2022

# Parental Attitudes Regarding the Primary Dentition, Dental Decay, and Trauma

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# Parental Attitudes Regarding the Primary Dentition, Dental Decay, and Trauma

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Dentistry at Virginia Commonwealth University.

By

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Pediatric Dentistry

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Richmond, Virginia

May, 2022

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## Abstract

PARENTAL ATTITUDES REGARDING THE PRIMARY DENTITION, DECAY AND TRAUMA

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Purpose: The purpose of this study is to identify the ability of parents in the VCU Pediatric Dental Clinic to recognize signs of decay and trauma and to determine their knowledge regarding the primary dentition.

Methods: This is a cross-sectional study that determined parental attitude and knowledge toward the function of primary teeth, childhood dental decay and dental trauma. Study data was collected through REDCap, a secure web-based survey application. Parents who brought their child to the VCU Pediatric Dental Clinic for a new patient examination or a recall examination were included in the study. The survey was only formatted in English, any non-English speaking parents were excluded. The following patient demographics were ascertained in the survey: gender, age, race, and level of education.

Results: A total of 107 guardians participated in the study. Guardians demonstrated strong knowledge of importance of baby teeth, with greater than 90% of guardians agreeing or strongly agreeing that primary teeth are important (95%), impact ability to eat (95%), and that they hold space for adult teeth (92%). Guardians were also aware that sugary foods/drinks cause cavities (93%), However, only 62% agreed/strongly agreed that they are important for fitting in with friends/peers. Almost half still agreed or strongly agreed that baby teeth have no function and will be replaced (46%).

Conclusions: Parents and guardians appear to have a general understanding and knowledge of their child's primary (baby) teeth, but increased guardian education on the early signs of decay and anticipatory guidance regarding dental trauma could help to prevent cavities from forming and help parents and guardians understand the significance of a traumatic dental injury.

# Introduction

## Early Childhood Caries

Early childhood caries is defined as the presence of at least one decayed tooth (cavitated or non-cavitated), missing tooth (due to caries), or filled dental surface (due to caries) in any primary tooth in a child aged six years or younger. In children under three years of age, signs of smooth surface caries is indicative of severe early childhood caries.[1] Severe childhood caries is a term used to encompass "atypical," "progressive," "acute," or "rampant," patterns of decay[2]. This pattern of early childhood caries has previously been referred to as labial caries, caries of incisors, rampant caries, nursing bottle caries and baby bottle tooth decay.[2]

According to the United States Department of Health and Human Services, dental caries is one of the most prevalent, and significant pediatric health problems within the United States. Dental caries is the single most common chronic childhood disease, five times more common than asthma, seven times more common than hay fever and fourteen times more common than chronic bronchitis. More than one-fourth of children between the ages of two and five years will experience early childhood caries before entering kindergarten.[3] Compared to children who do not have early childhood caries, those who do are more likely to get caries in the future as they become older children and adolescents.[4] By the age of nineteen, about 68% of adolescents have experienced tooth decay in their permanent teeth.[4]

The presence of untreated dental decay in the United States is significant, with 16% untreated in children aged two to four years, 29% in children aged six to eight years and 20% in adolescents by the age of fifteen.[2] Dental caries can lead to a myriad of problems including

higher risk of new carious lesions, oral pain, increased missed school days, hospitalizations and emergency room visits, difficulty concentrating, delayed or insufficient physical development, poor appearance, and poor health as an adult.[2,3,5]

Early childhood caries is an infectious disease, most likely caused by Streptococcus mutans, while diet also plays an important role in the acquisition and clinical expression of this infection. The early acquisition of *S. mutans* is a critical factor in the natural history of the disease.[6,7] *S. mutans* can spread from mother to baby during infancy and can even inoculate in pre-dentate infants. These bacteria break down sugars for energy, which causes an acidic environment in the mouth, resulting in demineralization of the enamel of the teeth leading to dental caries.

Unlike most infectious diseases, tooth decay is not self-limiting and decayed teeth require professional treatment to remove the infection and restore tooth function.[8] In bacteriologic studies, it has been demonstrated that in children with early childhood caries, *S. mutans* regularly exceeds 30% of the cultivable plaque flora. This level of bacteria in the oral cavity is associated with carious lesions and white spot lesions. Conversely, it was shown that *S. mutans* constitutes less than 0.1% of the plaque flora in children with negligible to no caries activity.[6] A longitudinal study was performed by Alaluusua and Renokenen[9] to assess for *S. mutans* colonization and dental caries in children 2-4 years of age showed that children who harbored *S. mutans* in their plaque by age two had the most caries activity by age four. This study showed that the mean DMFS score in children was 10.6 when the colonization occurred earlier, whereas children that colonized *S. mutans* later had a mean DMFS is 3.4. The presence of *S. mutans* by the age of one was the most effective predictor of developing caries by age of three and a half.

The main reservoir from which infants acquire the *S. mutans* bacteria is their mothers.[6] Early childhood caries can occur early in life and progress rapidly in children who are considered high risk. In these children, early childhood caries often goes untreated. The initial phase of early childhood caries is recognized as a dull, white demineralized enamel which quickly advances to obvious decay typically along the gingival margin. This decayed, hard tissue is clinically visible as a yellow or brown cavitated area.[8] Knowing the natural history of an infectious disease facilitates a more comprehensive approach toward its prevention.

**Etiology and Risk Factors**

Children between the ages of one and three are the most susceptible population to develop dental caries.[10] The etiology of early childhood caries is multifactorial, but it is mainly attributed to time-specific interactions between the microorganism with sugars on a tooth surface. The factors that are concurrently present to initiate and propagate the disease include the cariogenic microorganisms, fermentable carbohydrates (substrate), and also the susceptible tooth surfaces and host.

Diet and feeding practices of children play an important role in the acquisition of the infection and ultimately, the development of dental caries.[11] Children with early childhood caries are shown to have frequent and prolonged consumption of sugars from liquids. The caries-promoting sugars which include sucrose, glucose and fructose, are frequently found in fruit juices and many infant formula preparations.[6] Often at the center of the severity and etiology of early childhood caries is the inappropriate use of the baby bottle. Several studies show the significant correlation between the development of early childhood caries and bottle-feeding or sleeping with a bottle.[8] Other factors such as high sugar intake, lack of oral hygiene, lack of

fluoride exposure and enamel defects can also be responsible for the development of early childhood caries.[11]

A child is at a higher risk for the development of dental caries if their diet contains high levels of fermentable carbohydrates. Inappropriate feedings practices can prolong the exposure of teeth to these fermentable carbohydrates in turn aggravating the chances of developing early childhood caries. Another risk factor for the initiation and development of caries in children is bottle feeding during bedtime or sleeping.[11] Increasing the time per day that these fermentable carbohydrates are available appears to be the most significant factor in shifting the re-mineralization process to de-mineralization.[8] The best evidence indicates that the level of dental caries is lowest in countries where consumption of free sugars is less than 40-55 grams per person, per day. More recently, however, the relationship between diet and dental caries has become weaker in contemporary society which has been attributed to widespread use of fluoride.[8]

Association between early childhood caries and socioeconomic status has been well documented. According to Colak et al., studies have suggested that early childhood caries is more commonly found in children who live in poverty or in poor socio-economic conditions.[8] Also according to Matilla et al., the main factors associated with children's caries index (dmft) of more than 0 at the age of five years old are: mother's young age, parent's cohabitation, rural dwelling, parents' poor caries history, mother's poor dental hygiene habits, child's sugar consumption before the age of eighteen months and finally occurrence of headaches in children at the age of five.[12,13] Children with parents in the lowest income group had mean decayed, missing, and filled teeth (dmft) scores four times as high as children with parents in the highest income group.[8] Sociodemographic characteristics affect the oral health knowledge and attitudes

of parents or guardians with a lower level of education and this negatively affects their own oral health practices. Children living in a higher social class were shown to experience few caries in their lifetime, while children from lower classes have the poorest dental health.[12]

Because mothers are often the primary role models for their children, they have a significant influence on their children's oral habits and practices. More specifically, their education level is one of the most important socioeconomic indicators affecting the incidence of early childhood caries in their children. According to Ismail et al., highly educated mothers were reported to have higher positive attitudes and stronger intentions to control children's sugar intake, as compared to mothers with a lower education level.[10] The severity of early childhood caries is linked to decreasing level of mother's education because the knowledge and skills that they acquire may translate into their own positive oral health behaviors, which have been shown to exert a significant positive influence on children's own toothbrushing habits and ultimately caries experience. A child's greatest social support initially stems from their family, thus it is important to empower families, especially mothers, to take control over their child's oral health.[10]

**Caregivers Knowledge and Attitudes Toward ECC and Trauma**

Early childhood caries has consequences which are associated with all four core domains of a child's quality of life: physical symptoms, functional status, psychological functioning and social functioning.[14] This makes oral health an integral component of a child's health and well-being. Children affected by early childhood caries often suffer from a reduced oral health-related quality of life when compared to their caries-free peers.[15] Parental belief systems and practices are important factors that mediate the influences of culture on their child's oral health.[16] A study done by Schroth et al. looked at parental attitudes and knowledge regarding childhood caries.

The questionnaire asked caregivers whether they agreed or disagreed with specific statements designed to gather knowledge and attitudes about the primary dentition of infants and preschoolers. Some examples of questions used were “Baby teeth are important,” “Problems with baby teeth will affect adult teeth,” “Babies without teeth need mouths cleaned,” and “Rotten teeth could affect child’s health.” The results of this study showed that most caregivers believed that primary teeth were important (91.2%), that dental disease could lead to general health problems (87.5%), that a first dental visit should be made by age one (74.7%), and that fluoride toothpaste helps prevent decay (75.5%). However, the results also showed that only 39.5% of caregivers believed that a mother’s diet during pregnancy could affect the development of the deciduous dentition.[15] The above results demonstrated that the caregiver’s attitude correlated with their child having early childhood caries. Children were more likely to develop early childhood caries if their caregiver disagreed that primary teeth were important, as they had higher deft scores (6.4) compared to the children of caregivers who agreed that baby teeth are important (4.0). Additionally, significantly more caregivers of children with early childhood caries believed that caries could not affect a child’s health (78.3%).[15] While 74.7% of primary caregivers agreed with the importance of a first dental visit by the age of one, only 3.9% of children actually attended a dental appointment before this developmental milestone. This study displayed that certain attitudes and beliefs held by caregivers were significantly associated with both early childhood caries and increased caries activity (deft). Overall, the majority of parents and primary caregivers believed that primary teeth were important, and they responded appropriately to other questions assessing knowledge and attitudes about early childhood oral health. However, these caregivers did not believe that prenatal diet could affect the primary

dentition. Successful oral health promotion efforts should focus on targeting the knowledge and attitudes of parents and primary caregivers.[15]

Previous qualitative studies have identified not valuing baby teeth and a parent's own negative dental experience as factors underlying parents' dental health beliefs and behaviors. A study has shown that parents who believed that dental decay was caused by increased sugar consumption and prolonged bottle use also believed that their child's dental problems would disappear with the eruption of their adult teeth.[16,17] The struggles of parents and the barriers they face with adopting preventive behaviors must be acknowledged when planning preventive interventions. Additionally, there tends to be a lack of compliance with preventive recall visits due to the fact that most parents attend dental visits when there is obvious decay or pain present.[16] Parents' negative perceptions or incomprehension for the need of preventive visits, dental treatment for primary teeth, and the importance of cessation of habits that lead to increase in caries risk (i.e. sugar consumption and prolonged bottle use) can lead to severe sequalae for their dentition and the child's perception of the role of the dentist.

There is also evidence that good parental knowledge and oral hygiene positively affects a child's dental health. Children are more likely to be caries free if they have parental involvement. Parental attitudes towards caries and its initiation, development and prevention are likely to predict the positive behavior of twice-daily toothbrushing.[18] A questionnaire developed by Vanagas et al. consisted of 40 items concerning parental and children's oral health behaviors. Parental skills were assessed according to answers on their own oral hygiene skills regarding the appropriate use of an toothbrush, toothbrushing twice a day or more, consumption of sugary snacks and the frequency of visits to dental hygienists.[18] The results of this study showed that more than half of parents (52.6%) used an appropriate toothbrush, 69.7% of parents were

brushing their teeth twice a day or more, and 77.7% of parents reported inappropriate use of sugary snacks. The association between parental attitudes toward tooth decay in their children and their own oral hygiene skills were analyzed. Parents who demonstrated good personal oral hygiene skills more often understood the importance of brushing their children's teeth. The results of the study reveal that parental attitudes toward their children's oral health were significantly associated with positive parental oral health behavior. This concludes that parental attitudes towards oral health should be considered an essential factor that influences the development of positive health-related behavior in children.[18]

Dental trauma, along with tooth decay, is considered among the world's major public health challenges. Traumatic dental injuries include any thermal, chemical or mechanical lesion affecting dentition, including the hard tissues of the tooth, the pulp or the periodontal structures. Traumatic dental injuries or TDI's have been associated with feelings of embarrassment to smile, laugh or show one's teeth; difficulty in social relationships; irritability; and an inability to maintain a healthy emotional state, all leading to a negative impact on an individual's quality of life.[19]

First aid after dental trauma in the pediatric age group is important; however, many parents, teachers and sports coaches rarely know how to appropriately intervene in cases of dental trauma. A study was done in Southern Italy to investigate the level of knowledge about dental trauma among parents of children attending primary schools. The results from the study show that overall, 53.8% of respondents reported knowing what to do in a case of dental trauma and 84.8% of the participants would contact a dentist, while 10.7% stated they would contact or go to the emergency room. Parents in this study were also asked about a time limit within which it is best to intervene in the case of dental trauma and 56.8% indicated "within 30 minutes",

20.7% indicated “within 2 hours” (which was deemed the correct response), 11.6% indicated “I don’t know” and finally 10.8% said “within a day”. According to this study most participants appeared to know what dental trauma is, and the knowledge increased with parental age and level of education, but unfortunately only half of the respondents knew what to do in case of trauma. This data was consistent with other studies which stated that parents do not have the information necessary to best assist a child in the event of dental injury.[19]

This survey showed that only a few parents would be concerned about trauma to a primary tooth, suggesting that education plays a crucial role in increasing parental knowledge regarding trauma, especially the outcomes of trauma to primary teeth. However, a study by Quaranta et al showed that nearly all participants surveyed said they would be concerned in the case of trauma to a permanent tooth. Once again, this could be attributed to poor perception about the risks related to primary teeth by parents and guardians.[19] Knowledge of good practices and how to handle trauma to deciduous teeth is widely lacking among the general population. The ability to increase parental knowledge and motivate parents to assume a more preventive approach towards dental trauma may produce positive changes that would ultimately increase long-term benefits for the health of children. In an attempt to prevent early childhood caries and learn how to handle incidences of dental trauma, dental education regarding signs of childhood decay, the function and importance of the primary dentition, and dental trauma prevention should begin at a child’s first appointment with their primary care physician and their dentist.

The purpose of this study is to test parents’ knowledge regarding the primary dentition, to determine parents’ concern regarding signs of decay and trauma, and to then quantify their concern in terms of urgency for seeing a dental provider. This information is important because as pediatric dentists it is our job to educate the parents of our patients on proper diet, oral

hygiene, signs of decay, infection and trauma. This study is also important to evaluate whether guardians recognize that even if their child has a healthy dentition, 6 month recalls are still standard of care and recommended by pediatric dentists.

## Methods

This study was granted exempt status from the Virginia Commonwealth University Institutional Review Board HM 20020958. This was a cross-sectional study to determine parental attitude and knowledge toward the function of primary teeth, childhood dental decay and dental trauma. Study data were collected and managed using Research Electronic Data Capture (REDCap) tools hosted at Virginia Commonwealth University. REDCap is a secure, web-based software platform designed to support data capture for research studies.[20] The survey was formulated by clinicians, modeled after previous research studies and survey questions and given by the dental provider to the parent or guardian at any new patient examination or recall examination appointment.

Parents or legal guardians who brought their child to the VCU Pediatric Dental Clinic for a new patient examination or a recall examination were included in the study. Not every parent or guardian was asked to participate in the survey because the distribution of the survey was provider dependent; only first and second year dental residents were asked to distribute the survey. The following guardian demographics were ascertained in the survey: gender, age, race, and level of education. They were also asked to note their personal dental experience; stating if they go to the dentist regularly, and if they have had any treatment done, such as fillings, extractions, orthodontics, gum disease surgery or dentures. The survey was only formatted in English, any non-English speaking parents were excluded. The sample survey can be observed in Appendix 1.

The first part of the survey aimed to determine parents' or guardians' knowledge regarding the primary dentition. These knowledge-based questions required parents to agree or disagree with statements about the role of primary teeth. The statements in the survey were based

on questions used in previous studies.[3,4,15,21] The parents or guardians were shown six cases ranging from healthy dentition, mild/moderate decalcification, moderate decalcification to severe decay, and then two trauma cases. The parents were asked to determine their level of concern for each of the six cases and answer follow up questions regarding the primary dentition.

Case 1 depicted a mixed dentition with mild to moderate decalcification along the gingival margin of the maxillary anterior permanent teeth. This case can be seen in Figure 1.[22] Parents or guardians were asked to look at this photo and determine their level of concern as not at all concerned, slightly concerned, somewhat concerned, moderately concerned, or extremely concerned.

Case 2 depicted a primary dentition with moderate decalcification of enamel with moderate cavitated smooth surface caries on multiple teeth, as seen in Figure 2.[23] This would be quantified as severe early childhood caries. Once again parents or guardians were asked their level of concern for this child's baby teeth.

Case 3 depicted primary dentition with no clinical signs of decalcification or active decay. This case can be seen in Figure 3 (photo taken from VCU Pediatric Dental Clinic). The aim of including this photo in the survey was to determine if parents or guardians could recognize that even though they may not be concerned, this child should still be brought to the dentist every six months for regular examinations.

Case 4 depicted primary dentition with severe early childhood caries, with cavitated lesions on almost every tooth and surface (Figure 4).[24] For this case parents or guardians were asked to determine their level of concern using the scale previously mentioned (not at all concerned to extremely concerned). This case was also associated with follow up questions

where parents agreed or disagreed with statements regarding the primary dentition, oral hygiene and perception of their self-esteem.

Case 5 depicted a previous unknown trauma that could have been minor, such as a concussion, or more major trauma such as an intrusion that re-erupted (Figure 5).[25] The color of the tooth indicates necrosis, but there are no clinical signs of infection associated with the tooth. The parents or guardians used the same scale as previous cases to determine their level of concern.

Case 6, the final case, depicted an intrusion of one of the primary central incisors that has not re-erupted (Figure 6).[25] The cause of the intrusion was unknown with no associated infection. Parents and guardians were also asked to determine their level of concern for this final case.

After their review of the six cases, the parents or guardians were asked to use a scale to assess their perceived timing of when they would take their child for a dental evaluation based on their concerns in the increments of within one week, within one month, within three months, regular six-month evaluation or no evaluation needed. The questions aimed to address the knowledge parents or guardians have of the primary dentition, and their level of concern regarding the decayed and traumatized dentition.

Responses were summarized with descriptive statistics (counts, percentages, median, interquartile range). Association between respondent characteristics and responses to knowledge questions were compared with chi-squared tests. Association between level of concern and timing for a dental visit were compared using chi-squared test. Significance level was set at 0.05. SAS EG v.8.2 (SAS institute, Cary, NC) for all analyses.

Figure 1: Mild/Moderate Decalcification

Figure 2:Severe Decalcification with Facial Caries

Figure 3: Healthy Dentition with no Clinical Caries

Figure 4: Severe Decay

Figure 5: Discoloration from Previous Trauma

Figure 6: Intrusion from Previous Trauma

## Results

A total of 107 parents or guardians participated in the study. The majority were female (n=91, 85%). In terms of race, most participants were either Black or African American (52%), followed by Caucasian (33%). The majority had a high school degree or less (68%). Just under half of guardians reported that they had had a dental exam within the past 6 months (45%). The remaining indicated at least a year ago (19%), between 1 and 5 years ago (23%), or more than 5 years ago (13%). When parents or guardians were asked about their dental history, 88% selected that they had had check-ups and cleanings, 67% reported fillings, 41% have had extractions, and 27% have had braces or aligners. Other less common dental experiences included dentures or partials (7%) and periodontal disease (5%).

Guardians reported their number of children ranging from 1 (21%) to 5 or more (9%). The most common age range for the child visiting on the day of recruitment was 7-12 years (37%) followed by 4-6 years (28%). The most common selection for the reason for the child's dental visit was a regularly scheduled exam and cleaning (83%). Only 11% indicated it has been more than a year since their child's last visit and 6% indicated it had been at least 2 years. Most guardians reported that their child sees a dentist two times a year (69%) followed by one time a year (23%). A summary of these respondent characteristics is presented in Table 1.

Guardians were asked a series of 7 questions to evaluate their knowledge of importance of baby teeth (Table 2). Responses were on a 5-point Likert scale ranging from Strongly Disagree (scored as -2) to Strongly Agree (scored as 2). More than 90% agreed or strongly agreed to the statements: "Baby teeth are important" (95%), "Frequently eating food or drinks that contain sugar may cause cavities" (93%), "Baby teeth are important for ability to eat"

(95%), and “Baby teeth hold space for adult teeth” (92%). For all four of these questions, the median response was scored as a 2 (Strongly Agree). Although slightly lower, most guardians agreed or strongly agreed that baby teeth are important for jaw growth (81%). Only 62% agreed or strongly agreed that baby teeth are important for a child’s “ability to fit in with peers.”

Guardians were also presented with the statement that baby teeth have no function and will fall out and be replaced with adult teeth. Only 54% of guardians disagreed or strongly disagreed with this statement and 38% agreed or strongly agreed. When looking at factors associated with agreement that baby teeth have no function, there was a significant association with respondent race (p-value=0.0054) and marginal association with whether or not the guardian had more than one child (p-value=0.0694). Among those with no other kids, 37% disagreed or strongly disagreed that baby teeth have no function compared to 61% of those with other children. In terms of race, 80% of Caucasian respondents disagreed or strongly disagreed that baby teeth have no function compared to 43% of those who identified as Black or African American, and 44% of those from other races (Hispanic, Asian, Asian Indian, Pacific Islander, Other).

Figure 7 displays the responses of the guardians regarding their level of concern with regards to clinical photos. When presented with a photo of severe decay (Figure 4), 97% selected “Extremely concerned.” For a case with severe decalcification with facial decay (Figure 2), this dropped to 85%. For the photo displaying decalcification (Figure 1), 17% were extremely concerned, 24% moderately concerned, and 51% somewhat or slightly concerned. For the photo of healthy teeth (Figure 3), only 31% indicated “Not at all concerned” and 20% selected each of slightly, somewhat, and moderately concerned. Extremely concerned was still selected by 11% of respondents. For the photo of trauma with discoloration (Figure 5), 21% were extremely

concerned, 31% moderately concerned, and 40% somewhat or slightly concerned. Only 8% were not at all concerned. For a photo of trauma with intrusion (Figure 6), 42% were extremely concerned, 30% moderately concerned, and 24% somewhat or slightly concerned. Only 4% were not at all concerned.

In order to quantify guardian concern in terms of urgency for seeing a pediatric dentist, the survey also asked respondents to indicate the time frame within which a child should be seen by the dentist based on level of concern from the photos shown. Level of concern was significantly associated with the perceived timeframe for a dental visit (p-value<0.0001). The trend in the urgency of visiting the dentist based on the level of concern is displayed in Figure 8. Extreme concern was indicated as needing to be seen within 1 week by 74% of respondents. No concern ("Not at all") was indicated as needing to be seen at regular 6 months evaluations by 71% of respondents. "No evaluation needed" was selected by 14% of all respondents. The median amount of time for "Not at all concerned" was a regular 6-month evaluations, within 3 months for "Slightly" and "Somewhat concerned," within 1 month for "Moderately concerned" and within 1 week for "Extremely concerned" (Figure 9).

Figure 10 combines the guardians' self-reported level of concern and their perceived time frame for visiting the dentist. The figure presented each of the six cases with the median reported level of concern and the time frame that corresponds to that level of concern.

Table 1: Characteristics of Respondents and their Children

| | | n | % |
|---|---|---|---|
| **Gender** | | | |
| | Female | 91 | 85% |
| | Male | 16 | 15% |
| **Age** | | | |
| | 21-24 | 4 | 4% |
| | 25-30 | 22 | 21% |
| | 31-35 | 20 | 19% |
| | 36-40 | 27 | 25% |
| | >41 | 34 | 32% |
| **Race** | | | |
| | Caucasian | 35 | 33% |
| | Black or African American | 56 | 52% |
| | Hispanic | 5 | 5% |
| | Asian | 2 | 2% |
| | Asian Indian | 2 | 2% |
| | Pacific Islander | 1 | 1% |
| | Other | 6 | 6% |
| **Education** | | | |
| | Did not graduate high school | 4 | 4% |
| | High school or GED degree | 68 | 64% |
| | Bachelor's degree | 23 | 21% |
| | Master's degree or above | 12 | 11% |
| **Number of Children** | | | |
| | 1 | 22 | 21% |
| | 2 | 33 | 31% |
| | 3 | 23 | 21% |
| | 4 | 19 | 18% |
| | 5 or more | 10 | 9% |
| **Age of Child** | | | |
| | 0-3 | 23 | 22% |
| | 4-6 | 30 | 28% |
| | 7-12 | 39 | 37% |
| | > 13 | 14 | 13% |
| **Guardian Dental Exam Frequency** | | | |
| | Within the past 6 months | 48 | 45% |
| | At least a year ago | 20 | 19% |
| | Between 1 and 5 years ago | 24 | 23% |
| | More 5 years ago | 14 | 13% |
| **Guardian Dental History** | | | |
| | Check-ups and Cleanings | 94 | 88% |
| | Fillings | 72 | 67% |
| | Extractions | 44 | 41% |
| | Periodontal (gum) Disease | 5 | 5% |
| | Dentures/Partials | 8 | 7% |

| | | |
|---|---|---|
| Braces/Aligners | 29 | 27% |
| **Nature of Child's Visit** | | |
| My child is here for an exam and cleaning | 88 | 83% |
| My child is here for an exam and cleaning but it has been longer than 1 year since their last appointment | 12 | 11% |
| My child is here for an exam and cleaning but it has been longer than 2 years since their last appointment | 6 | 6% |
| **How often have your other children typically seen a dentist?** | | |
| None of my kids have been to the dentist before today | 1 | 1% |
| Only when there is a problem | 5 | 6% |
| 1 time a year | 18 | 23% |
| 2 times a year | 54 | 69% |

Table 2: Guardian Knowledge of Importance of Primary Dentition

| | **Agree/Strongly Agree** | **Median*** | **IQR**** | |
|---|---|---|---|---|
| Baby teeth are important. | 95% | 2 | 1 | 2 |
| Frequently eating food or drinks that contain sugar may cause cavities. | 93% | 2 | 2 | 2 |
| No function - they will all fall out and be replaced with adult teeth (Disagree/Strongly Disagree) | 54% | -1 | -1 | 1 |
| Ability to eat | 95% | 2 | 1 | 2 |
| Jaw growth | 81% | 1.5 | 1 | 2 |
| Hold space for adult teeth | 92% | 2 | 1 | 2 |
| Ability to fit in with friends/peers | 62% | 1 | 0 | 2 |

*Strongly Disagree (-2), Disagree (-1), Neutral (0), Agree (1), Strongly Agree (2); **IQR= Interquartile Range (IQR, $25^{th}$-$75^{th}$ percentiles of responses)

Figure 7: Level of Concern by Clinical Case

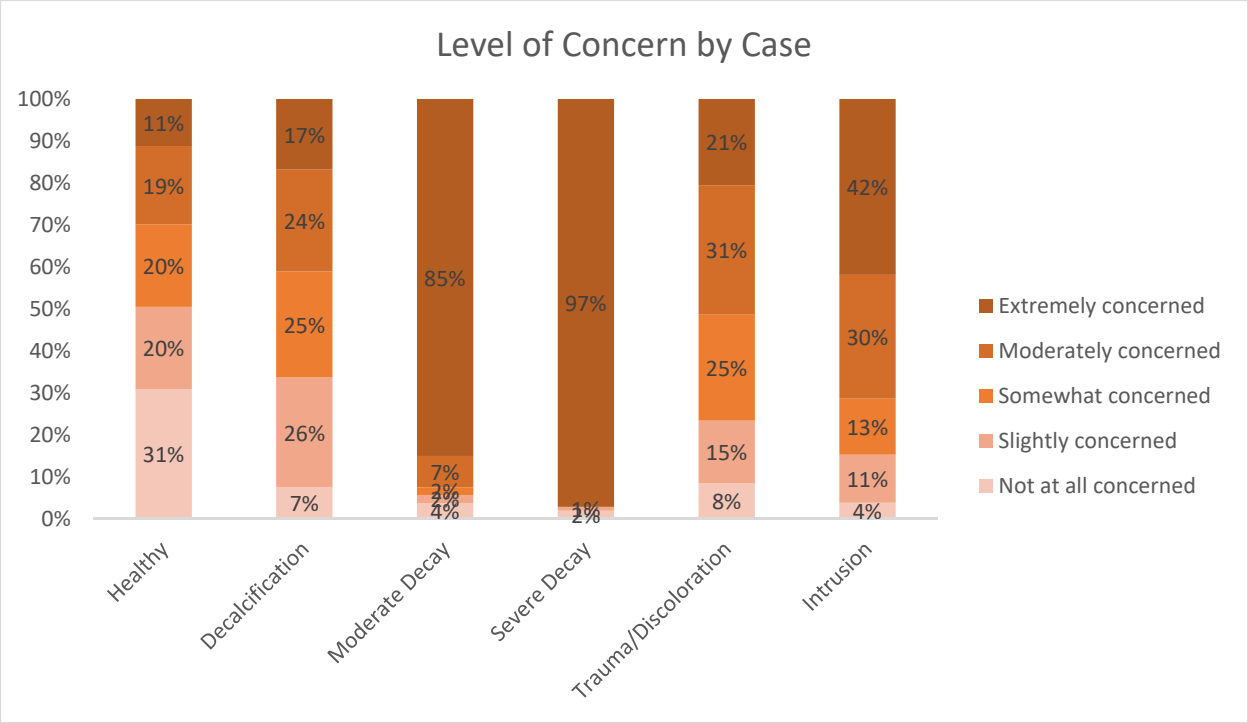


Figure 8: Guardian selection for time frame in which a child should be seen by the dentist by level of concern

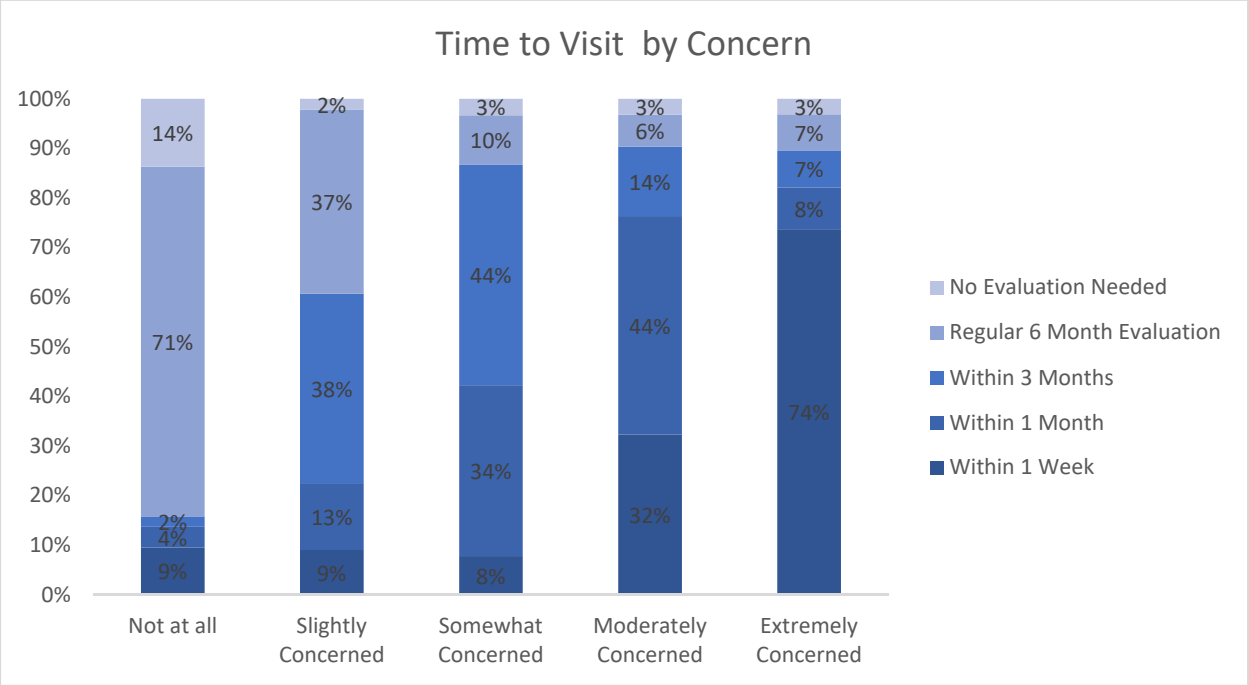
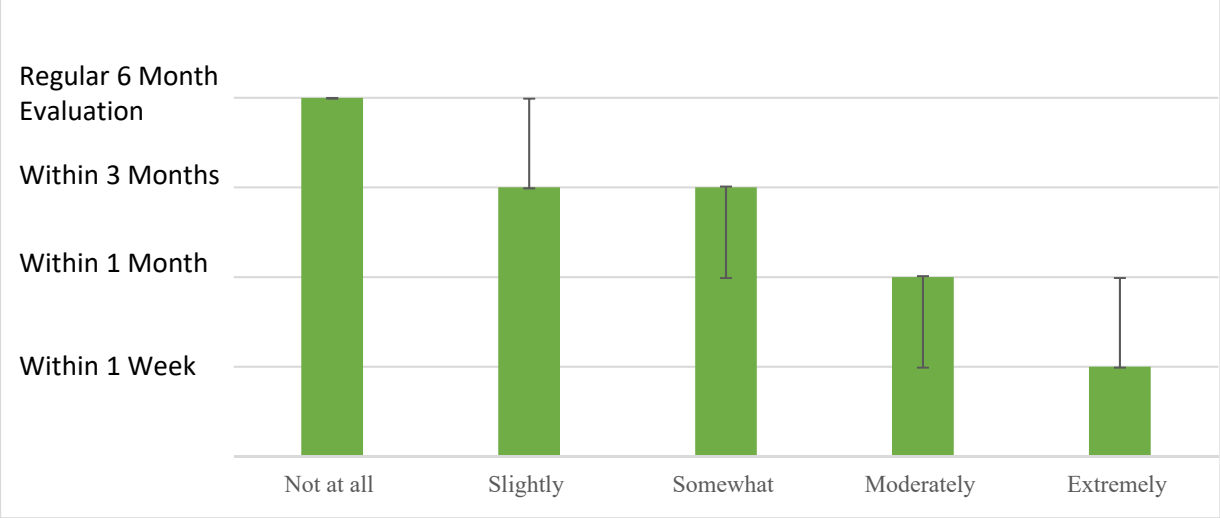



Figure 9: Median Perceived Time Frame in which a Child Should be Seen by the Dentist by Level of Concern




*Error bars represent the Interquartile Range (IQR, 25th-75th percentiles of responses)

Figure 10: Guardian Self-Reported Concern with Dental Decay and Trauma and Corresponding Timing for Dental Visit

| Clinical Photo | Median Concern Score | Median Time to be Seen |
|---|---|---|
|  | 1- Slightly Concerned | 3- Within 3 Months |
|  | 4- Somewhat Concerned | 3- Within 3 Months |
|  | 4- Extremely Concerned | 1- Within 1 Week |
|  | 5- Extremely Concerned | 1- Within 1 Week |
|  | 3- Moderately Concerned | 2- Within 1 Month |
|  | 3- Moderately Concerned | 2- Within 1 Month |

## Discussion

The results from the 7 questions evaluating guardians' knowledge of importance of baby teeth showed that more than 90% agreed or strongly agreed to the statements: "Baby teeth are important" (95%), "Frequently eating food or drinks that contain sugar may cause cavities" (93%), that baby teeth are "important for the ability to eat" (95%) and that they "hold space for adult teeth" (92%) (Table 2). These results are comparable to the results from the survey in another published study, which showed that 594 believed baby teeth matter (81%).[26] Some of the questions for the present survey were developed based on questions from the study by Nelson et al. [26] These results show that the parents or guardians from the VCU Pediatric Dental clinic are aware of the importance of baby teeth and that they have several functions (eating and holding space for adult teeth). Parents and guardians also recognized that frequently eating food or drinks that contain sugar may lead to cavities.

Initially, the results were positive regarding parental knowledge; however, only 62% of parents or guardians agreed that baby teeth were important for the child's "ability to fit in with peers". This might have affected their response to the questions for "level of concern" and "when the child should be evaluated by a professional" that appeared later in the survey. In a previous study that evaluated parents' and guardians' evaluation of their children's oral health related quality of life, one survey question asked "My child is happy with his/her teeth", which received a high degree of attention from the parents/guardians due to the natural concern by parents for their child to be happy and confident with their appearance.[2] It can be concluded that a parent/guardian may not be aware of a dental problem until it interferes with a child's life, thus altering a parent/guardians "level of concern" and "when should the child be evaluated by a

professional". This response also could indicate that parents and guardians assume that their child's peers are unaware or do not care about the appearance of their teeth. This could be further looked at by surveying children about the appearance of different pictures of baby teeth. Children today are concerned about fitting in with their peers, but their parents may not be aware of this concern.

It is to be noted on the statement "baby teeth have no function and will all fall out and be replaced by adult teeth", only 54% of parents and guardians disagreed and 38% of parents have either agreed or strongly agreed. There was an association with respondent's race as 80% of Caucasian compared to 43% of Black or African American respondents disagreed with this statement. Untreated caries in baby teeth is a strong predictor of future caries in the permanent dentition which indicates the chronic nature of this disease. Failure to recognize the importance of baby teeth among parents and guardians is associated with adverse health habits and outcomes for their children such as less frequent tooth brushing and a lower likelihood of having regular preventative visits to the dentist.[26] In a previous study by Nelson et al, a similar survey was conducted asking the for caregivers' response to the statement "cavities in baby teeth don't matter since they fall out anyway" with the same five point Likert scale used in this study ("strongly agree" to "strongly disagree"). This study did not identify differences in respondent race but the preliminary results indicated a total of 140 caregivers believed baby teeth don't matter (19%) and 594 (81%) believed they do.[26] While this overall sample size is larger than the sample size at VCU Pediatric Dental Clinic, their population appeared to have more of an understanding that baby teeth matter compared to the parents or guardians in the present study. The parents or guardians have an overall understanding of what causes cavities and the purpose or function of baby teeth but appear to fall short when asked if the baby teeth have no function.

When parents or guardians were presented with the cases and asked to state their level of concern using a five point Likert scale ranging from “not at all concerned” to “extremely concerned” the majority of parents and guardians were “extremely concerned” about the case of severe decay shown in Figure 4 (97%). This response indicates that the parent or guardian can correctly recognize the severity of the decay displayed in the photo. However, when moderate to severe decay/decalcification (Figure 2) was shown, only 85% of the respondents were “extremely concerned”. These are subjective responses, but with early childhood caries, if moderate decay is not addressed, it can quickly develop into severe decay so level of concern should still be high. As the photos displayed decreased in severity of decay, the level of concern also went down from “extremely concerned” to “somewhat or slightly concerned”. This response could indicate that even though parents recognize that there is decay present and needs to be treated, they are not concerned about it in the immediate. A surprising result was that 11% of parents selected “extremely concerned” in regards to the photo with healthy dentition with no clinical signs of decay. This leads to the possibility of obsequiousness bias discussed in the limitations for this study. Even though Figure 3 displays healthy dentition with no signs of clinical caries, parents and guardians should still acknowledge that their child still needs to be seen by a dentist every six months for preventative evaluation.

Finally, for the two trauma photos, parents or guardians were divided in their responses of extremely concerned, moderately concerned and somewhat or slightly concerned. Many parents or guardians of young children can sometimes be unaware when a trauma first occurs, but it is important to educate them on the signs and symptoms to look out for after a suspected or even unknown trauma. Overall, parents and guardians have an understanding of what severe decay looks like and the importance of treating it quickly, so dentists should focus guardian

education on the early signs of decay and this is why it is recommended parents and guardians bring their child for their first dental appointment six months after first tooth eruption or by the child's first birthday.[27]

This study presented with several limitations. The first limitation presented with this study is the language of the parents/guardians. The survey was only presented to parents or guardians whose first language is English. This is a limitation because VCU Pediatric Dental clinic has a significant number of guardians who are non-English speaking. Another limitation is the sample size. The survey only had 107 participants across six months of data collection. The pediatric dental clinic has the possibility of seeing at least 50 patients for either a recall examination or a new patient examination per day and it was estimated prior to survey distribution that the survey could get at least 200 responses. The clinic has a high no show rate, which limits the number of possible survey responses. The clinic also sees a variety of patient appointments each day (emergency, operative, sedations) along with the recall and new patient examinations, again limiting the parent/guardian availability for survey responses. Another limitation was the ability to distribute the survey. The survey was on a private computer in each of the ten dental operatories in the dental clinic. However, due to the presence of dental students that were not aware of the research in those operatories, the survey was not given to every parent or guardian who brought their child for a new patient exam or a recall examination.

Limitations also include what the parents or guardians were detecting in terms of their concerns. There were not questions addressing the parents' specific concerns regarding the photos presented, as the concerns could have ranged from the alignment of the teeth, to the color of the gums or to the presence of decay. The responses to what the level of concern means for the

parents were subjective, and we attempted to quantify this with the question about how soon the child should see a provider.

Obsequiousness bias, which is altering responses in the direction perceived to be desired by the investigator, could also be present in this study. The pictures became progressively worse before displaying the healthy dentition and finally the trauma photos. The parents could have been swayed to select a higher level of concern on the healthy dentition after seeing the pictures of the minor and moderate decalcification or severe decay. With these limitations several improvements should be made for future similar studies to gain more profound results. A larger sample size and presenting the survey in more languages would have given more representative results for the population of the VCU Pediatric Dental Clinic.

## Conclusion

Overall, parents and guardians have strong knowledge regarding the primary teeth, as it relates to what can cause cavities, the ability to eat, the ability to hold space for permanent teeth eruption and overall importance. However, a high percentage of parents still agreed that baby teeth have no function and will eventually fall out to be replaced by adult teeth. When showed several clinical cases, parents or guardians were able to identify an appropriate level of concern for the cases with severe decay; however, as the amount of decay decreased, so did the respondents' level of concern. Parents and guardians appear to have a general understanding and knowledge of their child's primary teeth, but increased guardian education on the early signs of decay and anticipatory guidance regarding dental trauma could help to prevent cavities from forming and help parents and guardians understand the significance of a traumatic dental injury.

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# Appendix 1

# Parental Attitudes Regarding the Primary Dentition, Dental Decay, and Trauma

The purpose of this research project is to determine parental knowledge and attitudes toward the primary dentition (baby teeth), dental decay and trauma. You are being asked to participate in this study because you are the parent/guardian of a child that seeks dental care at the VCU Pediatric Dental Clinic. Your participation is voluntary and you can stop at any time.

If you decide to participate in this project, you will be asked to answer several questions about your attitudes toward the function of baby teeth. You will also be shown several photos of baby teeth with varying levels of decay/trauma and asked to state your level of concern. The survey will last approximately 5-10 minutes. Participation is voluntary and you can stop the survey at any time. There are no costs for participating in this study other than the time you will spend filling out the survey. Data will be collected only for research purposes. Any and all data will be kept confidential, anonymous, and not linked to any personal information. Once you submit your responses, you will not be able to withdraw frm the study since there is no way to identify your responses. Access to all data will be limited to study personnel. If you have any questions or concerns about your participation in this project, contact: Kathryn Dundervill at dundervillk@mymail.vcu.edu or 804-828-9095.Thank you!

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Gender

◯ Female
◯ Male
◯ Other

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Your Age:

◯ 16-20
◯ 21-24
◯ 25-30
◯ 31-35
◯ 36-40
◯ ≥ 41

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Race

◯ Caucasian
◯ Black or African American
◯ Hispanic
◯ Asian
◯ Asian Indian
◯ Pacific Islander
◯ Other

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Highest education level:

◯ Did not graduate high school
◯ High school/GED degree
◯ Bachelor's degree
◯ Master's degree or above

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When was your (the parent's/guardian's) last dental exam?

◯ Within the past 6 months
◯ At least a year ago
◯ Between 1 and 5 years ago
◯ More 5 years ago

Check all boxes that apply to your (the parent/guardian's) dental history:

- ☐ Check-ups and Cleanings
- ☐ Fillings
- ☐ Extractions
- ☐ Periodontal (gum) disease
- ☐ Dentures/Partials
- ☐ Orthodontics (braces/aligners)

**Use the scale provided to indicate your agreement with the following statements:**

| | Strongly agree | Agree | No opinion | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| Baby teeth are important. | ◯ | ◯ | ◯ | ◯ | ◯ |
| Frequently eating food or drinks that contain sugar may cause cavities. | ◯ | ◯ | ◯ | ◯ | ◯ |

**Using the scale provided, please indicate your agreement with the role of baby teeth for each of the following:**

| | Strongly agree | Agree | No opinion | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| No function - they will all fall out and be replaced with adult teeth | ◯ | ◯ | ◯ | ◯ | ◯ |
| Ability to eat | ◯ | ◯ | ◯ | ◯ | ◯ |
| Jaw growth | ◯ | ◯ | ◯ | ◯ | ◯ |
| Hold space for adult teeth | ◯ | ◯ | ◯ | ◯ | ◯ |
| Ability to fit in with friends/peers | ◯ | ◯ | ◯ | ◯ | ◯ |

## Information about your Child(ren)

How old is your child for today's dental visit?

◯ 0-3
◯ 4-6
◯ 7-12
◯ ≥ 13

Is this the child's first time to see a dentist?

◯ Yes
◯ No

What is the nature of today's dental visit for your child?

◯ My child is here for an exam and cleaning
◯ My child is here for an exam and cleaning but it has been longer than 1 year since their last appointment
◯ My child is here for an exam and cleaning  but it has been longer than 2 years since their last appointment

Do you have children other than the one here today?

◯ Yes
◯ No

How many total children do you have?

◯ 1
◯ 2
◯ 3
◯ 4
◯ 5 or more

Please indicate the age of each of your children:
Child 1: _____
Child 2: _____
Child 3: _____
Child 4: _____
Child 5: _____
Child 6: _____
Child 7: _____
Child 8: _____

How often have your other children typically seen a dentist?

◯ None of my kids have been to the dentist before today
◯ Only when there is a problem
◯ 1 time a year
◯ 2 times a year

## Case 1

Case 1 Image

Photo Credit: Nowak, Arthur, Christensen, John R, Mabry, Tad R, Townsend, Janice Alisa, and Wells, Martha H. Pediatric Dentistry - E-Book. Philadelphia: Elsevier - Health Sciences Division, 2018. Web.

Based on the appearance of the teeth above (Case 1) what is your level of concern for the child's baby teeth?

◯ Not at all concerned
◯ Slightly concerned
◯ Somewhat concerned
◯ Moderately concerned
◯ Extremely concerned

## Case 2

Case 2 Image

Photo Credit: AAPD Clinical Photo Library

Based on the appearance of the teeth above (Case 2) what is your level of concern for the child's baby teeth?

◯ Not at all concerned
◯ Slightly concerned
◯ Somewhat concerned
◯ Moderately concerned
◯ Extremely concerned

## Case 3

Case 3 Image

Photo Credit: VCU Department of Pediatric Dentistry

Based on the appearance of these teeth above (Case 3) what is your level of concern for the child's baby teeth?

◯ Not at all concerned
◯ Slightly concerned
◯ Somewhat concerned
◯ Moderately concerned
◯ Extremely concerned

## Case 4

Case 4 Image

Photo Credit: http://www.mykidsdentist.com.au/tooth-decay-in-children/

Based on the appearance of these teeth above (Case 4) what is your level of concern for the child's baby teeth?

◯ Not at all concerned
◯ Slightly concerned
◯ Somewhat concerned
◯ Moderately concerned
◯ Extremely concerned

**Use the scale provided to indicate your agreement with the following statements based on the Case 4 Image repeated below.**

| | Strongly agree | Agree | No opinion | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| The child may get cavities in their adult teeth. | ○ | ○ | ○ | ○ | ○ |
| Their adult teeth might not have enough space. | ○ | ○ | ○ | ○ | ○ |
| This child needs to brush their teeth better. | ○ | ○ | ○ | ○ | ○ |
| This child should have an adult help them brush their teeth. | ○ | ○ | ○ | ○ | ○ |
| The child may have lower self-esteem. | ○ | ○ | ○ | ○ | ○ |

Case 4 Image

Photo Credit: http://www.mykidsdentist.com.au/tooth-decay-in-children/

## Case 5

Case 5 Image

Photo Credit: AAPD Clinical Photo Library

Based on the appearance of these teeth (Case 5 above) what is your level of concern for the child's baby teeth?

◯ Not at all concerned
◯ Slightly concerned
◯ Somewhat concerned
◯ Moderately concerned
◯ Extremely concerned

## Case 6

Case 6 Image

Photo Credit: AAPD Clinical Photo Library

Based on the appearance of these teeth (Case 6 above) what is your level of concern for the child's baby teeth?

◯ Not at all concerned
◯ Slightly concerned
◯ Somewhat concerned
◯ Moderately concerned
◯ Extremely concerned

**For each level of concern listed on the left, select the time frame in which you think a child should be seen by the dentist.**

| | Within 1 Week | Within 1 Month | Within 3 Months | Regular 6 Month Evaluation | No Evaluation Needed |
|---|---|---|---|---|---|
| Not at all concerned | ◯ | ◯ | ◯ | ◯ | ◯ |
| Slightly Concerned | ◯ | ◯ | ◯ | ◯ | ◯ |
| Somewhat Concerned | ◯ | ◯ | ◯ | ◯ | ◯ |
| Moderately Concerned | ◯ | ◯ | ◯ | ◯ | ◯ |
| Extremely Concerned | ◯ | ◯ | ◯ | ◯ | ◯ |