Nurse Practitioner's and Certified Nurse Midwives' Knowledge, Opinions and Practice Behaviors regarding Periodontal Disease and Adverse Pregnancy Outcomes

Katherine T. Wooten, RDH, MS; Jessica Lee, DDS, MPH, PhD; Heather Jared, RDH, MS; Kim Boggess, MD; Rebecca S. Wilder, RDH, MS

Abstract

Purpose: The purpose of this study was to assess the knowledge, opinions and practice behaviors of nurse practitioners (NP) and certified nurse midwives (CNM) regarding periodontal disease and adverse pregnancy outcomes.

Methods: A 45 item survey was developed, approved, pretested, revised and mailed to 404 North Carolina NPs and CNMs who provide prenatal care. Data was entered into an excel database and transferred to SPSS for Windows for complete analysis. Linear regression modeling was used to determine statistical significance.

Results: A total of 219 NPs and CNMs responded to the mailed survey, achieving a response rate of 54%. NPs and CNMs reported having limited knowledge regarding oral health. The majority felt they should collaborate with oral health care professionals to screen patients for periodontal disease. Most agreed they needed more information about periodontal disease and adverse pregnancy outcomes.

Conclusion: NPs and CNMs who frequently examine women could serve an important role in screening for oral health problems and making appropriate dental health referrals. Increased basic and continuing education could prepare these professionals for collaborative care with oral health care professionals. This study suggests that collaboration between NPs and CNMs with dental professionals could lead to improved oral health care for pregnant patients.

Keywords: Periodontal disease, Preterm birth, adverse pregnancy outcomes, oral health knowledge, interprofessional collaboration, nurse practitioners, certified nurse midwives

This study supports the NDHRA priority area, **Health Promotion/Disease Prevention:** Validate and test assessment instruments/strategies/mechanisms that increase health promotion and disease prevention among diverse populations.

Introduction

Several governmental, dental and medical agendas have been published that state the importance of oral health and overall well being. The first Surgeon General's Report on Oral Health in America emphasized the importance of oral health to general health and well being.[1] The report discussed the emerging associations between oral health and systemic conditions and noted that chronic oral infections can be associated with diabetes, heart and lung diseases, stroke and preterm labor and low birth weight.[1] The United States Department of Health and Human Resource document, Healthy People 2010, outlines a plan for disease prevention and health promotion, including dental health.[2] A goal of Healthy People 2010 is to improve the health and well being of women, infants and children. Among other conditions, low birth weight and prematurity are indicated as major concerns in the United States.[2] The 2003 Surgeon General's National Call to Action reflects the work of public and private sectors working collaboratively to achieve the goals of oral health and general health and well being of all Americans.[3] In addition, the American Dental Hygienists' Association's National Dental Hygiene Research Agenda, updated in 2007, has emphasized the need for investigation regarding how dental hygienists are utilizing emerging science to reduce risk in susceptible patients.[4] These documents support the need for increased awareness among health care professionals and patients about the risk factors associated with periodontal disease and other systemic conditions. The purpose of this study is to find out if there is a relationship between nurse practitioners (NP) and certified nurse midwives (CNM) concerning knowledge, opinions

and practice behaviors regarding periodontal disease and adverse pregnancy outcomes.

Review of the Literature

Periodontal Disease and Adverse Pregnancy Outcomes

Periodontal disease may be an independent contributor to systemic conditions, such as heart disease, respiratory diseases, diabetes mellitus, adverse pregnancy outcomes and stroke.[5–10] Preterm birth is the leading perinatal problem in the United States.[11] A low birth weight infant weighs less than 2,500 grams.[12] A preterm infant is classified as late preterm (34 to 36 weeks), moderately preterm (32 to 36 weeks) and very preterm (less than 32 weeks).[13] Between 1996 and 2006, the rate of infants born preterm in the United States increased more than 16%.[13]

Since the early 1990s, investigators have studied the relationship between periodontal disease and adverse pregnancy outcomes.[5,14–19] In 1998, Offenbacher et al sought to determine if periodontal infections in pregnant women trigger preterm births.[5] The results indicated that gingival crevicular fluid and Prostaglandin E2 (PGE2) levels were significantly higher in mothers who gave birth prematurely, or had a low birth weight infant, compared to women giving birth to term and normal birth weight infants. The researchers concluded that periodontal disease is a sufficient infectious challenge to cause preterm birth and low birth rate. More recently, Boggess et al found that women who are pregnant and have moderate or severe periodontal disease early in pregnancy have a risk ratio of 2.3 (1.1 to 4.7) for a small–for–gestational–age infant.[18] Gazolla et al conducted a study to evaluate the effect of periodontal treatment for pregnant women and to determine if this treatment can interfere with pregnancy duration and weight of the newborn.[9] They found that those in the non–treated group had a higher incidence (79%) of preterm delivery.

The link between periodontitis, preterm birth and low birth weight may be that, in the presence of periodontal disease, lipopolysaccaride exposure, inflammatory mediators and maternal cytokine production in the maternal serum, the patient is at risk for adverse pregnancy outcomes. Periodontal disease serves as a reservoir for lipopolysaccaride, which can target the placenta membrane through the bloodstream.[5,14] Inflammatory cell mediators TNFα and PGE2, which are produced locally in the oral cavity, can serve as a source of fetotoxic cytokines.[14] An increase in these inflammatory cytokines may contribute to preterm rupture of the membranes and uterine contractions, which can lead to miscarriage or preterm birth.[15] Maternal cytokines, TNFα and prostaglandin production, in response to gram–negative periodontal infection, have been associated with the onset of labor.

A few studies have failed to find a relationship between dental health and pregnancy outcomes.[20–23] While the reasons for these results have yet to be identified, overall studies suggest potential benefits for addressing oral health during pregnancy and have confirmed that it is safe to provide dental treatment during pregnancy.[24]

The cost of treating infants due to adverse pregnancy outcomes is in the billions of dollars each year.[25] Therefore, insurance companies are beginning to pay attention to the relationship of poor oral health and certain systemic conditions. Several companies are adding enhanced benefits to dental plans that target high–risk populations. Aetna Inc. has added an additional scaling and periodontal maintenance appointment for pregnant women, those with heart disease and/or cerebrovascular disease and patients with diabetes.[26,27] Increasing awareness within the insurance companies and the medical community is one of the first steps to improving oral health and educating patients regarding the oral systemic link. However, it may take more than the dental/dental hygiene profession and insurance companies to expand the education needed to improve the oral health condition of pregnant patients.

Pregnant Women's Knowledge and Behaviors Regarding Oral Health

The Center for Disease Control and Prevention (CDC), Division of Oral Health, attempted to look at women's knowledge and attitudes regarding oral health and dental visits during pregnancy. Data was used from the CDC Pregnancy Risk Assessment Monitoring System, which surveys women's attitudes, experiences and behaviors before, during and after pregnancy. The findings showed that most women did not visit the dentist during pregnancy, and of those who reported having oral problems, 50% did not seek care. The qualitative results show that many pregnant women believe that poor oral health is normal during pregnancy and that some dental procedures could harm the unborn child.[28]

Habashneh et el conducted a study of 625 pregnant women to investigate factors related to the utilization of dental care during pregnancy and to assess their knowledge about oral health during pregnancy and the affect on pregnancy outcomes.[29] Only half reported visiting the dentist while pregnant. Even though the socioeconomic status of the

subjects was high, the knowledge of the relationship between oral health and adverse pregnancy outcomes was limited. The authors concluded that oral health education is important before and during pregnancy, because it raises greater awareness of the potential relationship of oral health and adverse pregnancy outcomes.

One way to increase education among pregnant women is through the interprofessional collaboration of all health care professionals that are involved in the care of the patient. Dentists, dental hygienists, physicians and nurses could participate in providing oral health exams, refer patients as needed and educate patients about the oral–systemic link and its possible relationship to adverse pregnancy outcomes. However, limited research has been conducted to investigate the knowledge level and willingness of health care providers to participate in oral health assessment and education.

Physicians' Knowledge and Behaviors Regarding Oral Health

Physicians are in the position to help prevent oral disease, but they may lack the knowledge and skill to do so. Lewis et al reported on a national survey of 1,600 pediatricians and found that 90% felt they had an important role in identifying dental problems and teaching prevention to families, but only half felt they had training in medical school or residency regarding dental issues.[30] In addition, only 9% answered correctly in the knowledge section on oral health questions. McCundiff et al showed that only 7% of primary care physicians performed an oropharyngeal cancer examination on patients, and that their knowledge level needed to be more current.[31]

Wilder at el conducted a study with 194 practicing obstetricians in a 5 county area in central North Carolina.[32] When asked about the description of gingivitis, 95% answered correctly, but only 67% correctly answered the question regarding the description of periodontitis. When asked about the causes or what is associated with periodontal disease, 94% correctly answered bacteria, although 73% answered tooth decay, 69% said aging and 51% answered excess dietary sugar. Only 22% looked into patients' mouths at initial prenatal examination. That number rose to 48% when a problem was mentioned by the patient. Fifty percent rarely or never recommended a dental examination. However, 84% considered periodontal disease to be as important a risk factor to adverse pregnancy events as those currently known in obstetrics practice. This study concurred with others that there is limited incorporation of oral health assessment or education in medical settings.

At the University of Washington (UW), investigators estimated that medical students received about 2 hours of lecture on oral health during their 4 years of medical school.[33,34] In 2005, a new oral health elective was created at the UW Medical School to provide medical students with the knowledge, attitude and skills to graduate and provide preventative dental care. The lectures were taught by 9 pairs of medical and dental faculty. After each lecture there was a clinical laboratory or an interview with a patient to enable the medical students to get practical experience. Dental students served as volunteers during the laboratory exercises, and they assisted the medical students during the performance of oral exams and the application of fluoride varnish. The results of the pre– and post–test of oral health attitudes, confidence and knowledge were that the medical students' attitudes toward oral health were more positive at the completion of the course, and their confidence in identifying oral disease was higher ($p<0.001$).

Nurses Knowledge and Behaviors Regarding Oral Health

Nurses are extremely important to the care of patients in all aspects of their health. They are in an ideal position to screen for dental disease, refer for dental care and promote good oral health. In the January 2008 issue of Maternal Child Nursing, Clemmens and Kerr introduced a Nurses' Plan of Action to respond to "largely preventable diseases," namely oral health problems.[35] The authors stressed the need for nurses to understand the range of oral health problems associated with systemic and chronic health conditions. However, with little integration of oral health topics in nursing curricula, it is unlikely that this will be accomplished quickly.[36]

One hundred and fifty–eight United States primary care nursing centers were surveyed to determine to what extent they provide oral health screening, education and referral services for patients.[37] The study also identified factors that encourage or discourage these services. Results found that 49% almost always screen patients for gum infections and oral lesions, 20% reported teaching their patients how to perform oral cancer self–examinations and 19% were informed about the effects of xerostomia. Most reported infrequently referring patients for treatment of oral conditions. Factors that discouraged referrals were lack of referral resources and unavailability of health care professionals to provide on-site basic oral health services in the centers. Factors that encouraged the integration of oral health services into primary care nursing centers were an appreciation for the benefits of oral health and being knowledgeable to perform oral health services. This

data provides support for the collaboration of oral health care professionals and nurses to expand oral health services.

Nurse Practitioners and Certified Nurse Midwives

A NP is a post master's degree nurse with a focus in areas such as family, adult, pediatric or women's health care. NPs gain knowledge and skills in advanced comprehensive assessment, diagnostic reasoning and the management of health problems. They work in prenatal clinics and are in ideal positions to implement and direct educational programs for expectant mothers.[38] Nurse midwives have been practicing since the 1920s, however, the criteria for credentialing CNMs was approved in 1994. It has been reported that 70% of women who receive care from CNMs are vulnerable to poor health outcomes due to socioeconomic status and ethnicity, among others.[39] Many times, NPs and CNMs are the individuals implementing screenings, referrals and the promotion of oral health in pregnant women. However, little is known about their potential role in decreasing periodontal disease in expectant women.

The purpose of this study was to assess the knowledge, opinions and behaviors of NPs and CNMs regarding periodontal disease and adverse pregnancy outcomes. The study was conducted via a mailed questionnaire. The questions addressed knowledge and behaviors regarding periodontal disease and adverse pregnancy outcomes, opinions/perceptions of the NP's and CNM's role relative to oral health and demographics and personal oral health experience.

Methods and Materials

The survey instrument was developed by the research team and approved by the Biomedical Institutional Review Board at the University of North Carolina (UNC). It consisted of 45 open and closed ended questions and Likert scale questions. Pilot testing occurred with 5 prenatal care providers. After revision and final approval, it was mailed to all NPs and CNMs (n=404) who provide prenatal care in North Carolina.

The sample was randomly selected from a mailing list obtained from the North Carolina Medical Board. A cover letter explaining the purpose of the study and the importance of participation was included along with an information request form that was used in an incentive drawing for 5 gift cards. Subjects were asked to return the completed surveys in the stamped return envelope 3 weeks after mailing. A second mailing was conducted 6 weeks later.

Data Analysis

Descriptive statistics reporting percentage frequency distributions of responses for NPs and CNMs characteristics, knowledge and practices were run using SPSS statistical software. After an examination of bivariate associations of independent variables and referral, a logistic regression model was developed to test the effects of nurses' knowledge and training on the likelihood of providing dental care services while accounting for years in practice. To facilitate interpretation of the regression parameter estimates, categorical variables were created from the continuous summary scores for the 7 explanatory variables by using either the upper or lower 20 to 35% of responses as one category or the other responses as another.

Results

Demographics

A total of 219 NPs and CNMs responded to the mailed survey, achieving a response rate of 54%. Thirty surveys were returned due to insufficient address. Eighty–five percent of participants reported providing prenatal care in North Carolina to an average of 45 patients per week (range 1 to 350). Almost half of those surveyed reported working in a publicly funded facility. The majority of respondents had provided prenatal care for more than 6 years. Thirteen percent have been told they have periodontal disease and 96% rated their oral health as good or excellent (Table I).

Oral Periodontal Examinations: Sixty–two percent of the nurses reported looking in a patients' mouth (oral health examination) as part of routine care at the initial prenatal visit. Six percent reported never looking in the patient's mouth. The remainder looked only if the patient identified a problem. Twenty percent indicated that it was the responsibility of dental professionals to provide the exam.

Practice Behaviors

Participants were asked what prenatal care services are provided at their work setting. Ninety–eight percent reported providing low risk care to patients, while 84% reported providing non–stress tests. Only 32% reported providing dental screenings as part of prenatal services, while 20% reported providing dental care (Table II).

When asked what referrals were made for their prenatal patients in the last 12 months, the following was reported:

Table I: Respondents Practice Demographics & Personal Oral Health

Prenatal Care Providers (n=218)	
Yes	85% (186)
No	15% (32)
Patients Seen Each Week (n=181)	
Per week	1–350
Mean	45
SD	43
Practice Setting	
General Practice	10% (19)
Solo	1% (1)
Group	13% (29)
Specialty Practice	37% (64)
Public Health/Government	40% (70)
Hospital Practice	10% (17)
Other	2% (4)
Number of Years in Practice (n=187)	
Less than 1 year	1% (1)
1–2 Years	10% (19)
3–5 Years	14% (27)
6–10 Years	24% (45)
11–20 Years	34% (64)
More than 20 years	17% (31)
The Last Time You Received Dental Care (n=180)	
Within the last six months	79% (142)
6 months–1 year ago	13% (23)
1–2 Years ago	7% (12)
2 or more years ago	2% (3)
Never	0% (0)
Last Examination to Assess the Health of Your Gums (n=181)	
Within the last six months	79% (143)
6 months–1 year ago	13% (23)
1–2 Years ago	7% (12)
2 or more years ago	2% (3)
Never	0% (0)

Table II: Prenatal care services provided in setting

	Yes	No
Biophysical Profile (BPP) (n=161)	67% (108)	33% (53)
Childbirth Classes (n=159)	55% (88)	45% (79)
Dental Care (n=140)	20% (28)	80% (112)
Dental Screening (n= 142)	32% (45)	68% (97)
Genetic Consultation (n=152)	44% (67)	56% (85)
High Risk Care (n=167)	77% (128)	23% (39)
Low Risk Care (n=177)	98% (173)	2% (4)
Non Stress Test (NST) (n=177)	84% (149)	16% (28)
Nutrition Consultation (n=170)	78% (132)	22% (38)
Ultrasound Examinations (n=168)	82% (137)	19% (31)

*Not all respondents answered every question

Table III: NPs' and CNMs' beliefs associated with Periodontal Disease (n=219)

Bacteria	83% (182)
Smoking	77% (168)
Tooth Decay	76% (166)
Excess Sugar Consumption	62% (135)
Aging	54% (119)
Genetics	52% (113)
Child Bearing	42% (92)

*Not all respondents answered every question

- 97% reported referring for genetic screening
- 96% for nutrition
- 95% for childbirth preparation
- 93% for Women Infant & Children Supplemental Feeding Program
- 89% for social work involvement
- 86% for dental health

When asked what trimester is recommended for patients to initiate dental treatment, 56% reported the first trimester, 39% reported the second trimester and 1% identified the third trimester.

Knowledge

Participants were asked about factors contributing to gum disease. Eighty–three percent reported bacteria, 77% reported smoking and 76% iden-

Table IV: Opinions of NPs and CNMs about Periodontal Disease

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know
I am trained to provide an oral exam (n=183)	4% (7)	37% (67)	37% (68)	19% (35)	3% (6)
I am comfortable looking in a patient's mouth and determining if they have gum disease (n=184)	3% (5)	45% (83)	39% (71)	10% (18)	4% (7)
My knowledge about periodontal disease is current (n= 183)	1% (1)	19% (35)	60% (109)	14% (25)	7% (13)
Nurse practitioners, physician assistants and nurse midwives should be taught about periodontal health (n= 183)	52% (96)	47% (86)	0%	0%	1% (2)
I need additional information about periodontal disease and its impact on adverse pregnancy outcomes (n=184)	30% (56)	61% (112)	6% (11)	2% (3)	1% (2)
My patients are knowledgeable about the importance of good oral health during their pregnancy (n= 183)	3% (5)	18% (33)	50% (91)	25% (45)	5% (9)
Nurse practitioners and nurse midwives should be taught how to perform a cursory examination to determine health or disease (n=184)	40% (72)	54% (99)	2% (4)	0%	5% (9)
Nurse practitioners and nurse midwives should perform periodontal examinations to determine if a patient needs to be referred to a dentist (n= 184)	28% (52)	50% (92)	14% (26)	1% (2)	7% (12)
Nurse practitioners and nurse midwives need to collaborate with dental professionals to reduce a patient's risk of having an adverse pregnancy outcome (n=184)	43% (79)	52% (95)	2% (3)	0%	4% (8)
I am comfortable referring patients with dental problems (n= 184)	57% (105)	40% (74)	2% (4)	0%	1% (1)
Periodontal disease is a risk factor for adverse pregnancy outcomes (n=184)	41% (75)	49% (90)	1% (2)	0%	9% (17)
If a patient has periodontal disease she is more likely to have adverse pregnancy outcomes than a patient with healthy gums (n=184)	34% (63)	51% (94)	2% (3)	0%	13% (24)

tified tooth decay as being associated with gum disease. However, 62% erroneously thought that excess sugar consumption is associated with gum disease (Table III).

Regarding knowledge about gingivitis, 67% identified it as a reversible redness/swelling of the gums, and 49% as a potentially reversible infection. When asked about periodontitis, 65% percent indicated that it is a potentially reversible infection of the gums, while 27% identified it as tooth decay. Ninety–three percent correctly answered that periodontitis is worse than gingivitis.

Opinions

One section of the survey asked the opinions of NPs and CNMs about periodontal diseases and their role in oral health assessment and education (Table IV). When asked if they were trained to provide an oral exam, only 41% answered affirmatively. Ninety–four percent indicated that they should be taught how to perform a cursory examination to determine health or disease, while 95% said they need to collaborate with dental professionals to reduce a patient's risk of having an adverse pregnancy outcome. Eighty–seven percent agreed that in recent years an association has been made between periodontal disease and adverse pregnancy outcomes, and 85% agreed that if a patient has periodontal disease she is more likely to have adverse pregnancy outcomes than a patient with healthy gums. When asked to identify the single most important reason for not providing an oral health exam, 20% indicated that it was the responsibility of dental professionals.

Table V reports the results of the logistical regression analysis for providing dental services. Interestingly, NPs and CNMs who had a dental clinic present in the primary practice setting, or were educated in an institution near a dental school, performed more dental services in the work setting.

Discussion

With the possible oral–systemic links that have been identified between periodontal disease and certain systemic conditions, it is imperative that all health care practitioners be aware of a woman's oral health condition.40 Nurses are in an ideal situation to identify and refer women that need dental care. Prevention through education is needed by all prenatal care providers to teach mothers the importance of oral health for themselves and ultimately their babies.41

With increased awareness regarding potential oral–systemic links, health care providers must collaborate to educate pregnant patients before and during pregnancy. In the present study, 95% of North Carolina NPs and CNMs agreed they need to collaborate with dental professionals to reduce patients' risk of having an adverse pregnancy outcome. However, few reported having sufficient oral health content in their professional school curriculums, and only a few reported being adequately trained to provide an oral health examination. Only 20% reported being up to date in oral health issues and periodontal disease. The authors of this study suggest that increased oral health education in NPs and CNMs academic programs could increase the knowledge level regarding periodontal disease and adverse pregnancy outcomes and potentially benefit pregnant women and their infants. In addition, the authors strongly promote increased collaboration between NPs, CNMs and oral health care professionals to coordinate and provide better care for pregnant patients. While 62% of providers reported conducting an oral health examination as part of routine care at the initial prenatal visit, 6% reported never looking in the patient's mouth, and 40% looked only if the patient identified a problem. The majority want additional information regarding periodontal disease and adverse pregnancy outcomes. Therefore, training nurses how to provide a visual screening for oral health problems is also recommended. For practicing nurses, continuing education courses on periodontal disease and systemic conditions could be developed by the dental community. Also, having oral health referral sources available for nursing professionals so they can easily refer pregnant women for oral health care needs might facilitate the process and promote better oral health care for pregnant women.

Pregnant women who have bleeding gingiva, loose teeth, oral malodor or inflammation should be referred to a dentist, dental hygienist or dental clinic. Nurses could proactively identify dental clinics that will accept expectant mothers who have no insurance or who have financial barriers. In the current study, 69% reported that they knew dentists who they can refer patients to if needed. The number of potential referral sources could be increased through a collaborative effort between dentists, dental hygienists, NPs and CNMs.

Table V: Results of logistic regression analysis for providing dental services (n=160)

Variables	Odds Ratio	P–Value
Years in practices (5 years or less vs. 6 or greater)	0.13	0.20
Dental clinic present in primary practice setting (Yes vs. No)	0.008	<0.05
Dental training in the curriculum (Yes vs. No)	1.10	0.90
Dental school present in institution where nursing training was received (Yes vs. No)	11.3	<0.05
Dental Knowledge (Range 0–9, 9=higher dental knowledge)	2.3	<0.05

It was interesting to find that dental services by NPs and CNMs were increased if the professional had been educated in a setting near a dental school. Perhaps this is a "call to action" on the part of dentistry and dental hygiene to play a larger role in further educating our nursing colleagues about the importance of oral health and to also provide training on oral screening techniques and proper referral for treatment needs. New York University's Dental School and Nursing School have sought to combine their curriculum to provide comprehensive care to all patients.42

Participants in this study who had a dental clinic present in the primary practice setting were more likely to perform dental services. One would assume that having a clinic nearby eases the process of referral. Again, oral health care professionals such as dental hygienists and nurses need to work collaboratively to find mechanisms to access oral health care for patients in need.

A few limitations of this study warrant discussion. While a larger response rate was anticipated, the response rate of 54% is sufficient to assess the knowledge and practice behaviors of nurses regarding periodontal disease and adverse pregnancy outcomes. While non–response bias was examined, none was determined to be present. However, non–response bias cannot be fully assessed with the information provided from the medical board. The results might not have external validity and may not be generalized to other states.

Future studies might investigate a model for oral health promotion through a collaborative model. Another study might address the impact of including oral health content and diagnostic techniques in curricula of NPs and CNMs to assess knowledge levels and practice behaviors of these professionals who care for pregnant women.

Conclusion

Most NPs and CNMs reported that their basic nursing education did not include oral health in the curriculum. Therefore, few prenatal care providers feel that they are adequately trained to provide an oral health examination and refer for potential dental needs. Increased oral health education in NP and CNM programs could increase the knowledge level regarding periodontal disease and adverse pregnancy outcomes and potentially impact pregnant women's oral health. In addition, the current study concludes that oral health care professionals need to collaborate more with NPs and CNMs to improve the oral health care of pregnant patients. There are many opportunities in various work settings for nurses to educate, promote oral health and provide risk assessment to women.

Katherine Thomas Wooten, RDH, MS is an adjunct clinical instructor at the University of North Carolina School of Dentistry. Jessica Lee, DDS, MPH, PhD is an Associate Professor in the Department of Pediatric Dentistry at the University of North Carolina. Heather Jared, RDH, MS is a Senior Study Coordinator for Rho in Chapel Hill, NC. Kim Boggess MD is an Associate Professor in the Department of Department of Obstetrics and Gynecology, Division of Maternal Fetal Medicine, University of North Carolina School of Medicine. Rebecca S. Wilder, RDH, MS is a Professor and Director of Graduate Dental Hygiene Education, Interim Director of Undergraduate Dental Hygiene and Director of Faculty Development at the University of North Carolina School of Dentistry. At the time of this project, Kathryn Wooten was a graduate student in Dental hygiene Education at the University of North Carolina.

Disclosure

One of the authors serves on the Scientific Advisory Board for Colgate Oral Pharmaceuticals.

Acknowledgments

This study was supported by an unrestricted grant from Colgate Oral Pharmaceuticals.

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