EE. 2011. Maternal beliefs and motivations for first dental visit by low-income Mexican American children in California. *Pediatr Dent.* 33(5):392–398.
- Hoefl KS, Barker JC, Shiboski S, Pantoja-Guzman E, Hiatt RA. 2016. Effectiveness

- evaluation of Contra Caries Oral Health Education Program for improving Spanish-speaking parents' preventive oral health knowledge and behaviors for their young children. *Community Dent Oral Epidemiol.* 44(6):564–576.
- Kim Seow W. 2012. Environmental, maternal, and child factors which contribute to early childhood caries: a unifying conceptual model. *Int J Paediatr Dent.* 22(3):157–168.
- Marin G, Sabogal F, Marin BV, Otero-Sabogal R, Perez-Stable EJ. 1987. Development of a short acculturation scale for Hispanics. *Hispanic J Behav Sci.* 9(2):183–205.
- Mouradian WE, Berg JH, Somerman MJ. 2003. Addressing disparities through dental-medical collaborations, part 1. The role of cultural competency in health disparities: training of primary care medical practitioners in children's oral health. *J Dent Educ.* 67(8):860–868.
- Patrick DL, Lee RSY, Nucci M, Grembowski D, Jolles CZ, Milgrom P. 2006. Reducing oral health disparities: a focus on social and cultural determinants. *BMC Oral Health.* 6(Suppl 1):S4.
- Pitts NB. 2004. Modern concepts of caries measurement for statistical computing. *J Dent Res.* 83(Special Issue C):C43–C47.
- R Core Team. 2013. R: a language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing.
- Reisine S, Litt M. 1993. Social and psychological theories and their use for dental practice. *Int Dent J.* 43(3, Suppl 1):279–287.
- Telleen S, Kim R, Young O, Chavez N, Barrett RE, Hall W, Gajendra S. 2012. Access to oral health services for urban low-income Latino children: social ecological influences. *J Public Health Dent.* 72(1):8–18.
- Tiwari T, Albino J. 2017. Acculturation and pediatric minority oral health interventions. *Dent Clin North Am.* 61(3):549–563.
- Tiwari T, Batliner T, Thomas J, Henderson WG, Albino J. 2016. Oral health knowledge, behavior, and beliefs of American Indian mothers. Paper presented at the 17th Annual National Oral Health Conference, Cincinnati, Ohio.
- Tiwari T, Rai N, Colmenero E, Gonzalez H, Castro M. 2017. A community-based participatory research approach to understand urban Latino parent's oral health knowledge and beliefs. *Int J Dent.* 2017:9418305.
- Tiwari T, Quissell DO, Henderson WG, Thomas JF, Bryant LL, Braun P, Albino J. 2014. Factors associated with oral health status in American Indian children. *J Racial Ethn Health Disparities.* 1(3):148–156.
- Valencia A, Damiano P, Qian F, Warren JJ, Weber-Gasparoni K, Jones M. 2012. Racial and ethnic disparities in utilization of dental services among children in Iowa: the Latino experience. *Am J Public Health.* 102(12):2352–2359.