

Parental awareness, habits, and social factors and their relationship to baby bottle tooth decay

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Abstract

The general objective of this study was to investigate the relationship between parental awareness, habits, and social factors in a particular parent population and the occurrence of baby bottle tooth decay (BBTD) in their children. The sample consisted of Hispanic, Black, and White families and included 100 parents with 100 children from the Pediatric Clinic and the Pediatric Dentistry Clinic at Houston Medical Center, University of Texas, Houston. Questionnaires including information related to demographic data, educational level, marital status, baby care, and knowledge and beliefs about BBTD were completed by the parents. Each child was examined with mouth mirror and tongue blade to determine the presence of BBTD. Overall, 19 of the children were found to have BBTD. The racial distribution of the children with and without BBTD was statistically significant ($P = 0.03$) with the Hispanic population being over-represented in the BBTD group (72.2% versus 37.0%) and Blacks under-represented (16.2% versus 50.6%). The ages at which babies with BBTD were weaned from the bottle were significantly ($P < 0.001$) higher than those with no BBTD, and those weaned after 14 months of age were more likely to have BBTD. The percentage of babies with BBTD weaned from the bottle after 14 months old was higher (36.8%) than babies without the condition (26.5%). Awareness of BBTD was generally lower among parents of the BBTD children than parents of children without BBTD, as reflected by the feeding patterns of their children and their responses to questions dealing with their knowledge of BBTD. (*Pediatr Dent* 19:22–27, 1997)

Baby bottle tooth decay (BBTD), a term endorsed by the Healthy Mothers-Healthy Babies Coalition, is a disease (also called nursing caries) of young children, characterized by a distinctive pattern of tooth decay in the primary dentition. The four maxillary incisors are most frequently affected, while the four mandibular incisors usually remain unaffected. Explanations for this pattern include the pooling of milk or sweetened liquid from the baby bottle around the maxillary incisors and other teeth of a sleeping child as the main etiologic factor.¹

Cariou lesions, including those associated with

nursing caries, generally result from the interaction of three primary variables: 1) cariogenic microorganisms in the mouth, 2) fermentable carbohydrates, and 3) tooth surfaces that are susceptible to acid dissolution. A prerequisite for colonization and multiplication of cariogenic bacteria such as *Streptococcus mutans* (*S. mutans*) is access to a nonshedding surface in the mouth; consequently microorganisms of the mutans group are usually not detectable in the oral cavity before tooth eruption or without the presence of a nonshedding surface such as an obturator.² Several clinical studies have failed to isolate mutans streptococci from the mouths of normal preedentate infants.^{2–6}

The microorganisms responsible for dental caries apparently can be transmitted from one individual to another. Several studies have indicated that mothers can unknowingly transmit *S. mutans* to their infants and children.^{2,7,8,9} Maternal intrafamilial transmission is logical since the mother is usually the primary adult caring for the infant. However, in one study maternal and paternal transfer of *S. mutans* was found with similar frequency.¹⁰ In previous studies comparing salivary counts of *S. mutans* in children with those of their parents, children whose mothers had low concentrations of salivary *S. mutans* rarely harbored these microorganisms. On the other hand, children whose mothers exhibited high salivary levels tended to be infected and those having the highest salivary levels tended to have the highest caries experience.¹¹

Several studies^{12–16} have shown highly significant differences in caries prevalence between various ethnic and/or racial groups. Paul & Bradnock¹⁵ found a considerably worse overall state of dental health in Asian children than in indigenous children living in the English midlands city of Coventry. It was reported that 22.2% of 2-year-old immigrant children in Sweden had caries compared with 4.5% of nonimmigrant children.¹⁶ Determining the true prevalence of nursing caries is difficult. The influence of cultural and ethnic factors on infant feeding habits makes comparing studies of different ethnic types difficult.¹⁷ The prevalence of nursing caries varies depending on the country: Canada, 3.2%; Australia, 5.4%; South African urban Blacks, 3.1% and rural Blacks, 13.7%. In the United States, the preva-

lence of the disease varies from 1% to 53.1% depending on the ethnic or racial group.¹²

Studies have failed to identify a unique family profile that predisposes to the condition.¹⁸⁻²⁰ A common finding in families with nursing caries is parental overindulgence. Parental concern is evident but it is suggested that BBTd is a problem of overindulgence or lack of parental restraint rather than one of neglect.¹⁹⁻²⁰ Since many parents already know the potential consequences of extensive nursing caries, simply informing them of the hazard is apparently not enough for prevention. The fact that about one-third of the parents of BBTd children provide additional fluoride is further evidence that they are attempting to address dental caries.²⁰ Some studies²¹ suggest that parents of children with BBTd may require special support to help them achieve behavior change objectives. Health professionals interested in altering feeding patterns in infants and toddlers must realize that any change in feeding routine will affect the entire household or family system.²¹

This study investigated, via questionnaire, the relationship between various social and behavioral factors and the incidence of BBTd.

The specific objectives were to:

1. Describe the relationship between awareness of BBTd and caretaker sex and relationship to the child
2. Determine the prevalence of BBTd in different racial groups
3. Describe the relationship between BBTd and level of education of the caretaker
4. Describe the relationship between occurrence of BBTd in children and their feeding/nursing habits
5. Determine the relationship between BBTd and dentally related habits, especially those that might be involved in maternal transmission of cariogenic oral microorganisms to the child.

Methods and materials

The study sites were the pediatric clinic and the pediatric dentistry clinic at Houston Medical Center, University of Texas. Subject selection took place during a three-month period from all parents who went to the clinics with one or more children between ages 12 and 42 months. The selection of

a balanced sample of four major racial/ethnic groups (Hispanic, White, Black, Asian) was attempted, but the final composition of the study group was predominantly Black and Hispanic due to the nature of patients seeking care. Sampling was discontinued when the sample included 100 parents with 100 children. Children selected for this study reported no medical conditions, illness, or traumatic or systemic involvement that might have produced hypoplastic or defective enamel.

A cross-sectional survey design using a questionnaire directed to caretakers asking questions related to demographic variables, educational level, marital status, baby care, and knowledge and beliefs about BBTd was performed. A pilot survey of 10 questionnaires was done to check the survey instrument. The final questionnaires were available in English and Spanish. Questions were objective and closed-ended, and were divided into different categories according to the specific areas of awareness, focusing on behavioral risk factors for dental disease.

TABLE 1. MEAN AGES FOR PARENTS AND CHILDREN

Age	BBTD			No BBTD			t	P
	N	Mean	SD	N	Mean	SD		
Parents (years)	19	26.2	4.5	81	27.7	6.8	0.30	NS
Children (months)	19	23.6	7.2	81	20.0	9.0	1.62	NS

NS = not significant ($P > 0.05$).

TABLE 2. DEMOGRAPHIC ANALYSIS OF THE TWO GROUPS

Variable	BBTD		No BBTD		Test Statistics	
	%	(N)	%	(N)	X ²	P
<i>Sex of the Parents</i>						
Female	84.2	(16)	91.4	(74)	0.87	NS
Male	15.8	(3)	8.6	(7)		
<i>Race of Parents</i>						
Black	16.7	(3)	50.6	(41)	8.78	0.03*
Hispanic	72.2	(13)	37.0	(30)		
White	5.6	(1)	9.9	(8)		
Other	5.6	(1)	2.5	(2)		
<i>Parents' Marital Status</i>						
Married	47.4	(9)	39.5	(32)	0.51	NS
Never married	47.4	(9)	51.9	(42)		
Divorced	5.3	(1)	8.6	(7)		
<i>Parents' Education</i>						
Elementary	15.8	(3)	11.1	(9)	1.10	NS
High school	68.4	(13)	61.7	(50)		
College	15.8	(3)	25.9	(21)		
No answer	0.0	(0)	1.2	(1)		
<i>Child Insurance</i>						
Medicaid	89.5	(17)	87.7	(71)	0.77	NS
Private	5.3	(1)	9.9	(8)		
Other	5.3	(1)	2.5	(2)		
<i>Baby's Sex</i>						
Female	42.1	(8)	56.8	(46)	1.34	NS
Male	57.9	(11)	43.2	(35)		

NS = not significant ($P > 0.05$).

* Statistically significant.

TABLE 3. FEEDING HABITS

Variables	BBTD		No BBTD		Test Statistics	
	%	(N)	%	(N)	X ²	P
<i>Child Breast Fed</i>						
Yes	63.2	(12)	38.3	(31)	1.34	NS
No	36.8	(7)	60.5	(49)		
No answer	0.0	(0)	1.2	(1)		
<i>Duration of Breast Feeding</i>						
< 3 months	38.5	(5)	45.5	(15)	2.64	NS
> 3 months	53.8	(7)	54.5	(18)		
Still	7.7	(1)	0.0	(0)		
<i>Baby Still on the Bottle</i>						
Yes	47.4	(9)	56.8	(10)	0.88	NS
No	52.6	(10)	42.0	(65)		
No answer	0.0	(0)	1.2	(6)		
<i>Bottle Used as a Pacifier</i>						
Yes	0.0	(0)	12.3	(10)	2.69	NS
No	89.5	(17)	80.2	(65)		
No answer	10.5	(2)	7.4	(6)		
<i>Baby Off the Bottle</i>						
<12 months	0.0	(0)	29.4	(10)	25.01	0.001*
12-14 months	15.8	(3)	44.1	(15)		
>14 months	36.8	(7)	26.5	(9)		
Not sure	47.4	(9)	0.0	(0)		
<i>Brush: When to Start</i>						
Correct answer	63.2	(12)	51.9	(42)	0.79	NS
Incorrect answer	36.8	(7)	48.1	(39)		
<i>Sleep With the Bottle</i>						
Yes	78.9	(15)	55.6	(45)	3.51	0.06†
No	21.1	(4)	44.4	(36)		
<i>Time Bottle in Mouth</i>						
Fall sleep	68.8	(11)	41.3	(19)	3.58	NS
Nap time	6.3	(1)	10.9	(5)		
Finished	25.0	(4)	47.8	(22)		
<i>Content of Bottle</i>						
Milk, juice, soda	78.9	(15)	83.7	(36)	0.21	NS
Water	21.1	(4)	16.3	(7)		

NS = not statistically significant ($P > 0.05$).

* Statistically significant.

† Borderline significant.

The questionnaires were administered and personal interviews were performed by one investigator in either English or Spanish. A visual aid containing the questions was given to the parents to facilitate the interviews. The interview lasted about 10 to 15 min. Immediately afterward, each child was examined in a knee-to-knee position with a mouth mirror, pen light, and tongue blade. Children were classified as having BBTD if two or more maxillary anterior teeth exhibited carious lesions progressing beyond the white-spot stage (decalcification), and the mandibular anterior teeth were sound. Radiographs were not exposed.

The data were transferred to a computer for statistical analysis. Between-group differences were analyzed by the chi-square test for nonparametric data, or the T test for parametric data, such as mean ages of parents and children. $P = 0.05$ was the accepted level of significance.

Results

Overall, 19 of the 100 children (19%) were found to have BBTD. Of the 19 parents of the BBTD children, eight had never heard or read about BBTD. The children and parents were divided into two groups according to the BBTD status of the child.

Table 1 presents the means and SD for the parents' and children's ages. The parents' ages and children's ages in each group were very similar, and no significant between-group differences were found. Table 2 presents demographic information for the two groups. No significant differences were found between groups for parent's sex, marital status, or education, child's type of insurance, and baby's sex. A significant difference was found in the racial distribution of the parents ($P = 0.03$). Hispanic parents were over-represented among the children with BBTD and Black parents were under-represented.

Table 3 presents a summary of questions assessing the feeding habits of the children. Babies with BBTD were more likely to be breastfed than babies without the condition, but the difference was not significant. The parents' responses to questions pertaining to "duration of breast feeding", "baby still on the bottle", and "bottle used as a pacifier" were not significantly different. The between-group differences in response to the question dealing with the age at which the babies were weaned from the bottle was highly significant ($P < 0.001$). The proportion of children weaned after 14 months of age was higher among those with BBTD ($7/19 = 36.8\%$) than among those without ($21/81 = 26.5\%$). Of the 81 patients without BBTD, 60 (73.5%) were weaned from the bottle between 12 and 14 months. The distribution of responses to the question, "when to start brushing the baby's teeth" was not significantly different between groups. Most of the parents in the study knew they should start brushing when the first tooth erupts. The question pertaining to "putting the baby to sleep with the bottle" was not significantly different ($P = 0.06$). In the group of children with BBTD, the percentage who slept with the bottle (78.9%) was higher than for those who did not have the condition (55.6%). How long the bottle was

used was not significantly different between groups. The question pertaining to "when to start brushing the baby's teeth" was not significantly different between groups. Most of the parents in the study knew they should start brushing when the first tooth erupts. The question pertaining to "putting the baby to sleep with the bottle" was not significantly different ($P = 0.06$). In the group of children with BBTD, the percentage who slept with the bottle (78.9%) was higher than for those who did not have the condition (55.6%). How long the bottle was

TABLE 4. HABITS RELATED TO DENTAL HYGIENE

Variable	BBTD		No BBTD		Test Statistics	
	%	(N)	%	(N)	X ²	P
<i>Share Utensils</i>						
Yes	21.1	(4)	46.9	(38)	4.23	0.04*
No	78.9	(15)	53.1	(43)		
<i>Kiss the Baby on the Lips</i>						
Yes	31.6	(6)	50.6	(41)	2.90	NS
No	68.4	(13)	49.4	(40)		
<i>Baby has Toothbrush</i>						
Yes	100.0	(19)	86.4	(70)	2.90	NS
No	0.0	(0)	13.6	(11)		
<i>Help Child Brush</i>						
Yes	78.9	(15)	79.0	(64)	0.52	NS
No	21.1	(4)	18.5	(15)		
<i>No Answer</i>						
0.0	(0)	2.5	(2)			
<i>Daily Brushing Child</i>						
Once	47.1	(8)	34.8	(24)	0.42	NS
Twice or more	52.9	(9)	65.2	(45)		

NS = not statistically significant ($P > 0.05$).

* Statistically significant.

TABLE 5. KNOWLEDGE OF BBTD

Variable	BBTD		No BBTD		Test Statistics	
	%	(N)	%	(N)	X ²	P
<i>Knowledge of BBTD</i>						
Yes	57.9	(11)	69.1	(56)	0.88	NS
No	42.1	(8)	30.9	(25)		
<i>Describe BBTD</i>						
Don't know	33.3	(4)	9.6	(5)	4.54	0.03*
Know	66.7	(8)	90.4	(47)		
<i>Information about BBTD</i>						
Professional	8.3	(1)	17.9	(10)	3.03	NS
Media	8.3	(1)	19.6	(11)		
Both	75.0	(9)	60.7	(34)		
None	8.3	(1)	1.8	(1)		

NS = not statistically significant ($P > 0.05$).

* Statistically significant.

left in the mouth and bottle contents were not significantly different among the groups.

Table 4 presents responses of the two groups of parents to questions dealing with dental habits. The answers dealing with shared utensils were significantly different ($P = 0.04$). Those without BBTD were more likely to share utensils than the group with BBTD (46.9% versus 21.1%). Between-group comparisons dealing with "kiss baby on the lips", "baby has a toothbrush", "help child brush", and "daily brushing" were not significant.

Table 5 presents the results of questions regarding knowledge of BBTD. Between-group differences in responses to the question asking if the parent had knowledge of BBTD were not significant. However, the group without the condition had a higher percentage of yes answers than the group with the condition (69.1% versus 57.9%). The question dealing with the description

of BBTD was significantly different ($P = 0.03$). A correct description of BBTD was given by only 66.7% of the parents of children with the condition compared with 90.4% of the parents of children without the condition. The reported sources of information about BBTD were not significantly different among groups. In both groups, the sources of information came from the media (TV, radio, books, magazines) and professionals (pediatrician, dental office, and prenatal counseling).

Additional analysis was performed in the Hispanic group, specifically on parental awareness of BBTD. In the group of 30 children without the condition, seven parents (23.3%) stated that they had never heard or read of BBTD, compared to seven of 13 parents (53.8%) of children with the condition. The difference was statistically significant ($P = 0.05$).

Discussion

Several reports suggest that even though parents know the harmful effects of putting the baby to sleep with the bottle, they still do it.^{1, 20, 21} In our sample, almost half of the parents of children with BBTD did not know about BBTD or at least didn't know at the time of the interview. It is striking that half of the patients with the condition were Hispanic and half of their parents did not know about the condition. A possible explanation for this is that Houston is a city with increasing numbers of new immigrants who have not been completely integrated. In this research, we did not consider the different levels of acculturation, socioeconomic status,

number of generations living in the United States, or country of origin. However, it is well-known that the Mexican contribution to the overall Hispanic population in Houston is predominant. Also, noteworthy is the high proportion of Medicaid patients in the study, indicating a low socio-economic status. Dental health education in the Houston Hispanic population may not be received early enough to prevent their children from developing BBTD. Other socioeconomic and cultural factors not investigated in this study may play a very important role in the development of BBTD.

Recent studies have already suggested that cultural and ethnic factors play a major role in the development of BBTD.²¹⁻²⁶ Our results differed somewhat from the findings of Sullivan and Tinanoff.²⁵ In our study, the inappropriate use of the bottle was apparent. The percentage of patients with the condition who went to bed with the bottle was higher than in those without the

condition who also went to bed with the bottle. Although the percentage of our BBTD patients sharing utensils with their parents was unexpectedly lower than for that of the group without the condition, the results could be spurious, given the relatively small sample size of this study. Also, although shared utensils might be a factor in parent-child transmission of cariogenic bacteria, the role of shared utensils in BBTD is less clear.

Further interpretation of these data is limited by the absence of parent-child microbiological data. Another factor that limits conclusions is the cross-sectional design of our study, especially with respect to the diagnosis of BBTD, which might become clinically detectable in some of the children at a later age despite a negative classification at the present examination.

In a study of BBTD among Native American infants living in Washington state, Tsubouchi and coworkers²⁶ noted significant associations of BBTD with three factors obtained from parent/caretaker questionnaires: "bottle fed now", "giving bottle as baby falls asleep", and "three times or more snacks between meals". They also noted that brushing behavior was related to BBTD and concluded that feeding patterns appear to be behavioral risk factors in the prevalence of infant caries.

It appears that at least some of the future interventions to prevent and reduce the damaging sequelae of BBTD should be directed at education. The education should be initiated, not when the habit of putting the baby to sleep with the bottle is already established, but before the baby is born, if possible. The traditional approach of identifying which parents are giving their child the bottle at bed time and then trying to educate them needs to be reevaluated.²⁵ Almost half of the parents of our BBTD children had no previous knowledge of BBTD; the other half had some knowledge of BBTD, but still were unable to prevent it. Obviously, education alone may not be enough for prevention; but, if given, it seems desirable to provide parental guidance before harmful habits are established.

Conclusions

1. Hispanics were over-represented among the children with BBTD and Blacks under-represented.
2. Children weaned after 14 months of age were more prone to develop BBTD.
3. In the group of children with BBTD, the percentage who slept with the bottle (78.9%) was higher than those who did not.
4. The group of children without BBTD had a higher percentage of sharing utensils with their parents than the group with BBTD.
5. Knowledge of BBTD was higher among parents of children without BBTD than among the parents of children with BBTD.

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