# INFANT AND TODDLER ORAL HEALTH: A SURVEY OF ATTITUDES AND PRACTICE BEHAVIORS OF NORTH CAROLINA DENTAL HYGIENISTS

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# ABSTRACT

VIVIANA R. RUIZ: Infant And Toddler Oral Health: A Survey of Attitudes and Practice Behaviors of Dental Hygienists in North Carolina
(Under the direction of Dr. Rocio Quinonez)

The purpose of this study was to evaluate the knowledge, comfort, practice behaviors, and stage of readiness and barriers of dental hygienists (DH) in North Carolina (NC) with respect to providing oral health care to infants/toddlers. A questionnaire was mailed to 2000 licensed DH practicing in NC randomly selected from the NC State Board of Dental Examiners database. The majority of respondents (99%) were female and working in private practice (94%). A high rate of DH are currently not providing care to infants/toddlers (59%), although two thirds of the respondents were contemplating the care for infants/toddlers. Significant barriers included lack of continuing education, unfamiliarity with the American Academy of Pediatric Dentistry guidelines, and current practice situation. DH highly value preventive care for infants/toddlers, however, strategies to increase comfort and diminish practice constraints should be considered to improve DH's stage of readiness to care for this population.

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To my thesis committee for their invaluable knowledge, trust and support. To my dear three kids: Edwin, Julie and Allison whom I love with all my heart. To Victor for his unconditional support. To Ms. Debbie Price for making it all possible.

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**TABLE OF CONTENTS**

## List of Figures

Figures

## List of Tables

Table

## List of Abbreviations

| | |
|---|---|
| DH | Dental Hygienists |
| NC | North Carolina |
| ECC | Early Childhood Caries |
| CE | Continuing Education |
| AAP | American Academy of Pediatrics |
| AAPD | American Academy of Pediatric Dentistry |
| ADA | American Dental Association |

# INTRODUCTION

Early Childhood Caries (ECC) is one of the most common chronic childhood diseases that predominantly affects children from low-income families.[1-3] The onset of the disease occurs as early as 12 to 24 months of age and affects the smooth surfaces of primary teeth. The disease progresses rapidly, undermining child's overall health, development, education and quality of life.[4] The provision of early guidance, emphasizing appropriate preventive oral health education in accordance to children's age is crucial to thwart the onset and progression of ECC.[5]

The American Academy of Pediatrics (AAP), recommends that the beginning of dental risk assessment should occur at 6 months of age and that the child considered with a high risk for dental caries should have established a dental home by the age 1.[7] In addition, the American Academy of Pediatric Dentistry (AAPD) and the American Dental Association (ADA) recommend that the first dental visit should occur no later than 12 months of age.[8] It is a concern that regardless of these policies, disparities in children's oral health still exist among diverse populations in America.[9]

With considerable evidence that timing of care is critical in the prevention of ECC,[1] and with the evidence that the DH has a primary position in the prevention of oral disease [10-14] the questions raised in this study are: What are the attitudes, values, knowledge, practice behaviors and stage of readiness of the dental hygienists (DH) regarding

infants and toddler's oral health care? And, what are the factors that influence DH's stage of readiness to provide preventive oral health services to infants and toddlers?

## REVIEW OF THE LITERATURE

Recent studies have provided evidence regarding the shortage of dental practices providing access to care for children under 3 years of age.[15-17] With dental disease on the rise among preschool aged children, it is imperative to appraise the willingness of health professionals to collaborate, as well as the barriers that prevent them from providing access to care for this cohort of the population. However, limited data exists on the attitudes of dentists and physicians[16- 18] and even less on other allied professionals. With DH at the core of the dental team, [19] they provide a window of opportunity to help deliver these services to those at highest risk for dental disease. Therefore, the purpose of this study was to determine the current knowledge, values, comfort, stage of readiness, practice behaviors and barriers of DH in NC to provide care to infants and toddlers. A second goal was to assess the factors influencing their practice behaviors and stage of readiness for the delivery of preventive oral health services to this cohort.

### The Surgeon General Oral Health Report

The Surgeon General Report on Oral health in America emphasized that oral health in America has improved in this century, [1] however, minority populations are still suffering with the struggles of oral disease. The Surgeon General's Report, reviews the contribution of health professionals towards the achievement of oral health emphasizing the effectiveness of health promotion and education of patients for the prevention of oral

diseases. However, it states sadly the breach between research findings, disease prevention and health promotion practices. The report further reaffirms the role of the oral health professionals focusing mostly on a team–based practice for the prevention and treatment of oral disease. There is a calling to the health care providers to take advantage of initiatives and ideas from others to accomplish better oral health for the populations.

**The American Academy of Pediatrics and The American Academy of Pediatric Dentistry Guidelines on Children Oral Care**

In 1986 the AAPD developed a policy statement on infants to promote oral health and disease prevention. The policy states that an oral health risk assessment is necessary for infants by 6 months of age.[8] This assessment contributes for the institution of appropriate preventive strategies as the primary dentition begins to emerge.[20] Nearly two decades later (2003), the AAP released a new policy regarding children. This policy was specific for the care and prevention of oral diseases in children 6 months of age. The recommendation in this policy is that all infants receive an oral health assessment from a health care provider by the age of 6 months and higher risk children be referred to a dentist for preventive care and parent education at or before 12 months of age.[6, 7] In 2008 this policy was further modified so all children receive a dental referral except in situations where limited dental workforce exists. It is a concern that despite these policies changes, still many disparities in infants and toddlers oral health exist.[9]

**Children's Oral Health Problems and their Consequences**

Dental care is the most common oral disease and unmet needs of children[11, 21] raisings questions of education and attitudes of dental professionals in relation to young

children's care.[12] The oral cavity relates to the entire body and it is imperative to care for the oral health of individuals beginning at an early age. Oral and craniofacial conditions, immunologic, neuromuscular, nervous, pulmonary, are some of the many needs of infants and toddlers. When these needs are not taken care of, the overall wellbeing of the children can be compromised including affecting learning, excessive expenses for parents, and psychosocial outcomes.[4, 20] Many of oral conditions can be prevented, however, by taking preventive measures early and even before the baby is born, such as acid folic intake, alcohol, and tobacco use. Also, recognizing parents' oral health problems like periodontal disease, and caries can diminish the risk of transmitting these diseases to their babies.[22]

**The Primary Care provider: Attitudes, and Practices**

Primary care physicians play an important role in the overall health of children. The pediatrician and the family doctor are the first health care professionals in contact with this population. In essence, they see a large percentage of infants and toddlers. Pierce et al [18] reported that training of primary physicians and pediatricians for at least 2 hours on oral risk management produced an adequate level of accuracy in identifying and referring children at risk for oral problems to the dentist. They also found that dental screenings could be easily being incorporated into a primary medical practice.

**Dental-Medical Partnership**

One of the recommendations found on the Surgeon General's report was to work together in a multidisciplinary approach to procure and solve the devastating lack of oral

health in children.[1] Mouradian et al. [23] described several educational training strategies targeted to physicians and dentists to work together for better oral health in children and families. Studies have reported the need for a teamwork approach for the prevention and treatment of oral disease in children.[24-26] It is relevant to point out the need to expand the responsibilities of the dental hygienist in the diagnostic and prevention of oral disease in children.

**The Effect of Early Preventive Dental Visits**

Savage et al. stated that there is enough scientific to support a need for improvement in the oral health care strategies towards children.[27] It is necessary to assess the attitudes, knowledge and practice of oral health professionals to find solutions to the problem. ECC is a preventable condition but prevention is critical and an early risk assessment is of a high importance. It has been reported that children who had their first preventive dental visit by the age 1 were more likely to have consequent preventive visits, [28] but less likely to have subsequent restorative or emergency visits.[27-29,] In their rationales, Savage et al. [27] also emphasized that education from the dental professional to the children's parents played a significant role.

**The Dental Hygienist's Roles and Responsibilities**

Mertz and Mouradian described the role of allied dental professionals in the prevention of oral disease in children in various parts of the United States.[13] As some states allow DH to work in a different setting without the supervision of a dentist, many others like North Carolina have limited expansion of professional roles and

responsibilities of DH. Suggestions have been made to give more responsibilities to DH to procure an easier access to dental care for underserved populations.[30] Wing P et al [31] reported that in those states with more permissive laws for DH scope of practice there was a higher use for oral health services and better oral health outcomes.

**Early Childhood Caries: Knowledge, Attitudes and Practice Behaviors of DHs**

Manski and Parker [32] recommend increasing education of DH regarding ECC. There is a need for more training in the undergraduate level and more continuing education for the working professional. In addition, there is a need for new laws that allow DH to expand their involvement in the treatment of oral disease in children. The authors also stated that DH would benefit from more knowledge on preventive oral care for children based on intensive education in the undergraduate and professional levels.

## INTRODUCTION AND REVIEW OF THE LITERATURE

Early childhood caries (ECC) is one of the most common chronic childhood diseases affecting children predominantly from low-income families.[4, 22] the onset of (ECC) occurs as early as 12 to 24 months of age and affects the smooth surfaces of primary teeth. The disease progresses rapidly, undermining child's overall health, development, education and quality of life [5, 13, 16, 33, 34] Thus, the provision of early guidance, emphasizing developmentally appropriate preventive oral health strategies is crucial to thwart the onset and progression of ECC.[10] With the dental hygienist (DH) playing a critical preventive role in the dental team it is imperative that DHs become intricately engaged in the efforts to reduce ECC.[23, 35] Yet little is understood about their attitudes, values, knowledge, practice behaviors and stage of readiness regarding infants and toddler's oral health care. This study aims to address these questions and help identify factors that influence DHs' stage of readiness to provide preventive oral health services to infants and toddlers.[8]

In 1986 the American Academy of Pediatric Dentistry (AAPD) developed a policy on infants to promote oral health and disease prevention.[8] The policy currently states that an oral health risk assessment is necessary for infants beginning at 6 months of age and the establishment of a dental home by age 1 to contribute to the institution of appropriate preventive strategies as the primary dentition begins to erupt. In 2003, the American Academy of Pediatrics (AAP) released a new policy indicating a shift in recommendation

of the first dental visit from age 3 years to age 1 for those at high risk.[6] The policy has been updated to reflect universal referral except in situations when limited dental workforce exists.[7]

Despite these policies dental care continues to be one of the most unmet needs of children.[11] raising the question of education and attitudes of dental professionals in relation to children's care.[12] In their recent work, Mertz and Mouradian describe clearly the role of allied dental professionals in the prevention of oral disease in children: "Allied dental professions are essential members of the dental team; they complement the dentist and improve the efficiency and effectiveness of dental care." [13] Seale et al, [14] indicated the need to better utilize allied dental professionals to expand access to care for children from underserved populations as well as the selection of pediatric dentists to received training based on their desire to care in underserved areas.

In a study of DH in Maryland, Manski and Parker[32] reported the most recent information about DH knowledge, attitudes, and practice behaviors regarding children oral health care. They found that a substantial portion of their sample population of DH lacked knowledge about early childhood caries (ECC) as an infectious and transmissible disease and had a very low concern about the importance of nutritional counseling. Though 81% of DH in the Maryland study believed prevention of ECC should begin at the time of tooth eruption, experience and type of practice were related to the knowledge and practice of prevention of ECC. More experienced DH appeared more likely to have knowledge about ECC prevention protocols, as well as DH that worked in practices that

accepted Medicaid patients. Their study further demonstrated high evidence of underutilized fluoride varnish and a low percentage of DH offering nutritional counseling. The authors emphasized a need for more training at the undergraduate level, greater continuing education for the working professional, and need for assessment of current laws to allow DH to expand their involvement in the treatment of oral disease in children. Not addressed in the Maryland study were the stages of readiness and the willingness of DH in conjunction with the barriers preventing them from providing care to infants and toddlers. The purpose of this study was to evaluate the knowledge, comfort, values, practice behaviors, and stage of readiness, and the barriers of DH to providing oral health care to infants and toddlers in North Carolina (NC).

# RESEARCH DESIGN AND METHODOLOGY

## Survey and Study Design

A cross-sectional survey study design was used to assess DH oral health practices for infants and toddlers. The survey was based on a questionnaire developed for general dentists at the University of North Carolina at Chapel Hill School of Dentistry; Department of Pediatric Dentistry that focused on the same topic. The current survey was modified to address similar questions with dental hygienists and an additional section added to address barriers that might hinder the willingness of DH to provide dental care for infants and toddlers. The survey had a total of 61 questions in 12 sections that corresponded to the following primary domains: behaviors, values, stage of readiness, comfort/confidence, agreement (knowledge), barriers, AAPD guidelines awareness, continuing education, educational background, practice setting, and demographics. For the barriers section, the model by Cabana et al.[36] on physicians' adherence to practice guidelines was used to develop the questions and to assess the responses. The survey was pilot tested by five DH and reviewed by the research committee members to ensure feasibility and validity.

## Sample Description and Selection

A list of licensed registered DH was obtained from the NC Board of Dental Examiners. Approximately 2000 dental hygienists were randomly selected. The selection

criteria were: graduation between 1998-2010, practicing full time or part time in a private or public practice in NC. Retired DH, DH practicing outside the state or abroad and those working in specialty practices were excluded.

**Procedures**

After approval by the Biomedical Institutional Review Board of the University of North Carolina at Chapel Hill, the survey was mailed in the Spring 2011. Participants were asked to complete the survey and return it in a provided envelope. Following the Salant and Dillman's method.[37] a post card reminder was sent to all participants one week after the initial mailing; three weeks later a letter and replacement questionnaire was sent to non-respondents and finally seven weeks after first mailing, a letter and questionnaire was sent to non-respondents. Random identification numbers were assigned to each subject. Teleform format was used to develop the survey instrument simplifying the process of data entry. All results remained anonymous with no personal identifiers included on the survey. Only the research assistant had access to the linkage file connecting the survey identification number with the personal identifiers used to contact potential respondents. All data was stored in a password-protected database that was only accessible to the research team and statistician.

For the stage of readiness, the five' stage model of pre-contemplation, contemplation, preparation, action, and maintenance was used (Prochaska 2008). [38] The model identifies five stages of readiness (Figure 1.) For the purpose of this study, the model was simplified to three stages: [39-41] action/maintenance, contemplation/preparation and pre-contemplation as a way to increase power:

- The pre-contemplative phase is referred to the stage of no activity. DH in this stage have no intention to be involved in caring for infants and toddlers preventive care in a predictable future. They may be unaware or under informed of the implications of not providing care or have become unmotivated about the capability to do it after trying several times.
- Providers in the contemplative/preparation stage are beginning to consider and talk about providing care. There is awareness about meaning or implications of caring but may be ready for a commitment to take action in the next 6 months.
- Providers in the action/maintenance stage are actively involved in caring for infants and toddlers. There is commitment of time and energy, interest, awareness, and willingness to provide preventive care to children 0-2 years old.

Using SAS version 9.2 (SAS Institute Inc, Cary, NC) descriptive statistics were used to assess practice behaviors, knowledge, comfort, values and demographics, bivariate and proportional odds model analysis was conducted. For the proportional odds model, the primary outcome variable was the stage of readiness of DH to care for infants and toddlers in their practice. Level of significance was set at 0.05 for all analyses.

## RESULTS

The response rate was 43% (N=859), with usable surveys meeting the inclusion criteria at 38% (N=758). The majority of respondents were females (99%) and working in private practice (94%). Seventy four percent held a certificate or associate DH degree, and 63% reported providing patient care more than 30 hours per week.

Forty two percent (N=316) of DH responded currently being active in providing preventive care to infants and toddlers. 39% (N=297) indicated not delivering these services but were willing to do so (contemplators) and 19% were not delivering these services or willing to consider at this time. Of the contemplative group, 10% (N=31) reported being very likely to make changes to provide care to children less than 3 years old in the next 6 months. (Figure 2).

Bivariate analysis (Table 1) demonstrated significant differences between stage of readiness and age (P-value=0.009), years since graduation (P-value=0.0003), and number of patients insured by Medicaid (P-value=0.012). Younger DH were more active when compared with the older DH who tended to be more pre-contemplative. Graduates in the past eight years were more active than those with more than nine years since graduation. When comparing the percentage of providers accepting patients' insured by Medicaid, those in the pre-contemplative stage showed a complete negative shift in the distribution, meaning that these providers do not accept Medicaid insurance.

**Practice Behaviors**

While only 4% of respondents reported usually caring for 0-2 years old and 44% reported frequently providing care to 3-6 years old patients. Only 13% reported their practice accepting children 6-18 months old for 1st dental visit. Eighteen percent reported accepting children for the 1st dental visit beginning at 24 months old and 52% at 3 years old. The majority of respondents reported providing preventive care to 6-12 year old patients (83%). Figure 3 explains in detail the practice behaviors in relation to this study. When asked how often they discuss preventive oral health guidelines with caregivers related to caries prevention, 83 % of DH reported often. When asked how often they counsel caregivers about their child's development 66 % responded often.

**Values/ Comfort /Confidence**

DH reported a high value for preventive care of infants and toddlers (75%). They also reported feeling highly confident in providing proper preventive care to infant/toddlers (62%) as well as discussing proper infant/toddler feeding practices (82%). However, only 41% felt comfortable dealing with a crying infant. The bivariate analysis of value levels was significant (<.0001) (Table 2), reinforcing that DH in the active stage have higher values for the preventive care of infants and toddlers. Furthermore, the active providers tend to be more comfortable and confident than those in the pre contemplative stage of readiness (<.0001).

**Knowledge about Infants and Toddlers Preventive Oral Health Care**

DH's level of agreement (knowledge) about infants and toddlers preventive care was mixed. While responding correctly to nutritional questions (76%), questions about infectious nature of ECC (37%), preventive care guidelines (86%), and fluoride protocols (37%) were responded incorrectly. (Figure 4).

Bivariate analysis (Table 2) demonstrated that DH who reported awareness about the infant oral health AAPD guidelines were more likely to be in the active stage when compare to those that did not have AAPD guidelines familiarity (<. 0001). However, a high percentage of active dental hygienists reported no awareness of guidelines (38%). Additionally, DH who had not taken CE courses on this topic were more likely to be in the pre-contemplative and contemplative stage of readiness when compared to those reporting haven taken CE.

**Barriers**

Table 3 shows statistically significant barriers perceived by DH in relation to their stage of readiness (P-value=<0.0001). DH perceived that lack of education on infants/toddlers care (26%), awareness about guidelines (37%), continuing education opportunities (20%), and practice constraints (50%) as barriers for the provision of preventive oral health care to infants and toddlers.

The overall barrier median procedure supports that there is a statistically significant difference in the perceptions of barriers between DH and their stage of readiness in providing preventive oral care to infants and toddlers. DH in the active stage are more

likely to overcome the barriers to provide care than those in the contemplative and pre-contemplative stages (P-value=<.0001).

A proportional odds model was used to demonstrate what factors predicted the stage of readiness of DH to provide preventive care to infants and toddlers. The primary variables: (provider characteristics) did not add significantly to the outcome beyond the variables that were theoretically related to the stage of readiness (Figure 5).

The odds ratios (Table 4) for comfort level in providing infant and toddler oral health and time as a barrier indicated that for a unit increase in comfort level (increase implies greater comfort), individuals are 2.70 times more likely to be in the action stage than in the pre-contemplation stage (P<0.0001) and 2.99 times more likely to be in the contemplation/preparation stage than in the pre-contemplation stage (P<0.0001). An increase in the time as a barrier variable (increase implies more of a barrier) is protective with respect to the action and contemplative stages. Respondents who perceive time to be less of a barrier to the inclusion of infants/toddlers in their practice are more likely to be in the action stage or in the contemplative stage.

## DISCUSSION

This study aimed to asses the attitudes, comfort, knowledge, practice behaviors, and stage of readiness of DH to provide care for infants and toddlers, and to measure the barriers that DH encounter to provide preventive oral care to this population. Our findings indicated that while DH valued infant and toddler oral health, there was a lack of knowledge in this area. Furthermore, DH' readiness to care for infants and toddlers was proportional to their comfort on providing care and inversely related to practice constraints suggesting that DH have significant barriers to overcome in order to successfully embrace their involvement in the care of young children's oral health.

Our findings were consistent with Mansky and Parker[32] indicating lack of DH' knowledge on infants and toddlers oral health. Both studies were framed to assess the knowledge about preventive care to infants and toddlers including awareness about pediatric dental practice guidelines. NC DHs reported being comfortable in providing preventive oral care, however, their responses suggested that the majority lacked proper knowledge on the pediatric dental practice guidelines for infants and toddlers. While Mansky and Parker's study found underutilization of fluoride varnish for children, we found that knowledge about fluoride protocols for infants less than 6 months of age to be surprisingly low.

. NC DH' practices seem to offer opportunities to take CE courses on children oral health care, however DH reported not taking such courses. This finding is consistent with

limited opportunities in CE designated to early childhood dental care. Findings from this study support the importance of promoting further CE for all primary health care providers in this area of oral healthcare. An example of these opportunities is the Smile for Life, [42] a national oral health curriculum available online free of charge. This site has been developed by the Society of Teachers of Family Medicine Group on Oral Health and contains several basic oral health courses designed to enhance the role of primary care physicians in the promotion of oral health for patients of all ages. Taking advantage of these resources can help diminish knowledge barriers and motivate providers to make changes on their practices.

Our study also provides important information about the readiness of DH to provide preventive care in early childhood and the factors influencing their willingness. McFarland et al.[43] conducted a similar project aimed to assess the readiness of general dentists in NC for this cohort. . They found that for every unit increase in comfort general dentists were 3.12 times more likely to be in the active/maintenance stage of readiness than in the contemplation/preparation stage, and 5.55 times more likely to be in the action/maintenance stage than in the pre-contemplation stage. Our findings also indicated that higher levels of comfort relate to individuals in the action/maintenance stage rather than in the pre-contemplative stage. Weinstein[44] in his work on behavioral problems in the utilization of new technology to control caries: patients and provider readiness and motivation suggested that knowing more about the providers practice behaviors and the assessment of knowledge and use of newer technologies may be a key to motivate providers to change. He also referred to motivational interviewing as a way to equip providers with strategies to move from pre-contemplation to action stages. Casebeer et

al.[45] reported that internet education for physicians based on data collected from their own offices and the assessment of their needs were related to changes in practice behaviors. We also suggest that knowing what are the factors that affect the providers' comfort and the barriers that hinder their confidence may be a successful approach to find strategies for motivation to change from a pre-contemplative stage to action.

Cruz et al.[46] in their work on oral health care providers readiness to provide behavior counseling and oral cancer screening reported that there was underutilization of guidelines by oral health care providers. They stated that there was a need for the development of aids to increase the awareness of guidelines. Parallel to their findings, our study shows that DH lack awareness on the guidelines for infant and toddlers oral care hindering their readiness to become active providers. We suggest the need for greater efforts to motivate the dental team as a whole to learn and adopt the guidelines on infants and toddlers oral care. These will assist in the motivation of the dental team to target practice constraints.

Edelstein remarks that the number of DH and DH' programs have increased in the last decade in comparison to dentists and dental schools.[35] Furthermore, if practice constraints are diminished, and pediatric education is offered, DH can provide a major preventive role in the decrease of ECC. Fein et al.[47] found that increasing confidence in students in their 4$^{th}$ year of dental school and exposing them to a tool kit on infant and toddler oral care increased their motivation to provide care to this population. It is important to mention that cultural proficiency also played a significant role in the comfort of those students that could speak their patient's first language.

We also found that practice constraints to be a major barrier for DH to move through the stages of change. We began the process of barriers' assessment using the Cabana et al.[36] framework to assess physicians' adherence to practice guidelines. Based on factor analysis, we divided the most important barriers in three categories: Knowledge (education), practice behaviors and attitudes. Practice constraints and education were the most significant variables affecting the stage of readiness of DH in NC. It may be a key to further this study to a more in detail assessment of the answers of the participants to find out strategies to develop oral health provider's comfort and to target practice constraints. It would also be important to motivate general dentists since they are the head of the general dental practice to better utilize allied dental professionals to improve access to this cohort of children. Since motivating providers to deliver preventive oral health services to infants and toddlers can be complex, strategy development needs to be broad and systems based. Simpson[48] suggested the importance of sustainable initiatives by using this approach. So while focused and individualized strategies that target their office-practice behaviors and their motivation to offer care as a way to benefit their practice and the community are key, systems that help support these initiatives merit further attention. Among them, are broader policy agendas to assure improvement in reimbursement so that adequate care for all children at risk is offered. To best achieve this broader systems approach to the oral health care of young children, collaboration across and within disciplines are key.

The oral health in America report recommended elimination of oral health disparities by encouraging inter-professional collaboration in conjunction with the community and policymakers.[49] Wilder et al.[50] suggested that it is vital that the dental

profession find its way to the collaborative care. They also suggested that the biggest challenge dentistry faces is the incorporation of other professions into the dental curriculum.[40] Based on their suggestions we also recommend that the dental profession should focus on addressing the internal barriers within the profession and expand the access to care for young children. In addition, collaborative efforts should be made to transform the dental hygiene curriculum to increase DH comfort in order to affect their stage of readiness to provide care to this underserved population.

It is of high importance to create a baseline program that can provide complete access to care for children particularly those most in need. General dentists and DH are an important adjunct to the pediatric dentist to providing primary and secondary prevention in clinical practice. This study highlights important factors that affect directly to the process of change in behavior of providers to care for populations in need. The complexity of the barriers to provide preventive care to infants and toddlers can be managed developing strategies that systematically address the education and collaboration efforts necessary to get to children at an early stage so oral health prevention can be maximized and oral disease controlled.

The strengths of this study are the large sample size and the used of a unique framework as the foundation to assess barriers to provide care. However, this study should be considered in the context of its limitations. First are the possible response bias, poor memory, and/or content misunderstanding inherent in any survey study design. Second, the sample is limited to NC DH, preventing generalizability to the entire country.

# CONCLUSION

This study found that DH highly value preventive care for infants and toddlers. However, strategies to increase comfort and diminish practice constraints should be considered to improve DH's stage of readiness to care for this population. Such strategies should begin in dental and dental hygiene education through clinical training for the entire dental team. Both didactic and clinical experiences in the academic program will be key to helping oral healthcare providers feel comfortable in providing these services to infants and toddlers in clinical practice.

# APPENDIX

## A. Survey Instrument

UNC SCHOOL OF DENTISTRY
Department of Dental Hygiene

ID #: ☐☐☐☐

CHILDREN'S ORAL HEALTH SURVEY 2011
For Dental Hygienists

**Thank you for taking the time to complete this important survey and for providing your comments.**

**Please write directly on the survey with a BLACK BALLPOINT PEN. We ask that you answer all the questions to the best of your ability. Read each question carefully and provide your most appropriate response. Choose only ONE response per question. Fill in circles completely or fill in the boxes and blanks as needed. Write your answer as neatly as possible using print (not cursive) letters and numbers.**

**When completed, please fold the survey in half and place it in the enclosed business reply envelope and mail it back to us. Thank you again for your participation.**

| **A. These questions refer to your *CURRENT practice behaviors.*** | Never | Rarely | Sometimes | Often |
|---|---|---|---|---|
| 1. How often do you provide preventive care to 0 - 2 year olds? | ○ | ○ | ○ | ○ |
| 2. How often do you provide preventive care to 3 - 5 year olds? | ○ | ○ | ○ | ○ |
| 3. How often do you provide preventive care to 6 - 12 year olds? | ○ | ○ | ○ | ○ |
| 4. How often do you discuss preventive oral health guidelines with caregivers related to caries prevention? | ○ | ○ | ○ | ○ |
| 5. How often do you counsel caregivers about their child's dental development? | ○ | ○ | ○ | ○ |

**B. On a scale of "1 to 10" how important do you feel it is for the dental hygienist to provide preventive care to infants and toddlers?**

**(fill in ONE circle)** Not important ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 Very important

**C. At what age does your practice accept children for their first dental visit?**

○ 6 - 18 months ○ 24 months ○ 3 years ○ 4 years ○ 5 years ○ 6 + years

**D. Do you provide preventive care for infants and toddlers in the practice?** ○ Yes --> Skip to Section F ○ No --> Continue to Section E

**E. These questions refer to your *willingness and readiness* to provide preventive oral care to infants and toddlers independent of your practice situation.**

1. Independent of your current practice situation, would you be willing to care for infants' and toddlers' oral health in your practice? ○ Yes –> Continue to #2 ○ No –> Skip to Section F

2. How willing are you to implement a preventive infants' and toddlers' oral health program?

(fill in ONE circle) Not Willing ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 Very willing

3. How likely are you to make changes to providing preventive oral health care for infants and toddlers in the next 6 months? ○ Not likely ○ Somewhat likely ○ Very likely

Revised 03/2011

**SURVEY 2011- Page 2** | **ID #:**

**F. These questions refer to your level of *comfort and/or confidence* in providing preventive oral health care to children 0-3 yrs.**
**How comfortable and/or confident are you:**

| | Very Uncomfortable | Uncomfortable | Somewhat Comfortable | Comfortable | Very Comfortable |
|---|---|---|---|---|---|
| 1. Performing an infant or toddler oral health examination? | ○ | ○ | ○ | ○ | ○ |
| 2. Properly positioning an infant or toddler (0 - 36 mo old) for an examination? | ○ | ○ | ○ | ○ | ○ |
| 3. Dealing with a crying infant or toddler? | ○ | ○ | ○ | ○ | ○ |
| 4. Assessing dental caries in infants or toddlers? | ○ | ○ | ○ | ○ | ○ |
| 5. Explaining the infectious nature of early childhood caries and bacterial transmissibility from caregiver to child? | ○ | ○ | ○ | ○ | ○ |
| 6. Providing preventive services such as fluoride varnish on infants or toddlers? | ○ | ○ | ○ | ○ | ○ |
| 7. Discussing proper infant or toddler feeding practices with caregivers? | ○ | ○ | ○ | ○ | ○ |
| 8. Recognizing dental/oral abnormalities in infants or toddlers? | ○ | ○ | ○ | ○ | ○ |

**G. Please indicate your level of *agreement* with the following statements regarding dental care for infants and toddlers.**

| | Strongly Disagree | Disagree | Unsure | Agree | Strongly Agree |
|---|---|---|---|---|---|
| 1. Only bottle-fed children are at risk of Early Childhood Caries. | ○ | ○ | ○ | ○ | ○ |
| 2. Early Childhood Caries is an infectious, transmissible disease. | ○ | ○ | ○ | ○ | ○ |
| 3. Infants less than 6 months old should receive fluoride supplements if no fluoride water source is available. | ○ | ○ | ○ | ○ | ○ |
| 4. The age one dental visit is effective in prevention of Early Childhood Caries. | ○ | ○ | ○ | ○ | ○ |
| 5. Fluoride varnish is safe and effective and should be recommended for infants and toddlers. | ○ | ○ | ○ | ○ | ○ |
| 6. Pediatric patients should receive the first dental exam by three years of age. | ○ | ○ | ○ | ○ | ○ |
| 7. Pacifier use is protective against Sudden Infant Death Syndrome (SIDS). | ○ | ○ | ○ | ○ | ○ |
| 8. Pediatric patients ages 1-6 years should drink 8-12 ounces of juice per day. | ○ | ○ | ○ | ○ | ○ |

**SURVEY 2011 - Page 3** | **ID #:**

**H. Please indicate your level of *agreement* with the following statements regarding the provision of preventive oral health services to infant and toddler in your practice.**

| | Strongly Disagree | Disagree | Unsure | Agree | Strongly Agree |
|---|---|---|---|---|---|
| 1. I lack education on infants' and toddlers' preventive oral health care. | O | O | O | O | O |
| 2. My current practice situation doesn't offer me an opportunity to deliver preventive oral health care to infants and toddlers.. | O | O | O | O | O |
| 3. I lack time in my practice schedule to provide preventive oral health care to infants and toddlers . | O | O | O | O | O |
| 5. Infant/toddler preventive oral health care is disruptive to my current practice flow. | O | O | O | O | O |
| 6. I have concerns over legal risks when I give preventive oral health care to infants and toddlers. | O | O | O | O | O |
| 7. I believe reimbursement for infant and toddler preventive oral health care is inadequate. | O | O | O | O | O |
| 8. I lack parent acceptance of the dental hygienist providing infants' and toddlers' preventive oral health care and counseling. | O | O | O | O | O |
| 9. In my practice, medical history/software is not set up to prompt for appropriate questions or record responses about infants' and toddlers' preventive oral health care. | O | O | O | O | O |
| 10. I lack definitive evidence to indicate the need for preventive oral health care for infants and toddlers. | O | O | O | O | O |
| 11. I lack continuing education opportunities. | O | O | O | O | O |
| 12. I lack awareness about the guidelines on preventive oral health care for infants and toddlers | O | O | O | O | O |

**I. Are you familiar with the American Academy of Pediatric Dentistry guidelines on infant oral healthcare?**

O Yes O No O Not sure

**J. In the past 24 months, have you taken any continuing education courses encompassing infants' and toddlers' oral health?**

O Yes O No O Not sure

**K. How would you rate your dental hygiene school curriculum regarding infants' and toddlers' oral health?**

O Very poor O Poor O Good O Very good O Not sure

**L. The following questions correspond to your *practice setting*: (Please choose ALL that apply)**

1. Which of the following best describes your primary practice type?
   O Group private O Solo private O Public health O State or Federal Government O Other (please specify) _____

2. Which of the following corresponds to your primary practice specialty?
   O General practice O Pediatric O Orthodontics O Periodontics O Other (please specify) _____

3. Which best describes the location of your practice? O Urban O Suburban O Rural

4. On average, how many hours per week do you provide direct patient care?
   O 1 - 10 O 11 - 20 O 21 - 30 O 31 - 40 O 40 +

5. What percentage of patients in your practice are insured by Medicaid or Healthy Choice? ☐☐☐ %

**SURVEY 2011- Page 4** | **ID #:**

**M. These questions refer to the "Baby Oral Health Program" kit (bOHP)**

1. Does your office have the "Baby Oral Health Program" kit (bOHP)? ○ Yes --> Continue to Question 2 ○ No --> Skip to Section N ○ Not sure --> Skip to Section N

2. If yes, to what extent have you reviewed the bOHP kit?
(fill in ONE circle) Not thoroughly ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 Very thoroughly

3. How useful have you found the bOHP kit?
(fill in ONE circle) Not useful ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 Very useful

4. Which component of the kit have you found most helpful? Please rank from 1 to 4 with 1 being the most helpful and 4 being the least helpful.
a. DVD ☐ b. Flip chart ☐ c. Clinical form ☐ d. Supplemental forms ☐

5. Has this kit had any influence on your practice behaviors? ○ Yes ○ No ○ Not sure

**N. The following questions correspond to demographic information:**

1. Your age? ○ < 30 ○ 30 - 40 ○ 41 - 50 ○ 51 - 60 ○ > 60

2. Gender? ○ Male ○ Female

3. What year did you graduate from dental hygiene school? ☐☐☐☐

4. In which state did you graduate from your dental hygiene program? ☐☐

5. What is your highest degree? ○ Certificate ○ Associate's Degree ○ Bachelor's Degree ○ Masters ○ Doctorate

**Feel free to share your comments with us:**

**THANK YOU FOR YOUR PARTICIPATION!**

## FIGURES AND TABLES

**Figure 1.**

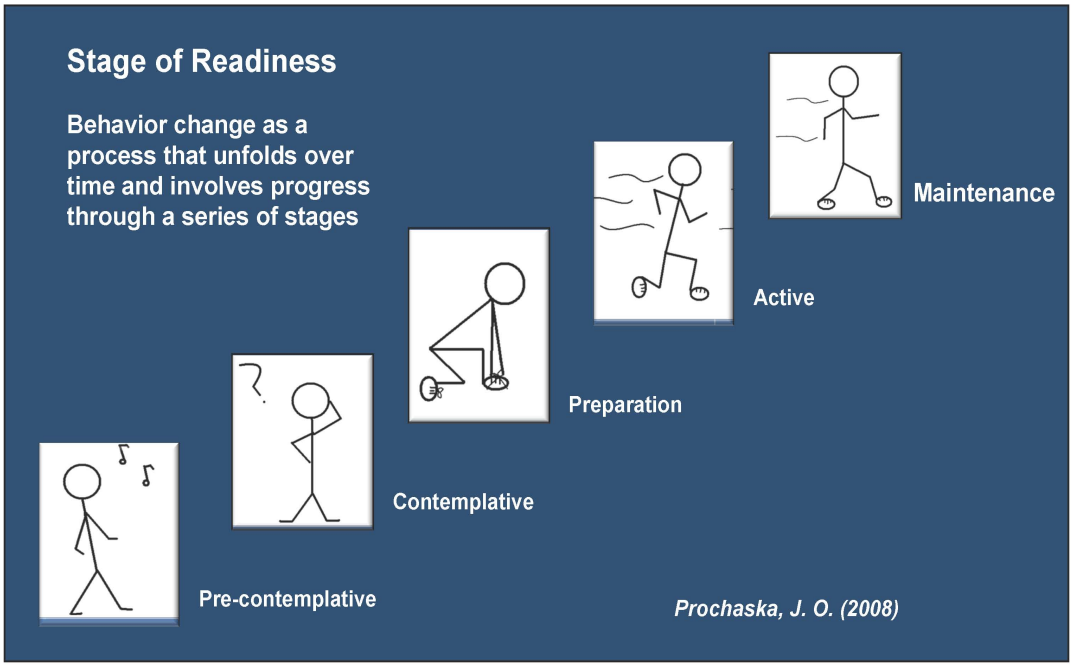


**Figure 2.** Results

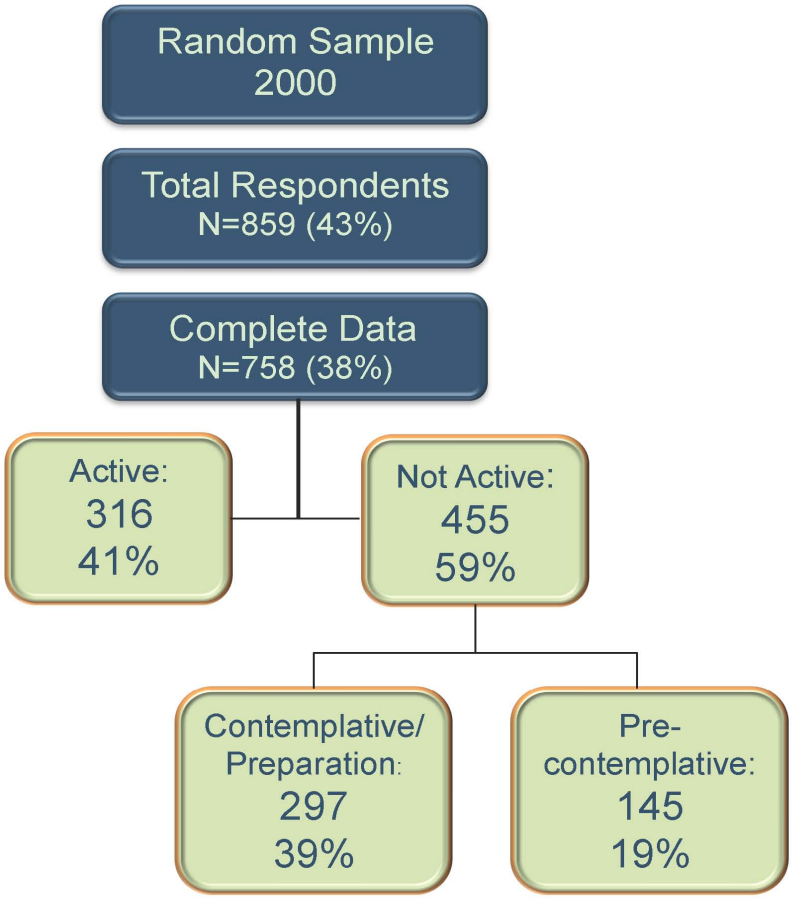


**Figure 3.** Practice Behaviors of NC DH in relation to infants and toddlers.

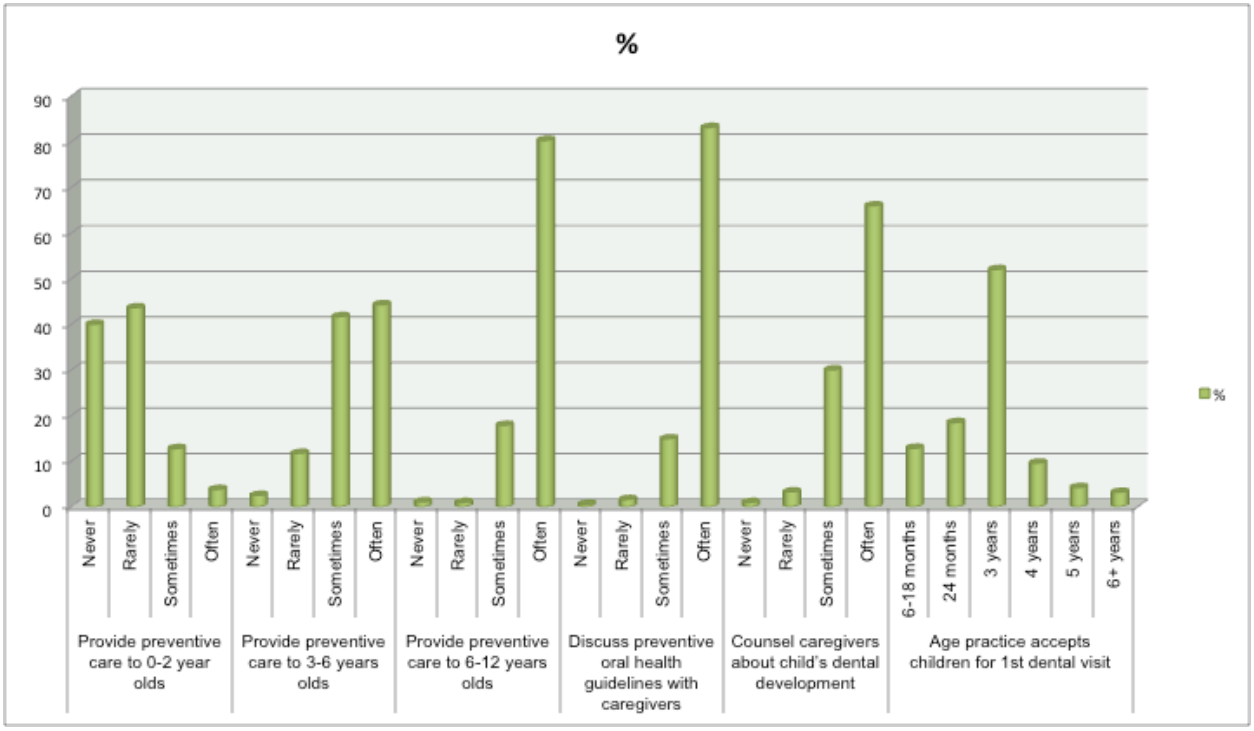


**Figure 4.** Level of Agreement (Knowledge) of DH about Infants and Toddlers Oral Care

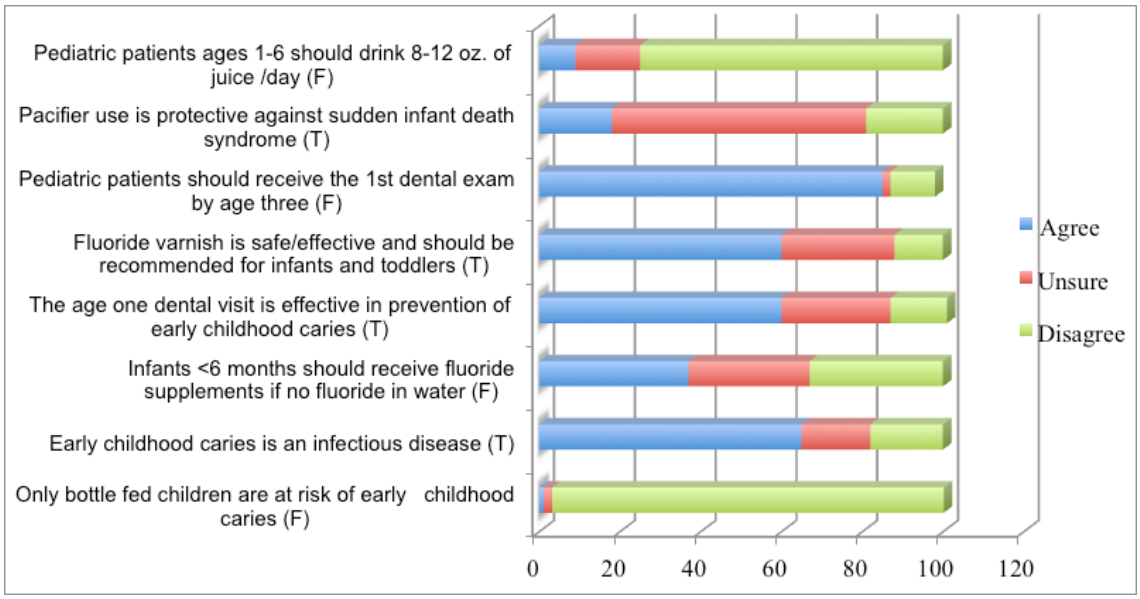
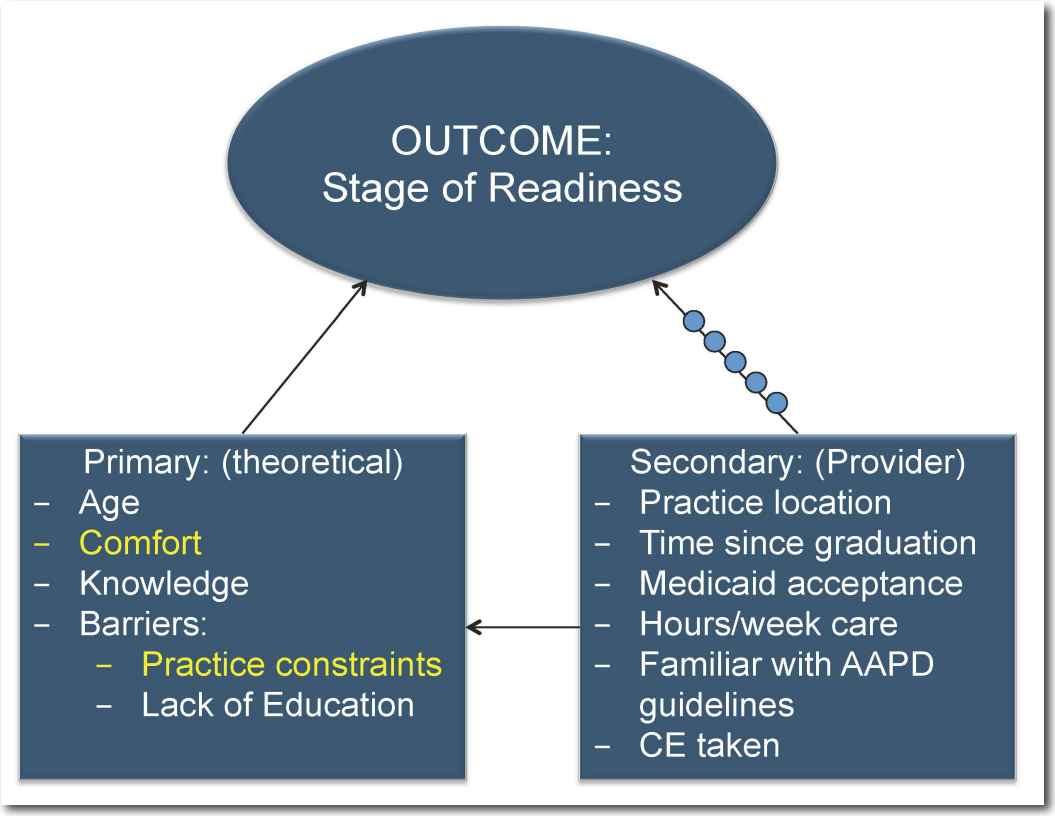


**Figure 5.** Effects of Primary and Secondary Variables in the Outcome (Stage of Readiness to Provide Preventive Care to Infants and Toddlers)




* Comfort and Practice Behaviors had significant effects on the stage of readiness.

## Table 1. Demographics and Practice Characteristics

| | | Active | | Contemplative | | Pre-contemplative | | Total | | P-value |
|---|---|---|---|---|---|---|---|---|---|---|
| | | N | % | N | % | N | % | N | % | |
| Categorical Variables | **Age** | | | | | | | | | |
| | <30 | 98 | 31.21 | 80 | 27.3 | 23 | 15.86 | 201 | 26.72 | 0.009 |
| | 30-40 | 139 | 44.27 | 126 | 43 | 72 | 49.66 | 337 | 44.81 | |
| | >40 | 77 | 24.52 | 87 | 29.69 | 50 | 34.48 | 214 | 28.45 | |
| | | | | | | | | 752 | 100 | |
| | **Practice location** | | | | | | | | | |
| | Urban | 77 | 26.19 | 94 | 33.81 | 38 | 29.01 | 209 | 29.72 | 0.3382 |
| | Suburban | 138 | 46.94 | 118 | 42.45 | 63 | 48.09 | 319 | 45.37 | |
| | Rural | 79 | 26.87 | 66 | 23.74 | 30 | 22.9 | 175 | 24.89 | |
| | | | | | | | | 703 | 100 | |
| | **Hrs/week of patient care** | | | | | | | | | 0.112 |
| | <=20 | 28 | 8.89 | 38 | 12.84 | 20 | 13.79 | 86 | 11.37 | |
| | 21-29 | 75 | 23.81 | 77 | 26.01 | 45 | 31.03 | 197 | 26.05 | |
| | >30 | 212 | 67.3 | 181 | 61.15 | 80 | 55.17 | 473 | 62.56 | |
| | | | | | | | | 756 | 100 | |
| | **Dental Hygiene degree** | | | | | | | | | |
| | Certificate/ Associate | 233 | 73.97 | 221 | 75.43 | 110 | 75.86 | 564 | 74.91 | 0.8782 |
| | Bachelors/ Masters | 82 | 26.03 | 72 | 24.57 | 35 | 24.14 | 189 | 25.09 | |
| | | | | | | | | 753 | 100 | |
| | | Active | | Contemplative | | Pre-contemplative | | Total | | P-value |
| | | Median | IQR | Mediam | IQR | Median | IQR | Median | IQR | |
| Continuous variables | **% of patients insured by medicaid** | 7.5 | 0, 40 | 4 | 0, 20 | 0 | 0, 15 | 2.5 | 0, 30 | 0.012 |
| | **Years since graduation** | 8 | 5.0, 13 | 9 | 5, 15 | 11.5 | 7, 16 | 9 | 5, 15 | 0.0003 |

## Table 2. Perception of Infants/Toddlers Care

| | | Active | | Contemplative | | Pre-contemplative | | Total | | P-value |
|---|---|---|---|---|---|---|---|---|---|---|
| | | N | % | N | % | N | % | N | % | |
| Categorical Variables | **Value preventive care *** | | | | | | | | | <.0001 |
| | 8-10 level | 281 | 89.21 | 216 | 72.97 | 73 | 50.34 | 570 | 75.4 | |
| | 5-7 level | 21 | 6.67 | 58 | 19.59 | 40 | 27.59 | 119 | 15.74 | |
| | 0-4 level | 13 | 4.13 | 22 | 7.43 | 32 | 22.07 | 67 | 8.86 | |
| | | | | | | | | 756 | 100 | |
| | **AAPD guidelines knowledge** | | | | | | | | | <.0001 |
| | Yes | 105 | 33.55 | 52 | 17.6 | 22 | 15.17 | 181 | 23.6 | |
| | No | 118 | 37.7 | 178 | 60.34 | 91 | 62.76 | 394 | 51.4 | |
| | Not sure | 90 | 28.75 | 65 | 22.03 | 32 | 22.07 | 191 | 24.9 | |
| | | | | | | | | 753 | 100 | |
| | **Taken CE courses** | | | | | | | | | 0.0004 |
| | Yes | 53 | 16.83 | 26 | 8.78 | 7 | 4.83 | 86 | 11.3 | |
| | No | 257 | 81.59 | 269 | 90.88 | 135 | 93.1 | 661 | 87.43 | |
| | No sure | 5 | 1.59 | 1 | 0.34 | 3 | 2.07 | 9 | 1.19 | |
| | | | | | | | | 756 | 100 | |

| | | Active | | Contemplative | | Pre-contemplative | | Total | | P-value |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Median | IQR | Mediam | IQR | Median | IQR | Median | IQR | |
| Continuous variables | **Comfort** | 3.5 | 3.5, 4.5 | 3.8 | 3.3, 4.1 | 3.3 | 2.8, 3.6 | 3.8 | 3.3, 4.3 | <.0001 |
| | **Knowledge about infant/toddler care** | 4 | 4.0, 5.0 | 4 | 3.0, 5.0 | 4 | 3.0, 4.0 | 3.4 | 3.1, 3.6 | <.0001 |

*Value of preventive care: 8-10= very important, 5-7= moderaly important, 0-4= not very important.

**Table 3. DHs Perceived Barriers to Provide Preventive Care for Infants and Toddlers**

| | Active | | | | | | | | Contemplative | | | | | | | | Pre-contemplative | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Agree | | Unsure | | Disagree | | | | Agree | | Unsure | | Disagree | | | | Agree | | Unsure | | Disagree | | | |
| **Education** | N | % | N | % | N | % | Mean | SD | N | % | N | % | N | % | Mean | SD | N | % | N | % | N | % | | |
| Lack of education on infant/toddler oral health | 34 | 11 | 14 | 4.4 | 267 | 85 | | | 99 | 33 | 24 | 8.1 | 173 | 58 | | | 64 | 44 | 7 | 4.9 | 73 | 51 | | |
| Lack continuing education opportunities | 54 | 17 | 8 | 2.6 | 252 | 80 | | | 64 | 22 | 23 | 7.7 | 210 | 71 | | | 33 | 23 | 7 | 4.9 | 104 | 72 | | |
| Lack definitive evidence to indicate need for preventive oral hygiene care | 28 | 8.9 | 32 | 10 | 254 | 81 | | | 50 | 17 | 49 | 17 | 195 | 66 | | | 46 | 32 | 27 | 19 | 70 | 49 | | |
| Lack awareness about the guidelines on preventive oral health care | 60 | 19 | 37 | 12 | 216 | 69 | | | 60 | 19 | 37 | 12 | 216 | 69 | | | 67 | 47 | 18 | 13 | 58 | 41 | | |
| | | | | | | | 2.08 | 0.75 | | | | | | | 2.61 | 0.77 | | | | | | | | |
| **Practice Constraints** | | | | | | | | | | | | | | | | | | | | | | | | |
| Lack of time in practice schedule | 38 | 12 | 5 | 1.6 | 272 | 86 | | | 38 | 12 | 5 | 1.6 | 272 | 86 | | | 65 | 45 | 8 | 5.5 | 72 | 50 | | |
| Infant/toddler preventive oral care is disruptive to current practice flow | 18 | 5.7 | 12 | 3.8 | 234 | 88 | | | 57 | 19 | 59 | 20 | 181 | 61 | | | 56 | 39 | 30 | 21 | 59 | 41 | | |
| Current practice situation does not offer opportunity to give preventive care to infants and toddlers | 39 | 12 | 11 | 3.5 | 264 | 84 | | | 221 | 75 | 20 | 6.8 | 52 | 19 | | | 113 | 78 | 8 | 5.6 | 23 | 16 | | |
| | | | | | | | 1.9 | 0.76 | | | | | | | 3.03 | 0.75 | | | | | | | | |

**Table 4. Proportional odds**

| Variable | Action/Pre-contemplation | Contemplation and Preparation/ Pre-contemplation |
|---|---|---|
| | OR (95% C.I) | OR (95% C.I) |
| Comfort Level | 2.70 (1.88, 3.88) | 2.99 (2.17, 4.13) |
| Practice Constraints | 0.12 (0.08, 0.17) | 0.74 (0.56, 0.98) |

REFERENCES


1. US Department of Health and Human Services. Oral Health in America: A Report of the Surgeon General-- Executive Summary. Rockville, MD: US Department of Health ad Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health, 2000. Available at: www.nidcr.nih.gov/DataStatistics/SurgeonGeneral/Report/ExecutiveSummary.htm Accessed on: January 2011.

2. Douglas CW, Edelstein BL. Dispelling the myth that 50 percent of U.S. schoolchildren have never had a cavity. Public Health Rep. 1995 September; 2012/3;110:522+.

3. O'Sullivan DM, Tinanoff N. The association of early dental caries patterns with caries incidence in preschool children. J Public Health Dent. 1996 Spring;56(2):81-3.

4. Jackson SL, Vann WF,Jr, Kotch JB, Pahel BT, Lee JY. Impact of poor oral health on children's school attendance and performance. Am J Public Health. 2011 Oct;101(10):1900-6.

5. Wyne AH. Early childhood caries: Nomenclature and case definition. Community Dent Oral Epidemiol. 1999 Oct;27(5):313-5.

6. Section on Pediatric Dentistry KJ. Oral health risk assessment timing and establishment of the dental home. Pediatrics (Evanston). 2003 -05;111(5):1113-6..

7. American Academy of Pediatrics. Policy statement--AAP publications retired and reaffirmed. Pediatrics. 2009 Aug;124(2):845.

8. American Academy on Pediatric Dentistry, American Academy of Pediatrics. Policy on early childhood caries (ECC): Classifications, consequences, and preventive strategies. Pediatr Dent. 2008 -2009;30(7 Suppl):40-3.

9. Mouradian WE, Slayton RL, Maas WR, Kleinman DV, Slavkin H, DePaola D, et al. Progress in children's oral health since the surgeon general's report on oral health. Acad Pediatr. 2009 Nov-Dec;9(6):374-9.

10. Beaulieu E, Dufour LA, Beaudet R. Better oral health for infants and toddlers: A community based program. J Dent Hyg. 2000 Spring;74(2):131-4.

11. Newacheck PW, Hughes DC, Hung YY, Wong S, Stoddard JJ. The unmet health needs of america's children. Pediatrics. 2000 Apr;105(4 Pt 2):989-97.

12. Mouradian WE. The face of a child: Children's oral health and dental education. J Dent Educ. 2001 Sep;65(9):821-31.

13. Mertz E, Mouradian WE. Addressing children's oral health in the new millennium: Trends in the dental workforce. Acad Pediatr. 2009 Nov-Dec;9(6):433-9..

14. Seale NS, McWhorter AG, Mouradian WE. Dental education's role in improving children's oral health and access to care. Acad Pediatr. 2009 Nov-Dec;9(6):440-5.

15. Seale NS, Casamassimo PS. Access to dental care for children in the united states: A survey of general practitioners. J Am Dent Assoc. 2003 Dec;134(12):1630-40.

16. Santos CL, Douglass JM. Practices and opinions of pediatric and general dentists in connecticut regarding the age 1 dental visit and dental care for children younger than 3 years old. Pediatr Dent. 2008 Jul-Aug;30(4):348-51.

17. Shulman ER. Survey of treatment provided for young children by west virginia general dentists. Pediatr Dent. 2008;30(4):352.

18. Pierce KM, Rozier RG, Vann WF,Jr. Accuracy of pediatric primary care providers' screening and referral for early childhood caries. Pediatrics. 2002 May;109(5):E82-2.

19. Mertz E, Mouradian WE. Addressing children's oral health in the new millennium: Trends in the dental workforce. Acad Pediatr. 2009 Nov-Dec;9(6):433-9.

20. US General accounting office. Oral health: dental disease is a chronic problem among low income populations. April 2000. GAO/HEHS-0072. Retrieved from: www.gao.gov Accessed on January 2011.

21. Kleigman RM, Behrman RE, Jenson HB, Stanton BF. Nelson textbook of pediatrics. 18th ed. Saunders Elsevier, 2007

22. Nowak AJ, Casamassimo PS. Using anticipatory guidance to provide early dental intervention. J Am Dent Assoc. 1995 Aug;126(8):1156-63.

23. Mouradian WE, Schaad DC, Kim S, Leggott PJ, Domoto PS, Maier R, et al. Addressing disparities in children's oral health: A dental-medical partnership to train family practice residents. J Dent Educ. 2003 Aug;67(8):886-95.

24. Nash DA. Adding dental therapists to the health care team to improve access to oral health care for children. Acad Pediatr. 2009 Nov-Dec;9(6):446-51.

25. Nash DA. Expanding dental hygiene to include dental therapy: Improving access to care for children. J Dent Hyg. 2009 Winter;83(1):36-44.

26. Beltran-Aguilar ED, Barker LK, Canto MT, Dye BA, Gooch BF, Griffin SO, et al. Surveillance for dental caries, dental sealants, tooth retention, edentulism, and enamel fluorosis--united states, 1988-1994 and 1999-2002. MMWR Surveill Summ. 2005 Aug 26;54(3):1-43.

27. Savage MF, Lee JY, Kotch JB, Vann WF,Jr. Early preventive dental visits: Effects on subsequent utilization and costs. Pediatrics. 2004 Oct;114(4):e418-23.

28. American Academy on Pediatric Dentistry Council on Clinical Affairs. Policy on the dental home. Pediatr Dent. 2008 -2009;30(7 Suppl):22-3.

29. Lee JY, Bouwens TJ, Savage MF, Vann WF,Jr. Examining the cost-effectiveness of early dental visits. Pediatr Dent. 2006 Mar-Apr;28(2):102,5; discussion 192-8

30. Niederman R, Gould E, Soncini J, Tavares M, Osborn V, Goodson JM. A model for extending the reach of the traditional dental practice: The ForsythKids program. J Am Dent Assoc. 2008 Aug;139(8):1040-50.

31. Wing P, Langelier MH, Continelli TA, Battrell A. A dental hygiene professional practice index (DHPPI) and access to oral health status and service use in the united states. J Dent Hyg. 2005 Spring;79(2):10.

32. Manski MC, Parker ME. Early childhood caries: Knowledge, attitudes, and practice behaviors of maryland dental hygienists. J Dent Hyg. 2010 Fall;84(4):190-5.

33. Tinanoff N, O'Sullivan DM. Early childhood caries: Overview and recent findings. Pediatr Dent. 1997 Jan-Feb;19(1):12-6.

34. Tomar SL, Reeves AF. Changes in the oral health of US children and adolescents and dental public health infrastructure since the release of the healthy people 2010 objectives. Acad Pediatr. 2009 Nov-Dec;9(6):388-95.

35. Edelstein BL. Dental care considerations for young children. Spec Care Dentist. 2002;22(3 Suppl):11S-25S.

36. Cabana MD, Rand CS, Powe NR, Wu AW, Wilson MH, Abboud PA, et al. Why don't physicians follow clinical practice guidelines? A framework for improvement. JAMA. 1999 Oct 20;282(15):1458-65.

37. Salant P, Dillman DA. How to conduct your own survey. New York: Wiley, 1994.

38. Prochaska JO. Decision making in the transtheoretical model of behavior change. Med Decis Making. 2008 Nov-Dec;28(6):845-9.

39. Ha BT, Jayasuriya R, Owen N. Male involvement in family planning in rural vietnam: An application of the transtheoretical model. Health Educ Res. 2003 Apr;18(2):171-80.

40. Tucker LJ, Snelling AM, Adams TB. Development and validation of a stages of change algorithm for calcium intake for college female students. J Am Coll Nutr. 2002 Dec;21(6):530-5.

41. Gulliver P, Horwath C. Women's readiness to follow milk product consumption recommendations: Design and evaluation of a 'stage of change' algorithm. J Hum Nutr Diet. 2001 Aug;14(4):277-86.

42. Smiles for Life, a national oral health curriculum. Retrieve from: www.smilesforlifeoralhealth.org. Accessed March 2012

43. MacFarland T, Quinonez RB, Lee J, Chung Y. Examining North Carolina general dentists' stage of readiness to providing preventive oral health services to infants and toddlers. This article is in the process of submission to a biomedical journal.

44. Weinstein P. Behavioral problems in the utilization of new technology to control caries: Patients and provider readiness and motivation. BMC Oral Health. 2006 Jun 15;6 Suppl 1:S5.

45. Casebeer LL, Strasser SM, Spettell CM, Wall TC, Weissman N, Ray MN, et al. Designing tailored web-based instruction to improve practicing physicians' preventive practices. J Med Internet Res. 2003 Jul-Sep;5(3):e20.

46. Cruz GD, Ostroff JS, Kumar JV, Gajendra S. Preventing and detecting oral cancer. oral health care providers' readiness to provide health behavior counseling and oral cancer examinations. J Am Dent Assoc. 2005 May;136(5):594,601; quiz 681-2.

47. Fein JE, Quinonez RB, Phillips C. Introducing infant oral health into dental curricula: A clinical intervention. J Dent Educ. 2009 Oct;73(10):1171-7.

48. Simpson DD. A framework for implementing sustainable oral health promotion interventions. J Public Health Dent. 2011 Winter;71 Suppl 1:S84-94.

49. Oral health in America: a report of the surgeon general. Rockville, MD: U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health, 2000:308.

50. Wilder RS, O'Donnell JA, Barry JM, Galli DM, Hakim FF, Holyfield LJ, Robbins MR. J Dent Educ. 2008 Nov;72(11):1231-7.