

Innovations in Dental Hygiene Education

Implementing a Prenatal Oral Health Program in Dental Hygiene Curriculum

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Abstract

Purpose: Inadequate prenatal oral health education in dental hygiene (DH) curricula can negatively impact patient care by graduating clinicians lacking competence in the provision of care for this population. The purpose of this study was to assess the knowledge, opinions, and willingness of DH students to provide oral care services to pregnant patients before and after participating in a prenatal oral health educational program (pOHP).

Methods: Senior DH students were invited to complete a baseline and post-program survey to evaluate their experiences in the pOHP at the University of North Carolina, Chapel Hill. All senior DH students attended a one-hour lecture on prenatal oral health guidelines and practices prior to their clinical rotation in the pOHP. Each survey consisted of items on knowledge, confidence, and attitudes related to screening, counseling, and willingness to provide oral care services to pregnant patients.

Results: Over a period of three years, 93 DH students (n=93) completed both the baseline and post-program surveys for a 96.8% response rate. Participants reported gains in knowledge and confidence for screening and counseling pregnant patients. Post-program survey respondents agreed that dental providers should deliver oral health counselling to pregnant women (99%, n=93) and perform an oral health examination during prenatal care (99%, n=92). Nearly all of the respondents, (98%; n=90) reported they are likely to take care of pregnant women upon graduation and deliver preventive oral health messaging to this population (98%, n=91).

Conclusion: Dental hygiene student participants in a prenatal oral health program (pHOP) demonstrated positive trends in increasing knowledge and confidence in screening and counseling pregnant patients in the dental setting. Inclusion of a clinical experience played an influential role in changes in knowledge regarding the safety of care during pregnancy, indicating a need for both didactic and clinical immersion opportunities to enhance cognitive and affective transformations.

Keywords: oral health education, pregnancy, prenatal oral health, dental hygiene students, interprofessional education

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Introduction

Inadequate prenatal oral health education in dental hygiene (DH) curricula can negatively impact patient care by graduating clinicians lacking competence in the provision of care for pregnant patients. Current research and published national standards support the safety and efficacy of dental care throughout all stages of pregnancy.¹⁻⁵ Patients who have been deferred oral health care during pregnancy can experience significant detrimental effects on their own health and the health of the developing fetus. Patient education and appropriate preventive treatment recommendations made by the dental hygienist can help reduce confusion in current practice standards and increase positive treatment behaviors by the dental team.

Oral health considerations in pregnancy

Inconsistencies in care and practice standards have been influenced by numerous reports of adverse pregnancy outcomes and oral disease. Several research studies have supported a relationship between poor maternal oral health with an increased risk of preterm delivery, low birth weight, preeclampsia, gestational diabetes, and stillbirth with strong evidence demonstrating that maternal oral health is associated to the oral health of the newborn.^{1,6-12} Pregnancy may also increase the risk of future dental decay due to behaviors of the expectant mother.¹³⁻¹⁴ Women with active decay-causing bacteria can transmit cariogenic bacteria from their

own mouths to the mouths of their infants.^{13,15} Additional data indicates that children of mothers with high levels of untreated decay are three times more likely to have children with dental caries.^{13,16}

Dental care during pregnancy

Few women utilize dental care services during pregnancy, with the lowest use documented among those in underserved communities.¹⁷ Studies consistently indicate low percentages of women seeking dental care during pregnancy, even when a problem arises, due to fears of adverse fetal development and low oral health literacy levels.^{2,9,18-20} Some barriers noted in the literature include low reimbursement, time restrictions, culture and language differences, lack of demand and poor oral health literacy.²¹ Inconsistent messaging from medical and dental care providers may also lead to discrepancies. Some health care providers may have learned different protocols throughout their time of training; such as delaying oral care until the second trimester or until after delivery.²¹ Messaging to expectant mothers may be influenced from preconceived culture and language beliefs that affect awareness of safety to receive dental care during pregnancy.

Oral health care providers play an essential role in adopting and delivering timely, evidenced-based practices for provision of oral health care. Results from a study evaluating knowledge and practice behaviors of general dentists in North Carolina indicated that while the majority of respondents believed in the importance of dental care during pregnancy; only 48% provided comprehensive oral health care to these patients.²¹ Further analysis also supported the hypothesis that an increase in knowledge scores correlated with the likelihood of providing comprehensive care services for pregnant women.²¹ In a survey of dental hygienists' knowledge, attitudes, and practice behaviors for pregnant patients in the state of Michigan, the vast majority of respondents (96%) agreed that prophylaxes could be provided throughout pregnancy.²² However, responses varied regarding levels of safety for scaling and root planning (76%), restorative care (62%), and exposure of radiographs (50%) in all trimesters.²² Over half of the respondents (64%) indicated that they wanted to receive additional education concerning care for the pregnant patient.²²

Research also indicates inconsistent oral health recommendations from primary care providers. One study of pregnant women indicated that less than one quarter (20%) of those surveyed, actually received advice to visit a dentist during pregnancy from their maternity care provider.²³ Fewer than half, indicated that they were instructed on the importance of good oral health, reiterating the necessity of oral health care providers to promote prevention and

treatment during pregnancy.²³ *Oral Health Care During Pregnancy: A National Consensus Statement*, addressing the oral health needs during pregnancy, was issued in 2012 by an expert workgroup, coordinated by the National Maternal and Child Oral Health Resource Center.² Participants from the workgroup included the American College of Obstetricians and Gynecologists and the American Dental Association. The statement provides consistent criteria, recommendations for care, and information regarding the calibration of care and messaging to patients and health care providers.²

Prenatal oral health in education

Little has been reported in the literature regarding the prenatal oral health content in DH program curricula. In a survey of the infant, toddler, and prenatal oral health content of dental and DH programs in Canada, 70% of the dental and 83% of the DH programs reported a prenatal oral health curricular component. Time restraints and a lack of patients were cited as the most impactful barriers to teaching and providing clinical experiences.²⁴ A 2012 study examined the amount of time devoted to prenatal oral health education in United States (US) dental schools and obstetrics and gynecology (OB-GYN) residencies.²⁵ A majority of dental school respondents (94%) reported including a minimum of one hour and 61% of schools included three or more hours.²⁵ Conversely, only 32% of the obstetrics and gynecology respondents reported a minimum of one hour of prenatal oral health education and only 6% reported three to four hours.²⁵ A positive relationship was identified with program directors' knowledge of the national standards consensus statement and the number of hours of prenatal oral health education in the curriculum.²⁵

Prenatal Oral Health Program (pOHP)

Currently, there is no known data indicating the number of DH programs offering didactic and clinical rotations to provide experiential learning in the management of oral care for pregnant patients. The Prenatal Oral Health Program (pOHP) at the University of North Carolina (UNC), Chapel Hill, offers a unique experience to prepare students for prenatal oral care via a didactic seminar and an intraprofessional clinical experience with pregnant patients. The program was originally established in 2012 as a collaborative effort between the UNC Adams School of Dentistry and the UNC School of Medicine, led by a pediatric dentist, and an obstetrician/gynecologist. The purpose of the program was to educate medical and dental students about prenatal oral health and establish a clinic for this population to receive dental care.²⁶ Emphasis was placed on training for screening, counseling, treatment, and referral to and from medical and dental health care providers.

As the pOHP evolved, the addition of senior DH students became an essential component of the program design by adding members to the dental team with a focus on disease prevention. The DH students gained valuable didactic and clinical experiences. Didactic content was provided as part of their curriculum; clinical rotations in the pOHP were included to facilitate educational experiences and patient care. The clinical structure included appointment blocks for dental and DH students to work together with patients referred to the clinic.²⁶ Administrative support staff and faculty were calibrated on the pOHP and supervised the students and patient care. Dental and DH students worked collaboratively to provide a comprehensive oral examination, obtain radiographs as needed, perform a dental prophylaxis, and provide pregnancy-focused oral health education.²⁶ Students benefited by working together in a team-based care model to solve patient problems and provide care leading to positive educational and patient experiences. The purpose of this study was to assess the knowledge, opinions, and attitudes of DH students who participated in a prenatal oral health educational program as part of a program evaluation.

Methods

This study was reviewed by the Office of Human Research Ethics at the University of North Carolina and determined to be exempt (IRB #12-1167). A pre-post survey was used to evaluate the knowledge, confidence, and attitudes of DH students related to screening, counseling, and willingness to treat provide prenatal oral care. All senior DH students from the UNC Chapel Hill graduating classes of 2015, 2016, and 2017 and participating in the pOHP met the inclusion criteria. Data were collected in the same manner for each cohort.

Recruitment

Due to the educational design and the requirement that all students experience the pOHP learning opportunity, the study design did not include a control group. The baseline survey was distributed during a clinical orientation session at the beginning of the second academic year. The DH students had completed one academic year including one semester of preventive and therapeutic DH patient care services. All senior DH students were invited to participate and complete the baseline survey. Students were informed that participation was voluntary and non-participation would not have a negative effect on their grade. Post-program surveys were distributed to the same cohort of students eight months following the baseline survey distribution, and following completion of participation in the prenatal oral health program.

Survey instrument

The survey instrument was a modification of an existing pOHP survey developed for medical and dental students.²⁶ The revised pOHP instrument examined similar constructs; modifications were made specific to DH. The modified survey was pilot tested by four recent graduates from the DH program; minor revisions were made based on the feedback provided.

The baseline survey instrument consisted of items including subset statements using a Likert-scale response (1=strongly disagree to 5=strongly agree) regarding levels of experience, agreement, and confidence. Question themes included: demographics (3 items), clinical experiences (1 item), and procedures performed with pregnant patients (12 items), knowledge regarding treatment safety (8 items), confidence of providing oral health services to pregnant patients (7 items), and additional statements asking to evaluate willingness to implement prenatal care and perception of resources, and practice behaviors (14 items). The post-program survey followed the same format as the baseline survey and included additional questions to gain evaluative program feedback (9 items).

Prenatal Oral Health Program

All senior DH students received a one-hour presentation that included review of practice standards for treatment and management of pregnant patients during the fall semester clinical orientation. The presentation content included a review of literature, trends of pregnancy and dental treatment, common oral conditions for pregnant patients, medical and oral considerations, review of consensus standards for screening, referral, and treatment of pregnant patients.² An 18-minute educational prenatal oral health video was also included.²⁷ The presentation was provided by the same professor each year of the study duration, and content remained consistent for each cohort. Information regarding the clinical rotation in the pOHP was also reviewed to provide instruction for preparation and completion of the clinical rotation. The students had one semester of patient care experiences in a preventive recall clinic; however, few had provided care for a pregnant patient. The DH students began their scheduled clinical and didactic coursework the week following orientation. Each student was scheduled to rotate a minimum of one time in the pOHP clinic as a part of their clinical course.

Statistical analysis

Univariate and bivariate analysis of the proportionality of the responses was completed. Since all students experienced the same didactic content, the only differences in their intervention was if they had a clinical patient experience. The

McNemar test or the Bowken's test of symmetry was used to evaluate changes in responses from baseline to post-program and the Mantel Haenszel row mean score test was used to assess whether the change in responses differed between those who had a clinical experience with a pregnant patient and those who did not. The primary outcome for the effect of experience was the change in their response values so that an increase was indicated by a positive number. Level of significance was set at ≤ 0.5 .

Results

A total of 95 DH students (n=95) completed the baseline survey for a response rate of 99%. At the end of the semester 93 DH students completed the post-program survey for a response rate of 87% (n=93). Ninety-three matched surveys were completed (n=93) for a response rate of 97% on the baseline and post-program surveys. The majority of the respondents were female (97%) and the average age at participation was 24 years. Over one-half of the participants (53%, n=46) reported having a pregnant patient experience facilitated through the pOHP. The most common types of care provided to pregnant patients included a comprehensive oral examination, oral health education, and completion of a prophylaxis. Sample demographics are shown in Table I.

Table I. Survey response rates by graduation year

Year	n	Baseline survey n (%)	Post-survey n (%)
2015	32	31 (97%)	30 (93.8%)
2016	30	30 (100%)	30 (100%)
2017	34	34 (100%)	33 (97%)
Total	96	95 (99%)	93 (97%)

Baseline data was collected to evaluate the educational gain and perceived value from the program. Table II illustrates responses to constructs of confidence, knowledge, and willingness, between the baseline and post-program data. A general increase in confidence for screening and counseling was noted, with 46% of the respondents (n=43) reporting increased confidence in examining a pregnant patient's mouth ($p=0.04$). Baseline willingness to implement prenatal oral health care education into their dental visits, when appropriate and needed, was positive; however, decreases were noted in post-program responses ($p=0.01$). Regarding concern for the safety of pregnant women to receive dental care while pregnant, 29% of the 2015 cohort demonstrated increased knowledge and 33% in the 2016 cohort; however, in 2017, only 6% indicated increased knowledge ($p=0.02$).

The majority of all post-program survey respondents agreed that the dental provider should perform oral health counselling to pregnant women (99%, n=93) and perform an oral health examination during prenatal care (99%, n=92). Nearly all respondents (98%, n=90) reported they are likely to take care of pregnant patients upon graduation and that they are likely to deliver preventive oral health messaging to pregnant women (98%, n=91).

The pOHP objectives also included infant oral health and early dental practices. Post-program responses demonstrated a high level of confidence with counseling women how to care infant gums and teeth (98%, n=91), and discussing timing of dental visits (99%, n=93). Eighty-six percent of post-program respondents (n=80) reported feeling confident in discussing proper infant feeding practices.

Participants were asked to provide attitudes and opinions regarding quality improvement for the pHOP education experience. These data demonstrate the trends of individual intraprofessional experiences and positive impressions of the pOHP resources. The majority of respondents favored other team-based rotations with dental students (91%, n=83) and continuation of the pOHP rotation (79%, n=72). Table III illustrates respondent feedback and program review data.

Discussion

Research strongly supports the safety and necessity for prenatal oral health.² The pOHP provides a platform for intra and interprofessional dental education and clinical practice to promote oral health care during pregnancy. Including DH students into this teaching and patient care model provides an opportunity to increase the oral health safety net for women during pregnancy. Dental hygiene student participation in the pOHP rotation promoted a more comprehensive approach to care while facilitating intra-professional education in an academic setting.

Overall, the pOHP received positive feedback from the DH students with a majority (73%) recommending that the program continue for future DH students. High response rates may indicate interest and eagerness to learn more and become involved. Negative feedback received from students focused on low numbers of patient experiences with a noted desire to have more opportunities to provide clinical and educational care for pregnant patients during their clinical education. The lack of exposure to pregnant patients during the respondent's individual rotation may have impacted those responses indicating diminished value in continuing the experience.

Differences in the various cohorts regarding safety of care during pregnancy were most likely impacted by their clinical

Table II. Comparison of survey responses for items rating confidence, knowledge, and attitude

Variable		Statement	Baseline Survey Data			Response Change			p-value
			Not Confident % (n)	Somewhat Confident % (n)	Confident % (n)	Decrease % (n)	No Change % (n)	Increase % (n)	
Confidence*	Screen	Examining a pregnant woman's mouth	6% (6)	16% (15)	78% (73)	13% (12)	41% (38)	46% (43)	0.04
	Counsel	Counseling pregnant women about their own oral health	5% (5)	28% (26)	67% (63)	15% (14)	47% (44)	38% (35)	0.32
Knowledge*	Safety	It is safe for pregnant women to have dental care during pregnancy	Disagree	Not Sure	Agree	Decrease	No Change	Increase	
			0	3% (3)	97% (91)	14% (13)	64% (60)	22% (21)	0.87
Attitude**	Willingness	How willing are you to implement prenatal oral health care education into your dental visits when appropriate/ needed?	1-4	5-7	8-10	Decrease	No Change	Increase	
			3% (3)	9% (8)	88% (83)	30% (28)	55% (50)	15% (14)	0.01

*Confidence and knowledge scales: 1 = not confident (strongly disagree) 2 = not very confident (disagree) 3 = somewhat confident (neutral) 4 = confident (agree) 5 = very confident (strongly agree).

A decrease by 1 unit was considered a decline in confidence/knowledge while an increase by 1 unit was considered an improvement.

** Attitude/willingness scale: 1-10, 1=not willing; 5=neutral; 10=very willing

Table III. Attitudes and opinions regarding the pOHP program experience

Post-survey Statement	Total Respondents (n)	Yes % (n)	No % (n)
Did your pOHP rotation give you the opportunity to work with a dental student in treating a patient?	94	73%(69)	27%(25)
Do you feel that the pOHP rotation provided you with an interdisciplinary experience of working as a dental team?	93	62%(58)	37%(35)
Do you feel that the pOHP rotation was a valuable component to your clinical education?	92	71%(65)	29%(27)
Would you recommend that the pOHP rotation continue for DH students?	91	79%(72)	21%(19)
Did you find the pOHP website helpful for patient education?	92	91%(84)	9%(8)
Would you use the pOHP website for patient education in private practice following graduation?	91	91%(83)	9%(8)
Based on this experience, would you recommend other clinical rotations for dental hygiene students to occur with dental students?	91	91%(83)	9%(8)

experiences. The 2017 cohort had the lowest number of DH students who were able to see a pregnant patient and only 6% of the respondents indicated a gain in knowledge regarding safety while providing care during pregnancy. When the results of the three cohorts were combined, respondents who reported treating a pregnant patient were more likely to rate increases in safety during the provision of care.

A general increase in confidence for screening and counseling of pregnant patients was noted. High knowledge levels for safety of treatment during pregnancy were noted at baseline and post-program. Baseline survey responses indicated consistent levels of willingness to implement prenatal oral health care education. However, decreases in willingness to implement prenatal oral health education were identified in post-survey feedback. This decrease in willingness may have been impacted by a negative clinical rotation experience, lack of clinical experiences with a pregnant patient, or inherent challenges of faculty calibration. Students may also have time management considerations and anxiety that a more thorough prenatal oral health education element would negatively impact completion of care in a time-structured setting. A similar decline in willingness to implement oral health education in prenatal care visits was observed in a study reviewing the outcomes of the UNC pOHP research studies with third-year medical students during their obstetrics and gynecology clerkships.²⁸ Multiple variables may produce negative affective changes including a difficult patient or lack of experience. Unanticipated events such as broken or cancelled appointments can impact one's perception and cause negative stereotyping that may lead to a belief that these patients are less likely to keep appointments. Poor clinical structure including a lack of organization, inability to identify resources, or a negative attending faculty experience can also impact attitudes in the learning environment. Research has demonstrated the impact that the learning environment, psychosocial interaction, culture, and teaching factors has on achieving student learning outcomes and student self-confidence.²⁹ Additional programmatic evaluation should be completed to better understand the underpinnings of this finding in order to make revisions for future students.

An overarching goal of the pOHP program includes the promotion of evidence-based practice behaviors in alignment with the content and goals of the *Oral Health Care During Pregnancy: A National Consensus Statement*.² High levels of familiarity with the prenatal oral health guidelines can positively impact practice behavior changes by increasing perceptions of knowledge and confidence in having adequate information and comprehension of standards of care.³⁰ If clinicians feel that they have been well educated, then they

may be more likely to practice according to the recommended guidelines. Experience with the guidelines may also provide them with the confidence to be leaders in their clinical practice settings. These educated and experienced clinicians could also share their knowledge with other colleagues who are either unaware of the current oral health guidelines for pregnant patients or are choosing to practice under the umbrella of outdated standards.

Inclusion of prenatal oral health in DH curricula should model practice standards and challenge novice learners to think beyond oral health. Pregnancy has systemic effects on the body, and there are multiple implications to the mother and baby if she is in poor health.³¹ While oral health is a key component in this equation, other factors such as diet, exercise, medication intake, pre-existing health considerations, and perinatal health concerns are all closely linked. Dental hygienists must be knowledgeable about prenatal health considerations and the systemic links to adverse pregnancy outcomes. Dental hygienists are well positioned to provide dietary as well as oral health counseling and have the skills to communicate with primary care providers to provide optimal and personalized care for pregnant patients.

Barriers preventing the inclusion of prenatal oral health in the dental curricula have been noted in several studies.^{24,25} Lack of time, priorities for completion of competences, lack of pregnant patients, are common reasons.²⁴⁻²⁵ These barriers are exacerbated by inconsistencies in individual practice behaviors from dental faculty and an unawareness of current national consensus guidelines.^{2,17,20} These challenges are often compounded by the finding that pregnant women tend not to seek dental care during pregnancy, and furthermore may be advised to avoid dental care by their obstetrician.^{2,17,20} Curricular integration across the health professions can increase awareness of the current practice standards and enhance knowledge and confidence for screening and counseling pregnant patients, as evidenced by the results of this study.

Respondents gave positive feedback regarding the intra-professional learning opportunities in this study. Post-program survey feedback noted these opportunities as a program benefit and indicated a desire to have more opportunities for intraprofessional student interaction. Learning in teams can not only enhance educational experiences while providing opportunities for peer-teaching and learning, but also modeling the intraprofessional care that is expected post-graduation.

Dental hygiene implications

Dental Hygiene programs are charged with educating students to be competent, practice-ready clinicians through curricula that is current, contemporary, and evidenced-

based. Development and implementation of the pOHP learning experience aimed to disseminate updated practice standards to the future dental and dental hygiene workforce. Creation of a prenatal curriculum can be modeled after the pOHP to include collaboration with other disciplines and provide experiential education. Multiple resources found on the pOHP website facilitate the implementation of such program into a variety of educational and clinical settings.²⁷ A focus on prevention and early intervention for infants and children provides an excellent opportunity to align with the changing landscape of health care and develop intra- and interprofessional learning opportunities. Educating dental hygienists who are adaptable to changing practice standards and leaders in patient care can be achieved with innovative curricula that challenges existing boundaries should be the goal of teaching future oral health care providers.

When considering the changing health care setting, it is important to envision the potential roles utilizing the skills of dental hygienists. One example of how dental hygienists can be incorporated into health care settings is Michigan's Grace Health, a nonprofit Federally Qualified Health Center (FQHC).³² Grace Health features a combination of medical and dental clinics. Dental hygienists may provide preventive services under indirect supervision from dentists employed by Grace Health with certification from Michigan's Public Dental Prevention Program. Under this indirect supervision model, an operatory was created in the obstetrics and gynecology clinic for pregnant patients to receive dental hygiene care. Each patient in the clinic receives at least one DH care appointment per trimester and one post-partum appointment. This care model includes preventive services, oral health counseling, and referral to the Grace Health dental clinic for patients without a dental home or presenting with urgent dental care needs. This team-based approach to whole-person care is an example of how the dental hygiene profession can bridge the gap between medical and dental providers and promote the provision of oral and systemic health care, in a timely, patient-centered manner.

Dental hygiene graduates should be prepared to practice in health care settings that include interprofessional models of care such as an FQHC. While an important design feature of the pOHP was to prepare all health care providers to screen, counsel, treat, and provide necessary referrals, the pHOP model does not currently provide for clinical education experiences. This is a key limitation to the pHOP program model and can be an opportunity to expand and enhance. Students may be able to acquire the didactic content, but there may be greater impact by having a clinical experience. This was evidenced in the results from this

study, with data demonstrating the influence clinical patient experiences regarding knowledge of the safety aspects for dental treatment during pregnancy. Respondents with fewer clinical experiences demonstrated fewer gains compared to cohorts with greater clinical experiences ($p=0.02$). Students with experiential educational opportunities in the curricula may be more confident to apply content learned rather than exposure to didactic content and simulation alone. Dental hygiene educators must include innovative teaching styles integrating a multi-disciplinary approach to challenge the practice mindset beyond the head and neck area and prepare clinicians for future dental hygiene workforce models.

Limitations and future research

This study had limitations. Changes within the pOHP clinical design during the three-year study period may have impacted individual student experiences. Additional limitations may include high patient broken appointment rates impacting the students' clinical experiences. The survey instruments were designed to gain program outcomes and feedback, limiting the generalization of the findings. Also, the survey reliability was not established. Future research should continue to examine the impact of combining didactic content and clinical experiences in caring for pregnant patients. Inclusion of intra and inter-professional educational designs would also provide value to the learning experience and model expectations for future oral health care providers.

Conclusion

Dental hygiene student participants in a prenatal oral health program (pHOP) demonstrated positive trends in increasing knowledge and confidence in screening and counseling pregnant patients in the dental setting. Inclusion of a clinical experience played an influential role in changes in knowledge regarding the safety of care during pregnancy, indicating a need for both didactic and clinical immersion opportunities to enhance cognitive and affective transformations. A solid foundation in prenatal oral health, including clinical experiences, will provide future clinicians with evidenced-based strategies to care for patients during pregnancy and the confidence to influence dental team members regarding the current standard of care for this population.

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