



## Dental caries in children under age three attending a university clinic

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### Abstract

**Purpose:** The aim of study was to determine the rates of dental caries and assess the restorative needs of children under three years of age attending an urban university clinic from 1993-1997.

**Methods:** In this retrospective study, data were abstracted from patient records and included demographic information, caries experience, and restorative needs.

**Results:** Gender distribution of the sample included 55% males and 45% females. The study population was predominantly African-American (51%) and Hispanic (34%), with a mean age of 20 months. A majority of the population had dental benefits through Medicaid (92%). Nearly one-third of the study population and as many as 56% of the children between 24 and 36 months had dental caries. Among those off the bottle (50%), children with severe dental caries had been weaned off the bottle at a significantly older age compared to those without any caries (16.9 vs. 10 months,  $P=0.000$ ).

**Conclusions:** This study provides further validity to the early oral health exam and early dental treatment, not only for preventive measures but also for restorative needs. The relatively high prevalence of early childhood caries could have been prevented by appropriate primary preventive strategies. (*Pediatr Dent* 21:262-265, 1999)

Infant oral health care was initially addressed at the American Academy of Pediatric Dentistry (AAPD) meeting during 1986 in Colorado Springs.<sup>1</sup> The traditional belief was for children to start visiting dentists at age three unless trauma or infection occurred. The new recommendation formulated in 1986, revised in 1989 and again in 1994, states that "infant oral health care begins ideally with prenatal oral health counseling for parents. A postnatal oral evaluation should be done within six months of the eruption of the first primary tooth and no later than twelve months of age."<sup>2</sup> Despite this decade old recommendation, it is not certain whether general dentists as well as pediatric dentists are in compliance and/or agreement.

In their study of AAPD members, Erickson and Thomas<sup>3</sup> found that 73% of the respondents were in agreement with the AAPD guideline on infant oral health care. However, only 47% of the respondents complied with the policy of performing the first oral examination at 12 months or before. Similar trends have been observed at the state level in Texas—while 69% of the pediatric dentists in Texas agreed with the AAPD

policy, nearly one-third (31%) did not.<sup>4</sup> The responsibility for the lack of early dental care lies not only with the dentist, but also with the parents. Kanellis<sup>5</sup> reported that fewer than two percent of Medicaid-enrolled children under one year of age in the state of Iowa, received any form of dental treatment. The proportion of this group of children receiving dental examination was even lower at 0.5%.

The dentist's primary responsibility to their patient is prevention, which begins with the eruption of the first tooth. Conditions such as early childhood caries, improper infant feeding practices, the early development of significant life long habits/patterns, the early transmission of *S. mutans* to infants, and the inappropriate use of fluorides in infants and toddlers reiterate the need for early intervention to promote the oral health of infants.<sup>6,7,8,9,10,11</sup> Such interventions include providing appropriate oral health education to parents and caregivers.<sup>10,11</sup> Infant oral health begins with the eruption of the first primary tooth, and our definition of early oral health would include this period up to age three, when a majority of pediatric dentists begin to see patients.

Few published studies exist on the dental caries experience of children under three years of age. Tang<sup>12</sup> investigated the dental caries experience among 5171 preschool children in Arizona, aged five months to four years. The author estimated dental caries prevalence of 6% among one-year-olds, 20% among two-year-olds, and 35% among three-year-olds. Data on the oral health status of similar age groups from other parts of the country appear to be lacking.

The University of Texas-Houston Health Science Center (UTHHSC) Pediatric Dental Clinic has been conducting early oral health examinations since 1993. The examinations consist of parental questionnaires, water fluoride analysis, anticipatory guidance, oral hygiene instructions, and clinical exams of infants aged six months to three years. The early oral health examination is meant to be a preventive approach to allow parents to gain knowledge about the oral development of their child and to care for their child's teeth. Further, the examination may facilitate the child to grow comfortable with the dental settings.<sup>11</sup> The purpose of this retrospective study was to determine the rates of dental caries and assess the restorative needs of children under three years of age attending an urban university clinic.

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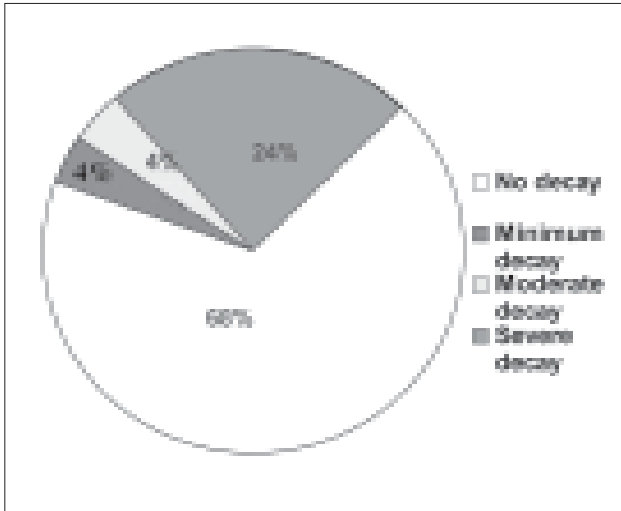


Fig 1. Caries rate in the sample.

## Materials and Methods

This retrospective study, approved by the Committee for the Protection of Human Subjects, consisted of 369 children, aged 8-36 months, attending the University of Texas-Houston Health Science Center dental clinic. Data were abstracted from the clinical charts available from the Department of Pediatric Dentistry, University of Texas-Houston Health Science Center. Clinical charts of all children (N=369), aged 8-36 months, seen at the clinic between 1993 and 1997 were chosen for the study. Gender distribution of the sample was 55% males and 45% females. The study population was predominantly African-Americans (51%) and Hispanics (34%), with a majority of the population (92%) receiving dental benefits through the state Medicaid program.

Parents or caregivers of the study population completed a questionnaire concerning the medical and oral development of the child, whether the child was still consuming fluids from a feeding bottle, when the child was weaned off the bottle, and whether there were any medical complications at birth. All parents and caregivers were requested to bring a sample of their drinking water for fluoride analysis. Compliance to water samples was poor (46%). Water testing was done to ascertain the need for supplemental fluorides. The examining dentist,

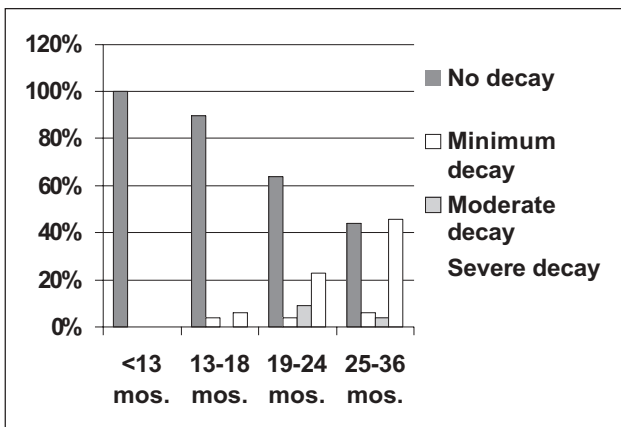


Fig 2. Caries rate vs. age.

with the aid of an ion analyzer, completed the analysis. Chan et al.<sup>13</sup> demonstrated that the weekly fluoride content of the fluoridated water fluctuates greatly in Houston, TX.

The information from the questionnaire as well as the regular health questionnaire was reviewed by the clinician with the parent. During interactive discussion, the dentist completed a preventive assessment. The benefits of fluoride were discussed with the caregivers and necessary supplemental fluoride were recommended as needed. Dietary and feeding counseling were also provided. Anticipatory guidance was discussed, thus "capturing parents' interest in important dental milestones and the future effects of habits and behaviors."<sup>14</sup> A knee-to-knee examination with a mirror and #23 explorer was done and prophylaxis/fluoride application followed while oral hygiene instructions were given to caregivers. Clinical charting was completed and radiographs were taken if needed. Restorative care for caries was scheduled utilizing local anesthesia alone, oral sedation, or general anesthesia. If no treatment was indicated, the patient was given a six-month follow-up appointment.

This retrospective study estimated the dental caries rates by the number of decayed teeth (dt) and not by the number of surfaces (ds). Caries experience was classified as mild (one decayed tooth or decalcification-white spot lesion), moderate (two or three decayed teeth), or severe (greater than three decayed teeth). Other data were collected through the parent questionnaire and review of the patient charts. Data for the study included age at dental appointment, health history, number of teeth decayed, age at which the child was weaned off the bottle, and a survey of their current oral hygiene program.

Statistical analysis included both descriptive and analytical/inferential tests. Descriptive statistics for the continuous variables, such as age, included measures of central tendency (median, mode, mean, and standard deviation). Discrete and categorical data were presented as frequency/percent distribution. Analytical/inferential tests were predominantly parametric and included Student's *t*-test and analysis of variance (ANOVA). These tests analyzed the difference in the duration of bottle feeding among those with different levels of dental caries. The significance level was set at alpha ( $P \leq 0.05$ ).

## Results

The age of the study population ranged from 8-36 months with a mean age of 20 months. As stated previously, the predominant ethnic distribution of the study population was 51% African-American and 34% Hispanic.

Among the 369 children aged 8-36 months, the prevalence of dental caries was 32%–24% had severe caries, 4% had mild decay, and another 4% had moderate caries (Fig 1). Not surprisingly, a positive association was seen between dental caries and age of the child. None of the 12 children less than 12 months old had dental caries. Nearly 10% of the children aged 13-18 months had caries. Of the 19-24 month olds nearly 36% had decay, and 56% of the children between 24-36 months had decay. Among the three-year-olds with caries, 46% had more than three decayed teeth (Fig 2).

The association between dental caries rates and the duration of bottle feeding was investigated. At the time of the dental appointment, 185 children (50%) had been weaned from the bottle and 184 (50%) were still taking a bottle. Among those weaned from the bottle at the time of the appointment, 29% had. Nine children (5%) had mild caries, seven (4%) had mod-

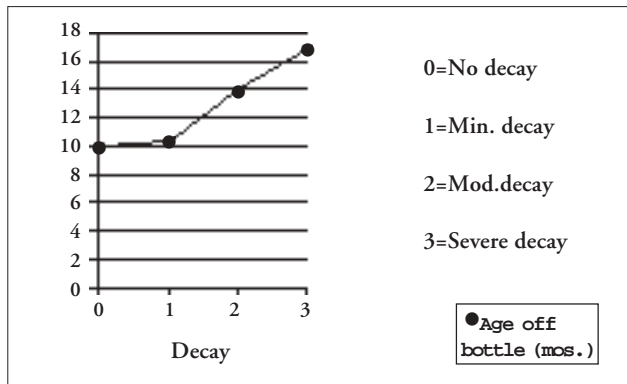


Fig 3. Decay vs. age off bottle (mos).

erate caries and 37 (20%) had severe caries. Among those children still taking a bottle, 35% were affected by dental caries. Of these, 77% were considered to have severe caries. The parents of those children who were weaned from the bottle were asked the age of the child when bottle feeding was stopped. Nearly 44% of the children were weaned at twelve months, 37% between 13-18 months, 13% at 19-24 months, and 6% at 25-36 months. The children without any dental caries were weaned at an average age of 10 months. Those with mild decay or moderate decay were weaned at an average age of 10.4 months and 14 months, respectively. The children with severe dental caries were weaned from the bottle at 16.9 months. Figure 3 depicts a statistically significant association between dental caries and the age the child was weaned from the bottle (ANOVA,  $P=0.000$ ).

The University of Texas-Houston clinic presents the dental treatment plan as well as the risks and benefits of the various treatment modalities to the caregivers of the children with decay. The options include restorative treatment without any sedation medication (recommended in a few cases), oral sedation for those over 25 pounds (American Society of Anesthesiologist's (ASA) classification of I or II), and general anesthesia for those under 25 pounds or over 25 pounds for extensive treatment (ASA I, II or III). Data for those children completing treatment indicate that 70% of the children were either placed on a two-three month recall to evaluate the white spot lesions or six-month recall if there were no lesions present. Of the 109 children who needed restorative treatment, 55% were treated in the dental office with oral sedation and 20% were treated in the hospital operating room. More than 17% did not comply with their appointment for sedation or general anesthesia and never had any treatment follow-up at the university clinic. The remaining 8% was either treated as a restorative appointment without sedation or anesthesia or was scheduled for treatment subsequent to this study. Among the 317 children eligible for six month recare appointments, 53% were in compliance with the recare appointment and 47% were not.

## Discussion

Any generalization or extrapolation of the findings from the present study should be done with extreme caution because of certain limitations such as sampling and examiner reliability. Concepts discussed here, however, could be applied to other

locales or populations. Our study was limited to a predominantly urban lower socio-economic population and may not apply to other areas of the country with well fluoridated water and/or higher socio-economic groups. Clinical examinations of the study population were done by a number of dental examiners, a majority of whom were pediatric dental residents between 1993 and 1997. Because of the multiplicity of the examiners, it is likely that the examiner reliability might be low. Because this study was a retrospective chart review, it was not possible to ascertain either inter- or intra-examiner reliability.

Early oral health care should not only be considered a time for the parents and children to get acquainted with the dentist, to relay proper oral hygiene techniques and anticipatory guidance, but also a time for the practitioner to plan and implement preventive strategies against oral diseases. Children, particularly those from high risk populations, need to be seen before any decay process begins.

Tang<sup>12</sup> reported similar findings to ours—nearly 20% of the two-year-olds and 35% of the three-year-olds from low socio-economic status have caries. Her study, as ours, "was accomplished recognizing that children from low-income backgrounds were over sampled." Our study found that almost one-third of the children who presented to the UTHHSC clinic for an infant oral health exam had caries. Among the children between the ages of 25-36 months of age, the prevalence of dental caries was 56%. Such high prevalence reiterates the need for oral health examinations not only for primary prevention, but also for restorative needs and secondary prevention. Early intervention after the eruption of the first tooth, but no later than one year of age, might have prevented dental caries. Certain obstacles or constraints need to be overcome if dental examinations are to be done on children less than 12 months of age. Relatively fewer dental care providers are willing to do dental examinations of one-year-olds, as seen in the national and state surveys of Erickson and Kendrick respectively.<sup>3,4</sup> It is likely that the parents and caregivers may not understand the value or the need for dental examination of one-year-old children. Future research studies are necessary to assess the effectiveness of oral health education and preventive strategies in preventing early childhood caries.

The average age of the study population was 20 months and only one-half of the children had been weaned from the bottle. While talking to parents and caregivers at the clinic, the principal investigator felt that the early oral health exam is most likely the first time these parents have been urged to wean their baby from the bottle. This observation, however, is contrary to some of the previous findings and warrants further research. Certain studies have reported that parents had prior knowledge of putting their child to bed with the bottle.<sup>15,16,17</sup> Johnsen<sup>15</sup> found that 40% of the parents of children with baby bottle tooth decay (BBTD) admitted having prior knowledge of the detriments of putting children to sleep with a feeding bottle. Benitez et al.<sup>16</sup> reported that more than 70% of caregivers of children with early and established BBTD acknowledged the cariogenic potential of a nursing bottle. Another study<sup>17</sup> found that nearly two-thirds of the parents of children with BBTD were informed about the harmful effects of children sleeping with baby bottles. Further, more than one-half (52.2%) of parents of children with BBTD were informed about the condition even before the child was born.<sup>17</sup> Among those children

who weaned from the bottle, the prevalence of dental caries increased proportionately with the increased age of weaning the child from the bottle. Because the ages of children in this study varied at the time of the dental appointment, it was difficult to determine when the decay had started and when the best time to wean the child from the bottle would be. Bacteria, host, substrate, and time are the primary factors of dental caries.<sup>9,18</sup> Early intervention at a young age, including explanation of appropriate preventive strategies to the parent or caregiver, and urging them, among other things, to wean their child from the bottle, might have prevented dental caries.

The dentist must not only be able to perform the early oral health examination, but also “should be prepared to render treatment when indicated, or should refer the patient to an appropriately trained dental providers for necessary treatment.”<sup>1</sup> “Restorative treatment of the condition is expensive and difficult, with many children requiring general anesthesia or oral sedation.”<sup>17</sup> At UTHHSC clinic, in-office oral sedation (55%) was the preferred method of treatment, although 20% were treated under general anesthesia. Clinicians completed the treatment as planned, perhaps due to insurance companies’ prompt approval of the procedures. As many as 17% of the children never had treatment for their caries by our clinic, which is a great concern. We can only believe they were never treated and will probably appear with even more decay. In a predominantly urban Medicaid practice patient follow up is difficult. Only 53% of the patients eligible for a recare appointment ever returning to our clinic.

## Conclusions

This study validates the early oral health examination from a restorative viewpoint.

1. Approximately one-third of the entire population and almost two-thirds of those between 25-36 months of age needed restorative intervention.
2. This large percentage may be attributed to prolonged use of the baby bottle, inadequate exposure to fluorides, poor diet, and poor oral hygiene. In general, caregivers appear to have had minimal dental health education.
3. The relatively high prevalence of early childhood caries could have been prevented by appropriate primary preventive strategies. One way of accomplishing such goals is to promote the early oral health concept not only to the patients and caregivers, but also to pediatricians and other medical colleagues.

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