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Study of the factors associated with dental caries in children who receive early dental care

Estudo de fatores associados à cárie dental em crianças que recebem atendimento odontológico precoce

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The present study investigated the factors associated with the development of dental caries in preschool children who receive regular dental care and follow-up. The research was carried out at the Baby Clinic, Londrina State University, and comprised two hundred preschool children, whose ages ranged from 24 to 48 months, as well as their mothers, who had already taken part in a dental program at the Baby Clinic during, at least, the previous twelve months. Regarding oral hygiene habits, there was no significant difference between the preschool children who presented with caries and those who did not present with caries. However, the presence of visible bacterial plaque on the upper incisors was strongly associated with the presence of dental caries. Other factors associated with the presence of caries were: period of formal education of the father or of both parents equal or inferior to 8 years, high sugar consumption and bottle-feeding during sleep. In the studied population, the dietary pattern is still the main cause of carious lesions. In addition, the presence of visible bacterial plaque on the labial surface of the upper incisors must be considered as an important clinical sign, often associated with inadequate patterns of diet and oral hygiene.

UNITERMS: Dental caries; Diet, cariogenic; Child, preschool.

INTRODUCTION

During the first years of life, dental caries may develop particular characteristics, and the mere adaptation of the knowledge and techniques employed in other age groups might not be enough for the promotion of oral health.

Even in countries or regions where there are evidences of decline in dental caries, part of the infants still develop carious lesions that sometimes are so severe as to interfere with their development and growth[3]. Although many efforts have been made in order to identify such risk group, there are few researches on infants subject to follow-up and early and steady dental care.

Researches conducted in Brazil in this age group indicate a high prevalence of caries[4,17] and reveal the need for adopting and popularizing strategies and actions capable of promoting health, such as those carried out at the Baby Clinic, Londrina State University (LSU), which was instituted by a convention signed in 1985 between the LSU and FINEP (sponsor of studies and projects)[28]. This program has education and prevention as distinctive features, and the activities begin before the infant is one year old[28,29].

This research has investigated some factors related to dental caries in a group that is subject to early intensive dental care, through a program whose methods were already proven to be efficient and effective.

The identification of such factors will help to develop approaches better suited to subjects with higher risk to develop dental caries.

MATERIAL AND METHODS

The research was carried out at the Baby Clinic, Londrina State University, in 1997, and the sample comprised infants from 24 to 48 months old and their mothers who had already taken part in a dental program during, at least, the previous twelve months.

The research involved 200 infants: 65 of them, with experience of caries, were placed in one

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group, and the remaining 135, without experience of caries, were placed in another group.

The presence of bacterial plaque on the buccal surface of the upper incisors was visually detected, without any disclosing solution. When visible plaque was detected on two or more incisors, the infant was classified as positive for this factor.

Oral examination for the detection of caries was performed visually after the teeth were cleaned and dried. Infants presenting carious lesions, with or without cavities, either active or not, were considered to have caries experience.

The mothers answered a specific questionnaire about their children's dietary habits, oral hygiene and socioeconomic and behavioral issues. The children's age at the time of the first visit was determined according to their records available at the Baby Clinic.

In order to establish the pattern of sugar consumption, a questionnaire – specifically designed for this research – was used. The frequency of sugar consumption was recorded.

In order to compare the group with caries with the one without caries the parametric Student's *t*-test, the nonparametric chi-squared test with Yates correction and the Mann-Whitney test for independent samples were utilized. The minimum significance level adopted was 5%.

RESULTS AND DISCUSSION

The average age of the infants was 35.2 months (± 6.7). Their average age by the time of their first visit was 11.3 months (± 3.9) and the average number of teeth by the time of the interview was 19.2 (± 1.7). The differences between the two groups were not statistically significant. The average age of the mothers by the time the infants were born was 26.3 years (± 5.1) and the average age of the fathers by the time of the interview was 32.3 years (± 5.8). The absence of significant differences between the groups reduces the possibility of errors in the assessment of the role played by other factors in the prevalence of caries.

Parents' formal education and caries

Although the inquiries found in the literature usually concentrate on mothers, the present study also considered the education of fathers, since the program developed at the Baby Clinic has proved to have a positive impact on the entire family[19].

The literature shows a clear relation between the formal education of mothers and the prevalence of dental caries, dietary habits of the infant, oral hygiene habits and other factors associated with the development of dental caries. Thus, children of mothers who received little formal education present with colonies of *Streptococcus mutans*[10] earlier than those of mothers who studied for longer periods. They also present higher prevalence of caries[9,11,13,18,22,23] and poor oral hygiene[21] and ingest foods rich in sucrose more often[20,22,23]. However, the influence of mothers on the dietary habits of their children seems to decrease with time, probably due to other social and familial factors involved in the children's diet[24].

The results indicated that although the effect of the level of formal education of the mother was not statistically significant when comparing the group without caries and the group with caries (Table 1), the period of formal education of the mothers of 38.5% of the infants with caries was equal or inferior to 8 years, while, in the group without caries, only 25.9% of the mothers had the same time of formal education. That might reveal a relation between low educational level of mothers and the presence of caries in infants. This tendency was statistically confirmed with regard to the formal education of fathers. The period of formal education of the fathers of 43.1% of the infants from the group with caries was equal or inferior to 8 years, while in the group without caries, only 27.4% of the fathers had the same time of formal education (Table 1).

Table 1 also shows that when the period of formal education of both parents was equal or inferior to 8 years, the differences in the distribution of infants between the groups with and without caries were statistically significant: 35.4% of the infants from the group with caries and 17% of the infants from the group without caries had parents with periods of formal education equal or inferior to 8 years.

The lack of statistic significance regarding the relation between the educational level of mothers and the presence of carious lesions in infants may be due to specific features of the studied sample: the mother was the one who usually accompanied the infant on the visits, receiving, then, proper guidance and following the results of the program. Thus, the impact of the poor formal education of mothers may have been weakened by intensive educative actions. However, the same is not true for fathers, who accompanied the infants on the visits less often.

When the level of education of both parents is low, the mother might face difficulties in changing

the environmental factors related to the development of carious lesions at home. In such cases, the father must be stimulated to attend the visits and the mother must be instructed in order to become capable of changing habits associated with oral health at home.

Sugar consumption pattern and caries

The dietary habits in the early infancy are very important not only because of the possibility of leading to carious lesions but also because they are the basis for later dietary habits[12,22,24,26] and serve as an important indicator of the risk of caries[9,20,22,26]. The pattern of sugar consumption is precociously established and maintained during the first years of life[24]. Foods rich in sugar are often introduced in the first months after birth[8,12].

The results observed in this research are in accordance with those reported in the literature. It can be noticed (Table 1) that in the group with car-

TABLE 1 - Distribution of children with and without caries, considering the analyzed variables.

Variables	Caries experience						Statistics*		
	With (n = 65)		Without (n = 135)		Total (n = 200)		Values	p	Sig
	N	%	N	%	N	%			
Formal education (years of study)									
Mother							2.71	0.100	NS
Equal or inferior to 8	25	38.5	35	25.9	60	30.0			
More than 8	40	61.5	100	74.1	140	70.0			
Father							4.30	0.038	S
Equal or inferior to 8	28	43.1	37	27.4	65	32.5			
More than 8	32	49.2	87	64.5	119	59.5			
Not reported**	5	7.7	11	8.1	16	8.0			
Mother and father							7.34	0.007	S
Equal or inferior to 8	23	35.4	23	17.0	46	23.0			
Bottle-feeding									
Bottle-fed	55	84.6	107	79.3	162	81.0	0.51	0.476	NS
Never bottle-fed	4	6.2	13	9.6	17	8.5	0.31	0.579	NS
No longer bottle-fed	6	9.2	15	11.1	21	10.5	0.03	0.872	NS
Moment of bottle-feeding									
Never to sleep/sleeping	22	33.8	78	57.8	100	50.0	9.12	0.003	S
To sleep	23	35.4	23	17.0	46	23.0	7.34	0.007	S
Sleeping	10	15.4	06	4.4	16	8.0	5.73	0.017	S
Not bottle-fed	10	15.4	28	20.7	38	19.0	0.51	0.476	NS
Sugar consumption									
Category							17.56	<0.0001	S
High consumption	35	53.9	31	23.0	66	33.0			
Moderate consumption	30	46.1	104	77.0	134	67.0			
Presence of plaque									
Upper incisors	25	38.5	24	17.8	49	24.5	9.06	0.003	S

*Chi-squared test with Yates correction; ** Not considered in the statistical test. Sig = significance; NS = nonsignificant; S = significant.

ies, most infants (53.9%) were ranked on the high sugar consumption level, while only 23% of the infants from the group without caries were ranked on the same level; such a difference is statistically significant. The elevated consumption of sugar, determined through a method that monitors the frequency of contact with sugar-containing food, increased the probability of developing carious lesions even in infants with both clinical and domestic regular follow-up.

Visible bacterial plaque on the buccal surface and caries

The evaluation of the presence of visible bacterial plaque on the buccal surface of the upper incisors is important, since this clinical indicator is positively related to the prevalence of caries[15,16] and to the level of *Streptococcus mutans* in the saliva[15], which enhances the possibility of development of carious lesions[1]. Furthermore, it is an easy checking clinic evidence, which is epidemiologically important in determining collective risk groups and in confirming reports regarding hygiene habits.

In the present study, the results indicated that the presence of visible bacterial plaque on the upper incisors showed a high correlation with the presence of caries (Table 1).

Table 2 shows that infants with visible bacterial plaque also displayed a pattern of elevated sugar consumption more often than infants without visible plaque – the percentages were 49% and 27.8%, respectively. Such a difference was statistically significant.

Thus, the presence of visible bacterial plaque may also be an indicative of high sugar consumption. Probably, high sugar consumption has an influence on the composition of bacterial plaque and on the pace of its formation. Furthermore, it must be considered that the behavioral factors that determine poor oral hygiene might also contribute to establish a profile of inadequate consumption of cariogenic food. However, such aspects deserve specific attention and new researches must be conducted on the subject.

Bottle-feeding and caries

In 1996, FRAIZ[7] reported that both the way and the moment of ingestion of food influence the time that is necessary to completely remove the food from the mouth. Thus, when infants are bottle-fed, the cariogenic potential of the food ingested is highly enhanced due to the possibility of high frequency and long periods of ingestion, during sleep. The correlation between bottle-feeding and the presence of a particular type of caries, usually termed nursing-bottle caries, has been widely reported[18,27,30].

Several authors associated bottle-feeding at night with nursing-bottle caries[2,14,18,25,27] and it has been observed that the length of time of feeding influences the prevalence and severity of the disease[5,13,14,30].

Furthermore, FRAIZ[6] (1993) stated that the nursing bottle is an important vehicle for sugar ingestion in childhood, since most foods ingested through it contain sugar. These findings are a reason for worry, since bottle-feeding with sugar-containing food may lead the infant to an excessive sugar consumption in the future[26].

Table 1 shows the results of the present study regarding bottle-feeding. It shows that there is no statistical difference between the frequency of bottle-feeding in the group with caries and in the group without caries. Such a result – which apparently contradicts those reported in the literature – may be justified when one observes that the studied population had a low prevalence of caries, presented with mild lesions and was under constant follow-up and guidance. The determination of the group with caries took into account any kind of carious lesion – the most prevalent lesions were incipient cavities and no nursing-bottle caries were observed. Furthermore, even though bottle-feeding was not related to the presence of caries, when the time of bottle-feeding was taken into account, there was statistically significant difference between the groups. Children with caries were more often bottle-fed at sleep time or when they were asleep than children without caries (50.8% and 21.4% of the infants, respectively) (Table 1).

The results suggest that, in populations in which the prevalence of caries is low and educative as well as preventive actions are carried out, the relation between bottle-feeding and caries is weaker, except for infants who are bottle-fed when they are put to sleep or when they are sleeping – in such cases, the preventive work is less efficacious due to the extremely harmful factors of aggression.

The results show that among the infants who were bottle-fed there was a higher percentage of experience of caries, presence of visible bacterial plaque, elevated sugar consumption, low frequency of oral hygiene (once a day or less often),

TABLE 2 - Data and statistics concerning the presence of visible bacterial plaque on the upper incisors and its relation to the pattern of sugar consumption.

Plaque / Sugar consumption	With plaque (n = 49)		Without plaque (n = 151)		Total (n = 200)		Statistics*		
	N	%	N	%	N	%	Values	p	Sig
Pattern of sugar consumption							6.57	0.010	S
High consumption	24	49.0	42	27.8	66	33.0			
Moderate consumption	25	51.0	109	72.2	134	67.0			

*Chi-squared test with Yates correction. Sig = significance; S = significant.

TABLE 3 - Comparison of data considering the habit of bottle-feeding.

Variables	Bottle-fed (n = 162)		No longer bottle-fed (n = 21)		Never bottle-fed (n = 17)		Statistics*		
	N	%	N	%	N	%	Values	p	Sig
With experience of caries	55	34.0	6	28.6	4	23.5	0.93	0.629	NS
Visible plaque – upper incisors	43	26.1	3	14.3	3	17.6	1.98	0.371	NS
High level of sugar consumption	56	34.6	6	28.6	4	23.5	1.06	0.590	NS
Oral hygiene performed once a day or less	24	14.8	1	4.8	1	5.9	2.49	0.287	NS
Uneasy behavior during oral hygiene sessions at home	27	16.7	3	14.3	2	11.8	0.33	0.849	NS

*Chi-squared test. Sig = significance; NS = nonsignificant.

TABLE 4 - Comparison of data considering the moment of bottle-feeding.

Variables	During sleep (n = 16)		To sleep (n = 46)		Never to sleep (n = 100)		Statistics*		
	N	%	N	%	N	%	Values	p	Sig
With experience of caries	10	62.5	23	50.0	22	22.0	17.47	0.0002	S
Visible plaque – upper incisors	7	43.8	12	26.1	24	24.0	2.77	0.251	NS
High sugar consumption	9	56.2	16	34.8	31	31.0	3.89	0.143	NS
Oral hygiene performed once a day or less	7	43.8	8	17.4	9	9.0	13.54	0.001	S
Uneasy behavior during oral hygiene sessions at home	5	31.2	11	23.9	11	11.0	6.50	0.039	S

*Chi-squared test. S = significance; Sig = significant; NS = nonsignificant.

and bad behavior during oral hygiene – in comparison with the infants who were never bottle-fed or who were no longer bottle-fed. However, the differences were not statistically significant (Table 3).

These variables show a stronger tendency to relate to bottle-feeding when the time of that kind of feeding is taken into account. Thus, the habit of bottle-feeding infants when they are put to sleep or during sleep is associated to higher prevalence of caries, higher difficulty in oral hygiene at home and inadequate standards of oral hygiene (Table 4).

As a matter of fact, bottle-feeding seems to be related to a pattern of behavior and a lifestyle that contribute to determine a profile of high caries risk.

CONCLUSIONS

The results allow one to conclude that, among the subjects of the present research, dietary habits remain the main cause of carious lesions, and the presence of visible bacterial plaque on the buccal surface of the upper incisors must be considered as an important clinical indicator, often associated with inadequate dietary and oral hygiene habits.

According to the methodology employed and based upon the obtained results, we conclude that:

1. The factors associated with the presence of caries were: period of formal education of the father or of both parents equal or inferior to 8 years; high sugar consumption; presence of visible bacterial plaque on the buccal surface of the upper incisors and bottle-feeding associated with sleeping.
2. The group of children who were bottle-fed during sleep also showed, along with a higher experience of caries, a higher frequency of the factors associated with inadequate standards of oral hygiene and bad behavior during oral hygiene at home, when compared with those who were not-bottle fed while they were sleeping.

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Esta pesquisa estudou os fatores associados com o desenvolvimento de cárie dentária em pré-escolares que recebem acompanhamento e intervenção odontológica. O estudo abrangeu 200 crianças, de 24 a 48 meses de idade, que participavam do programa da Bebê-Clínica (Universidade Estadual de Londrina) havia pelo menos 12 meses. A comparação entre as crianças com cárie e sem cárie não apresentou diferenças estatisticamente significantes com relação aos hábitos de higiene bucal. No entanto, a presença de placa visível nos incisivos superiores esteve fortemente associada com a presença de cárie dentária. Outros fatores relacionados à presença de cárie foram a educação formal paterna ou de ambos os pais igual ou menor do que 8 anos, alto consumo de açúcar e uso de mamadeira durante o sono. Na população estudada, o padrão dietético continua sendo o principal responsável pelo desenvolvimento de lesões de cárie. Além disso, a presença de placa bacteriana visível na superfície vestibular dos incisivos superiores deve ser considerada um importante sinal clínico, freqüentemente associado a padrões inadequados de higiene bucal e dieta.

UNITERMOS: Cárie dentária; Dieta cariogênica; Pré-escolar.

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