

Maternal-Child Oral Health Behaviors and Caries Experience in the Child

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Objective: This study examined maternal and child oral health behaviors and potential risk factors for dental caries in high-risk children. **Study Design:** Data on oral health practices were collected from surveys of mother/caregivers and the child's dental chart was reviewed. Linear regression and ordered probit regression models were used to examine data. **Results:** A total of sixty questionnaires were completed. There was a marginally significant relationship ($P=.08$) between number of times per day a child consumed a sweetened beverage and the dmfs of the child. Mothers who snacked more frequently had a greater probability (24%) that their child snacked 3 times or more. Mothers who drank a sweetened beverage more frequently had a greater probability (40%) that their child drank a sweetened beverage 3 or more times a day. Mothers who brushed their teeth with fluoridated toothpaste had a greater probability (79%) that their child brushed 2 or more times a day with fluoridated toothpaste. **Conclusions:** Two maternal variables, reported soft drink consumption and dietary habits, appear promising for caries prediction. Implementation of dietary counseling and oral health programs for mothers and research merit further exploration.

Keywords: dental caries, snacking, toothbrushing, sweetened beverages

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INTRODUCTION

Oral and dental health can be influenced by oral hygiene as well as dietary, biological, and demographic factors.¹ As health care providers, dentists have the opportunity to play a significant role in the development of healthy dietary patterns and the promotion of good eating habits in children. The American Academy of Pediatric Dentistry (AAPD) recommends “educating the public about the association between frequent consumption of carbohydrates and caries, and encourages pediatric dentists to provide dietary and nutrition counseling for their patients.”²

The significance of diet in the development of dental caries has been demonstrated extensively in literature.³⁻¹⁰ Sugar misuse, in particular, high frequency consumption of sugared beverages, has been reported as a risk indicator and risk factor for developing cavities in children.⁵⁻¹⁰ Specifically, fermentable carbohydrates are metabolized by bacteria to produce acid, resulting in the demineralization of the tooth and cavitation.^{5, 10} Similarly, studies have found that children who eat frequently between meals, i.e. snacking, have more carious lesions.^{5, 7, 10} Snack foods tend to be fermentable carbohydrates and frequent exposures will result in longer periods of low oral pH and subsequent demineralization and the development of carious lesions.⁵ Relatedly, the protective influence of fluoride is critical. When there is frequent exposure to fluoride, sugar consumption is reduced from a major risk factor for caries to one that is moderate-to-mild for most children.^{6, 8-10} The caries risk assessment tool (CAT) outlined by the AAPD lists frequent (i.e. 3 or more) between-meal exposures to simple sugars or foods as strongly associated with caries. Further, suboptimal topical fluoride exposure is also a high risk indicator for caries.¹¹

Utilizing the AAPD risk factors and recommendations, dentists employ counseling parents and children on issues regarding dietary factors that play an important role in children's dental and oral health. For example, dietary education for the purpose of reducing caries incidence in children aims to help parents change their children's dietary behaviors. Critical behaviors include choosing low or non-cariogenic snacks, limiting sweet foods to mealtimes, and toothbrushing after sugar exposures.¹⁰ The literature recognizes that

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modeling by caregivers will encourage the development of desirable dietary habits in children. Crockett et al demonstrated that parents and children have a positive influence on each other when trying to alter eating habits.¹² Positive eating behavior changes last longer if interventions are aimed at family attitudes and habits rather than individuals.⁸ The significance of parental influence has been demonstrated in studies addressing pediatric obesity. Parent training or modeling show positive changes in school age children's weight status and weight loss is more likely to be maintained by children whose parents are both normal weight.¹³⁻¹⁵ The American Dietetic Association emphasizes a parent and family counseling component for younger children since it has been observed that family feeding dynamics and parenting practices strongly influence pediatric overweight management.¹⁵ Similarly studies addressing pediatric cardiovascular disease found that family-oriented counseling produced favorable effects on behaviors involving food and nutrition in children. Diet intervention programs with the family allow the family to be allied in a common cause, thus resulting in a more positive impact on the individual child.^{16,17}

Currently there have been limited studies exploring the relationship between maternal-child dietary habits or the impact of family dietary counseling on dental caries in children. This pilot study explored the use of maternal information to identify relationship to child dental caries in the hope that this information could be especially useful for dental caries prevention for very young children.

METHOD

This study was approved by the Institutional Review Board of Columbia University Medical Center. Thirty active dental patients were recruited on a voluntary basis from the pediatric dental clinic. The study included healthy children between the ages of 3-6 years old. The mother's of these children were required to be able to read and understand English questionnaires and to be able to provide informed consent. In order to maintain confidentiality, no direct identifiers were used for the data. Two questionnaires were given to the mothers at the time of the child's dental appointment. One questionnaire related to the oral health behaviors of the mother and one questionnaire related to her child's oral health behaviors. The two questionnaires consisted of three identical questions addressing: (1) frequency of snacking, (2) frequency of consuming sweetened beverages, and (3) frequency of toothbrushing with a fluoridated dentifrice. A review of the child's dental chart specifically looked at the following information: (1) date of birth, (2) gender, and (3) evidence of oral diseases, defined as the number of decayed, missing, filled primary teeth and surfaces (dmfs, dmft) and based on a total dmf greater than zero.

Data Analysis

Linear regression and ordered probit regression models were run with the assistance from the Institute for Social and

Economic Research and Policy (ISERP) at Columbia University. Linear regression models are presented for the relationship between the child's oral health behaviors and the caries experience of the child. Ordered probit regression models are presented for the relationship between maternal-child oral health behaviors and caries experience in the child; and, the relationship between maternal oral health behaviors and caries experience in the child.

RESULTS

Sixty questionnaires were completed. Thirty of the questionnaires related to maternal oral health behaviors, and thirty of the questionnaires related to the child's oral health behaviors. The descriptive results are presented in Table 1. The majority of children in the study sample were Hispanic (70%), and male (63%) and the average age was 4. All of the families were of low socioeconomic status with Medicaid as their primary insurance. In terms of caries rate, the average number of dmft was 6.4 (range=0-13) and the average dmfs was 12.0 (range=0-30). The majority of mother's reported eating snacks 1-2 times a day, drinking something sweet 1-2

Table 1. Descriptive Results

Sociodemographics	n=30	dmft	dmfs
Ethnicity			
Hispanic	70%		
African American	20%		
Other	10%		
Gender			
Female	11		
Male	19		
Age (Years)			
3	9	7.30 (0-12)	14.30 (0-30)
4	11	7.45 (0-13)	12.91 (0-22)
5	6	5.67 (0-13)	12.33 (0-27)
6	4	2.75 (0-5)	4.00 (0-10)
Average	4	6.4 (0-13)	12.0 (0-30)
Maternal-Child Questionnaires	Mother's self response n=30	Mother's response for children n=30	
Frequency of snacking per day			
0	2	0	
1-2	25	22	
3 or more	3	8	
Frequency of drinking a sweetened beverage per day			
0	2	0	
1-2	17	14	
3 or more	11	16	
Frequency of toothbrushing with a fluoridated dentifrice			
0	0	0	
1	1	8	
2 or more	19	22	

times a day and brushing their teeth with a fluoridated dentifrice 2 or more times a day. The majority of mothers reported that their child ate 1-2 snacks per day, drank something sweet 3 or more times a day and brushed their teeth

with fluoridated toothpaste 2 or more times a day.

Following logistic regression and ordered probit analysis of the descriptive data collected the results are presented in Table 2. No statistical differences were found for age or gen-

Table 2. Summary of Results: Analysis of Descriptive Data

Relationship between the child's oral health behaviors and the caries experience in the child (dmft, dmfs)			
	Coef.	Std. Err.	P-value
dmft			
<i>Child's snacking</i>	1.353	2.086	0.523
<i>Child's consumption of sweetened beverages</i>	1.765	2.155	0.421
<i>Child's toothbrushing with a fluoridated dentifrice</i>	2.387	2.282	0.306
dmfs			
<i>Child's snacking</i>	-3.141	3.957	0.435
<i>Child's consumption of sweetened beverages</i>	6.467	3.634	0.087*
<i>Child's toothbrushing with fluoridated dentifrice</i>	-0.358	3.957	0.928
Adj R-squared=0.0217			
Relationship between maternal child oral health behaviors - Snacking			
	Mean	Std. Err	
Mother snacking 1-2 times a day			
<i>Child snacking 3 or more times a day</i>	0.240	0.085	
Mother snacking 0 times a day			
<i>Child snacking 3 or more times a day</i>	0.046	0.129	
Relationship between maternal child oral health behaviors - Sweetened Beverages			
	Mean	Std. Err	
Mother consuming sweetened beverages 1-2 times per day			
<i>Child consuming sweetened beverage ≥3 times a day</i>	0.396	0.105	
Mother consuming sweetened beverage 0 times a day			
<i>Child consuming sweetened beverage ≥3 times a day</i>	0.060	0.077	
Relationship between maternal child oral health behaviors - Toothbrushing			
	Mean	Std. Err	
Mother brushing teeth with fluoridated dentifrice ≥2 times per day			
<i>Child brushing teeth with fluoridated dentifrice ≥2 times per day</i>	0.793	0.133	
Mother brushing teeth with fluoridated dentifrice 0-1 times per day			
<i>Child brushing teeth with fluoridated dentifrice ≥2 times per day</i>	0.110	0.176	
Relationship between the mother's oral health behaviors and the caries experience in the child			
	Coef.	Std. Err.	P-value
dmft			
<i>Mother's snacking</i>	0.774	1.529	0.617
<i>Mother's consumption of sweetened beverages</i>	4.504	1.315	0.002*
<i>Mother's toothbrushing with fluoridated dentifrice</i>	4.596	2.812	0.115
dmfs			
<i>Mother's snacking</i>	-1.629	3.373	0.633
<i>Mother's consumption of sweetened beverages</i>	6.975	2.901	0.024*
<i>Mother's toothbrushing with fluoridated dentifrice</i>	8.160	6.202	0.201
Adj R-squared=0.3084			
Relationship between the mother's oral health behaviors and the caries experience in the child - dmft, dmfs			
	Coef.	Std. Err.	P-value
dmft			
<i>Mother consuming sweetened beverages ≥3 times per day</i>	7.151	1.624	0.001*
dmfs			
<i>Mother consuming sweetened beverages ≥3 times per day</i>	13.553	3.419	0.001*
Adj R-square=0.3903			

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der for any of the research questions. No statistical relationship was found between the child's dietary intake (snacking, consuming sweetened beverages) or frequency of toothbrushing with a fluoridated dentifrice and the number of dmft. Similarly, no statistical relationship was found between the number snacks and the frequency of toothbrushing with a fluoride dentifrice and the number of dmfs. However, there was a marginally significant direct relationship ($P=0.087$) between exposures per day of sweetened beverage and the dmfs of the child.

For mothers who snack 1-2 times a day, the probability that the child will snack 3 or more times a day is 24%. For mothers who do not snack, the probability that the child will snack 3 or more times a day is reduced to 5%. For mothers who drink a sweetened beverage 1-2 times a day, the probability that the child will drink a sweetened beverage 3 times a day is 40%. For mothers who do not drink a sweetened beverage every day, the probability that the child will drink a sweetened beverage 3 or more times a day is only 6%. For a mother who brushes her teeth 2 or more times a day, there is a 79% probability that her child will also brush 2 or more times. If the mother brushes 0-1 times a day there is an 11% chance that her child will brush 2 or more times a day.

There is a direct association ($P<0.002$) between how many times a day a mother drinks a sweetened beverage and the dmft of her child. Similarly, there is a direct association ($P<0.02$) between how many times a day a mother drinks a sweetened beverage and the dmfs of her child. Mothers who drank 3 or more sweetened beverages had a child with 7 more dmft ($P<0.001$) and 13.6 more dmfs ($P<0.001$) than mothers who drank less than 3 sweetened beverages.

DISCUSSION

This pilot study's findings support the influence of the mother's oral health behaviors on the child's oral health behaviors and the child's caries experience. For instance, a child is more likely to eat 3 or more between meals a day (24%) if the mother eats between meals as compared with children with mothers who do not snack (5%). Similarly, a child is more likely to drink a sweetened beverage 3 or more times a day (40%) if the mother drinks sweetened beverages as compared with children with mothers who do not drink sweetened beverages (6%). For those children whose mothers reported drinking 3 or more sweetened beverages, the child had a dmft of 7 or more ($P<0.001$) and a dmfs of 13.6 or more ($P<0.001$) than those children whose mothers reported drinking less than 3 sweetened beverages.

Also the relationship between maternal and child oral hygiene practices, specifically brushing, is well supported in the study findings. A child had a 79% probability of brushing 2 or more times a day with a fluoride dentifrice if the mother brushed 2 or more times a day. If the mother brushed less than 2 times a day with a fluoride dentifrice then the probability that the child will brush two times a day dropped to 11%. The AAPD oral health polices state that brushing 2 times a day with fluoridated toothpaste not only provides the child with optimal topical fluoride exposure but also signifi-

cantly decreases the amount of visible plaque and places the child in a low risk caries category.¹¹

The clinical implications of these results are important for the dentist. Dentistry recognizes the benefits of maternal education and therapeutic intervention to benefit a child's oral health outcomes. For instance, Kohler et al demonstrated that a reduction of salivary levels of streptococcus mutans in highly infected mothers inhibit or delay the establishment of this microorganism in their infants.¹⁸ Also, Casamassimo suggests that maternal oral health focus on the importance of periodontal health and reduction of bacterial load during pregnancy to reduce likelihood of transmission to the child.¹⁹ This study also supports the link between maternal behaviors and child oral health outcomes. As previously stated, the AAPD CAT clearly defines frequent (3 or more) between-meal exposures to simple sugars or foods as strongly associated with caries, and that suboptimal topical fluoride is a high caries-risk indicator.¹¹ Adjusting the mother's diet and oral hygiene practices can significantly affect a child's risk for dental caries.

This study results should be considered in light of study limitations. First, the data collection method, use of self-completed questionnaire, may be a limitation due to the tendency of respondents to answer in accordance with social expectations and memory bias. However, it is important to investigate whether maternal self-reports of dietary habits or dental status could be useful predictors of early childhood caries in the absence of clinical information. In particular, the use of maternal soft drink consumption appears promising as a potential predictor of subsequent caries experience. Other limitations are that the study uses a cross-sectional design and small sample size. To confirm any relationships a longitudinal study and larger sample size need to be employed. Lastly, the results might not have external validity. Due to the small sample size and the fact that the results are based on a convenience sample of patients from the pediatric dentistry clinic of a large medical center in Northern Manhattan they may not be representative of a national sample.

CONCLUSION

This investigation explored patterns of oral health behaviors between mother and child and the caries experience in a cross-sectional sample of children. Based on study results, the following conclusions can be made:

1. There is a direct relationship between how many times a day a child consumes sweetened beverages and the dmfs of the child.
2. Children have a greater probability of snacking, drinking sweetened beverages, and toothbrushing 2 or more times a day with fluoridated dentifrice if their mothers also do the same.
3. Mothers who report consuming 3 or more sweetened beverages per day had a child with a $dmft \geq 7$ and a

dmfs \geq 13.6 compared to children of mothers who consumed less than 3 sweetened beverages per day.

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