

Association between early childhood caries and maternal caries status: A cross-section study in São Luís, Maranhão, Brazil

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ABSTRACT

Objective: This study aims to evaluate the association between early childhood caries (ECC) and maternal caries status, and the maternal perception of ECC risk factors. **Materials and Methods:** A cross-sectional study was carried out with 77 mother-child pairs, the children ranging from 12 to 36 months of age and their mothers, who were seeking dental care at a health center in São Luís, Maranhão, Brazil. Data collection was conducted using a specific questionnaire for mothers. Oral clinical examination of the mother-child binomial to assess caries incidence, gingival bleeding (GB) and visible plaque was done. Home visits were performed in 10% of the sample in order to observe the environmental conditions, dietary habits and dental hygiene practices. **Results:** The findings showed that the caries prevalence in children was 22.5 times higher in the mother who had decayed tooth (prevalence ratio [PR] = 22.5, confidence interval [CI] 95% = 3.2–156.6, $P < 0.001$). GB also was observed in 14 mothers and children, the PR in pair was 12.2 (CI95% = 1.6–88.9, $P < 0.001$). The variables are related for the mother-child binomial in regression linear analysis. **Conclusion:** The maternal caries status was associated with ECC.

Key words: Dental caries, maternal behavior, preventive dentistry, risk factors

INTRODUCTION

The dental caries results of a localized demineralization in dental surfaces caused by metabolic events that occur in the dental plaque located in the affected area.^[1] Early childhood caries (ECC) is characterized by affecting several teeth, by occurring in areas considered of low risk and by showing rapid progression.^[2] Evidences suggest that maternal factors influence bacterial acquisition,^[3] thus the oral health behaviors, access to dental care, poor oral hygiene, and consumption of sugar feeding habits have been linked as risk factors for ECC.^[4]

The understanding the development of caries as a multifactorial disease involves biological factors that

act directly on the de-remineralization (biofilm, diet, saliva),^[5] as well as factors that modify or modulate the outcome (income, education level, and health status).^[6] Moreover, ECC affects the quality of life of children due to dental pain and subsequent tooth loss, resulting in difficulty in eating, speaking, sleeping and socializing,^[7] which can be avoided with early dental care.

The family environment also exerts great influence on the child, and parental attitudes can affect children's behavior, thus reflecting on oral health.^[8] The vertical transmission of cariogenic agents is supported by the fact that people with poor oral health tend to have parents with poor oral health, which can be explained by the interaction between genetic and

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environmental exposures.^[9,10] This study aims to evaluate the association between ECC and maternal caries status, and the maternal perception of ECC risk factors.

MATERIALS AND METHODS

This study was approved by the Committee of Ethics in Research of the Federal University of Maranhão (UFMA), under registration No. 23115012534/2008-41. The mothers responsible for the children were informed of the study and signed a term of free and informed consent.

Seventy-seven children from 12 to 36 months of age and their mothers were selected from among those who sought medical/dental assistance at a health center located in São Luís, Maranhão, Brazil, in the period from August 2009 to July 2010.

To carry out a risk profile analysis, a clinical examination of the oral cavity was conducted in order to observe the conditions of the mucous membranes (if dry and/or opaque), the characteristics of carious lesions (soft or not) and the presence of white spots in areas of greater or lesser susceptibility to caries disease. The prevalence of dental caries was evaluated using the decayed, missing, and filled teeth indexes. The visible plaque index used to evaluate the amount of dental plaque or dental biofilm assigns values of 1.0 for a tooth with visible plaque and 0.0 for a tooth with no visible plaque. The gingival bleeding index was used to evaluate the periodontal condition, where the 0 score stands for the absence of GB and 1 for the presence of GB. All diagnostic steps were carried out in the Pediatric Health Center.

The mothers responded to a questionnaire containing 29 closed questions related to the study. After that, in order to provide additional ethnographic information, home visits were conducted with seven families to observe "*in locu*" the environmental conditions, dietary habits and dental hygiene practices of mothers and children. During the home visits, supervised tooth brushing activities were carried out on the mothers and their children, in order to clarify possible questions about how to perform oral hygiene in children.

The data were analyzed first in a mechanical form and later in electronic form. SPSS 17.0 (IBM SPSS Inc., Chicago, IL, USA) was used for the tabulation and analysis of the results. The Kolmogorov-Smirnov test was applied to verify the normal distribution of

the sample. The Mann-Whitney test (U) was used to evaluate the relationship between the variables in the mother-child binomial since the sample studied does not belong to a normal distribution. The linear regression test, by the backward method, was applied for verification of relationship among the variables studied. The level of significance adopted was 5%.

RESULTS

Regarding the percentage distribution by socioeconomic status of mothers, the data show that, of the 77 mothers interviewed, 39 mothers (50.6%) have high school education. The predominant household income ranged from 1 to 3 minimum wages (84.4%), representing low socioeconomic status.

Of the 77 mothers interviewed, 58 mothers (75.3%) said that their children have a habit of waking up during the night to breastfeed, 45 (58.4%) breastfeed to sleep and 36 (46.7%) use the bottle during the night. Of these 36 children, 14 (38.8%) wake up once during the night to breastfeed and 14 (38.8%) wake up twice. When it comes to adding sugar to the baby bottle, 47 (61%) mothers responded that they do it [Table 1].

Table 2 shows the results of oral hygiene practices, guidance on oral health and oral habits: 43 mothers (55.8%) said that oral hygiene should be started as soon as the baby is born, 34 (44.2%) use toothbrush and toothpaste for the oral hygiene of their child, and 39 (50.7%) do that twice a day. Of the 77 mothers interviewed, 55 (71.4%) did not receive oral health guidance during pregnancy, 41 (53.2%) do not know when to make the first visit to the dentist,

Table 1: Percentage distribution of the children's eating habits

Variables	Frequency n (%)
Wake up during the night to breastfeed	
Yes	58 (75.3)
No	19 (24.7)
Breastfeed to sleep	
Yes	45 (58.4)
No	32 (41.6)
Bottle during the night	
Yes	36 (46.7)
No	41 (53.3)
Frequency of bottle use	
1 time	14 (38.8)
2 times	14 (38.8)
3 times	8 (22.4)
Add sugar to the bottle	
Yes	47 (61.0)
No	30 (39.0)

and 35 (45.4%) received such information from their pediatrician. When asked about information and habits related to ECC, 14 mothers (18.2%) said they had heard about the subject, 10 (13%) knew how it is transmitted, 39 (50.6%) tasted the baby food, 23 (29.9%) blew on the food, and 11 (14.3%) kissed the baby on the mouth.

Table 3 presents the oral conditions evaluated during the clinical examination. It shows that the caries prevalence in children was 22.5 times higher in the mother who had decayed tooth (prevalence ratio [PR] = 22.5, confidence interval [CI] 95% = 3.2-156.6, $P < 0.001$). GB also was observed in 14 mothers and children, the PR in pair was 12.2 (CI95% = 1.6-88.9, $P < 0.001$). On the other hand, 35 mothers and children did not present GB. Visible plaque present in 35 mothers and children simultaneously; and was absent, at the same time, in 26 mothers and children, the PR was 4.1 (CI95% =2.1-7.8, $P < 0.001$).

The linear regression test showed that all P values statistically significant, therefore, the variables are related for the mother-child binomial. However, from the beta coefficient onward, it can be concluded in all cases that the relationship among the variables in the sample studied was considered average [Table 4].

DISCUSSION

Tooth decay is a multifactorial disease that occurs due to the interaction of certain causal factors. The interrelation of cariogenic microbiota with the appropriate substrate, in a susceptible host, within a certain time, permeated by broad social, economic and cultural factors, influence the development and evolution of the disease.^[11]

There is still no consensus in the literature regarding the importance of maternal schooling on the development of caries. Some authors claim that there is no relationship between these two variables.^[12]

Table 2: Percentage distribution of the children's oral hygiene habits

Variables	Frequency n (%)
Start of the baby's oral hygiene	
As soon as the baby is born	43 (55.8)
When the teeth erupt	20 (40.2)
Don't know	14 (18.2)
What to use for the baby's hygiene	
Not done	12 (15.6)
Gauze/cloth with water	31 (40.2)
Toothbrush with tooth paste	34 (44.2)
Frequency of the baby's hygiene	
1 time	11 (14.3)
2 times	39 (50.7)
More than 2 times	27 (35.0)
Received dental guidance during pregnancy	
Yes	22 (28.6)
No	55 (71.4)
When the first visit to the dentist should be made	
Don't know	41 (53.2)
Shortly after birth	2 (2.6)
When the teeth appear	34 (44.2)
Who supplied information about the baby's oral care	
Never got information	27 (35.1)
Dental students	15 (19.5)
Pediatrician	35 (45.4)

Table 3: Percentage distribution and PR of oral conditions in mothers and children

Variables in mother	Variables in child n (%)		PR (CI 95%)	P
	Yes	No		
Dental caries				
Yes	30 (68.2)	14 (31.8)	22.5 (3.2-156.6)	<0.001*
No	1 (3.0)	32 (97.0)	Reference	
GB				
Yes	14 (34.1)	27 (65.9)	12.2 (1.6-88.9)	<0.001*
No	1 (2.8)	35 (97.2)	Reference	
Visible plaque				
Yes	26 (76.5)	8 (23.5)	4.1 (2.1-7.8)	<0.001*
No	8 (18.6)	35 (81.4)	Reference	

*Statistically significant difference (chi-squared test or fisher exact test).
PR: Prevalence ratio, CI: Confidence interval, GB: Gingival bleeding

Table 4: Linear regression test - backward method

Variables		Nonstandardized coefficients			Standardized coefficient	t	P
Dependent	Independent	Constant	Beta	SE	Beta		
Caries/child	Caries/mother	0.506	0.233	0.037	0.568	5.299	0.000*
Filled/child	Filled/mother	0.403	0.333	0.065	0.443	4.279	0.000*
IVP/child	IVP/mother	0.030	0.652	0.061	0.657	7.556	0.000*
IGB/child	IGB/mother	0.028	0.314	0.084	0.395	3.726	0.000*

*Statistically significant difference ($P < 0.05$). SE: Standard error, IVP: Index of visible plaque, IGB: Index of gum bleeding

The results found in this research are in accordance with studies that claim that the better the maternal level of education, the lower the occurrence of caries in children.^[13-15]

Epidemiological studies carried out in the past 20 years point to an inequality among different social classes in the experience of dental caries.^[16,17] This study found no significant association between household income and the presence of ECC. This difference can be explained by the fact that, in this study, the average household income was relatively high, varying between 1 and 3 minimum wages. In addition to this, the mothers' education level must be taken into consideration.

In this study, most mothers reported that their children breastfeed to sleep and/or nurse during the night [Table 1]. The American Academy of Pediatric Dentistry (AAPD)^[18] considers breastfeeding on demand after tooth eruption to be a risk factor for the development of the caries disease, which is in agreement with other studies.^[19-21] However, it should be considered that the relationship between prolonged breast-feeding and the emergence of caries is complex and may be confused by others factors such age, sucrose consumption between main meals, and quality of oral hygiene.^[22]

In this study, the high frequency of using a bottle at night, as well as the addition of sugar thereto, as reported by the mothers [Table 1], are risk factors for ECC. Regarding children's diet, during the home visits it was found that the consumption of sugary foods, offered by the mothers to their children between meals, is high and indiscriminate. There is a known correlation between family dietary pattern and the experience of ECC.^[23,24] The *Streptococcus mutans* group has a decisive effect on the development of ECC, since they are exposed to a cariogenic diet.^[25] Research shows that the precursor microorganism for caries is transmissible; and the vertical mother-child relationship of transmissibility has been emphasized over the years.^[25,26] A study conducted in Thailand found *S. mutans* in salivary samples collected from children under the age of 2 months,^[26] demonstrating the early vertical transmission of this microorganism. Thus, the dietary pattern associated with the transmissibility of the precursor microorganism must be considered a causal factor of ECC.

The lack of guidance regarding the family's and the baby's oral hygiene was also a predominant factor in this study. The majority of mothers as shown in

Table 2, did not receive information on dental care during pregnancy. In addition to that, they don't know when to start the baby's oral hygiene or when to visit the dentist for the 1st time. When the mothers received some type of information, it was from the pediatric physician. Studies prove the effectiveness of information in the fight against tooth decay, since family knowledge about tooth decay is a protection factor against ECC.^[20,24,27,28]

Recently published studies prove the effectiveness of early dental care in children under 3 years of age.^[19,29] The AAPD recommends that the best time to start dental care is between the ages of 6 and 12 months.^[18] In this study, we observed that mothers do not know when to take their children to their first visit to the dentist.

Clinical examination showed that there might be an association between the presence of caries in the mother-child binomial (PR = 22.5, CI95% = 3.2-156.6). As shown in Table 4, the average number of mothers' decayed teeth is equivalent to their respective children. The same positive correlation between mothers and children was found regarding the indices of GB and visible plaque.

During supervised brushing, it was observed that most mothers did not do it effectively. In addition to inadequate brushing, mothers also used an exaggerated amount of toothpaste, which often was swallowed by the child. This information is important to explain the contradiction between the high frequency of oral hygiene reported by mothers as well as the use of fluoride toothpaste associated with tooth brushing, and the data found during the clinical examination regarding caries, GB and visible plaque.

The findings of this study are in accordance with the literature and highlight the importance of the mother in the baby's health care. Moreover, this fact reinforces the importance of incorporating mothers in preventive oral health practice.

CONCLUSION

Within the limits of this research, these findings suggest that the maternal caries status was associated with ECC. Most mothers are unaware of early caries disease and its risk factors; and as they are the main transmission agents, it justifies the need for setting up preventive educational programs in oral health in the maternal-infant health units.

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