

Prevalence of dental caries in children born prematurely or at full term

Prevalência de cárie dentária em crianças nascidas prematuramente e a termo

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ABSTRACT: The objective of this study was to evaluate the prevalence of dental caries in 192 children, 96 born prematurely and 96 at full term, in a regional hospital in Brazil. Mean age at clinical examination was 40.72 months in the full-term group (G1) and 30.44 months in the premature group (G2). The children were divided in two age subgroups: 0 to 3 and 4 to 6 years. Statistical results (Student's *t* and Kruskal-Wallis tests) showed that dmft was 0.43 for G1 and 0.01 for G2 in the 0-3 age subgroup, and 1.7 for G1 and 1.1 for G2 in the 4-6 age subgroup. Differences were significant between G1 and G2 only in the 0-3 age subgroup ($p = 0.047$). Caries evaluation showed that, of the 96 children in G1, 75 were caries free, while in G2, 84 did not have the disease. These differences were not significant ($p = 0.088$). The lower mean dmft found in the 0-3 age subgroup in G2 may be attributed to routines established by the hospital's neonatology staff, such as frequent dental visits and preventive instructions about oral habits, oral hygiene and diet. After this age, with the completion of the primary dentition, values increased and became similar between the G1 and G2 groups. Results also suggested a highly skewed distribution since most caries were found in only a small number of children.

DESCRIPTORS: Dental caries; Prevalence; Dentition, primary.

RESUMO: O objetivo deste estudo foi avaliar a prevalência da cárie dentária em 192 crianças, 96 nascidas prematuramente e 96 a termo, em um hospital regional no Brasil. A média de idade ao exame clínico foi de 40,72 meses e 30,44 meses para os grupos a termo (G1) e prematuro (G2), respectivamente. As crianças foram divididas em faixas etárias de 0 a 3 e 4 a 6 anos. Os resultados estatísticos (testes *t* de Student e Kruskal-Wallis) mostraram que, entre 0 a 3 anos, o ceo-d foi 0,43 para o G1 e 0,01 para o G2. Entre 4 e 6 anos, o ceo-d foi 1,7 e 1,1 para G1 e G2, respectivamente. Os resultados foram significativos entre G1 e G2 apenas na faixa etária entre 0 e 3 anos ($p = 0,047$). A experiência de cárie mostrou que, das 96 crianças do G1, 75 estavam livres de cárie, enquanto que no G2, 84 não haviam tido a doença. Essas diferenças não foram significativas ($p = 0,088$). Conclui-se que o ceo-d médio menor encontrado no G2 entre 0 e 3 anos pode ser atribuído às frequentes visitas de rotina e orientações sobre hábitos de higiene oral e dieta, oferecidos pela equipe de neonatologia. Após esta idade, com a dentição decidua completa, os valores aumentaram e se equipararam entre os grupos. Parece que o fenômeno de polarização esteve presente, visto que a experiência de cárie concentrou-se em um reduzido número de crianças.

DESCRITORES: Cárie dentária; Prevalência; Dentição primária.

INTRODUCTION

The number of dental caries has declined significantly in the last few years. However, caries distribution is still skewed because a small number of children account for a large number of caries. Some risk groups have been identified, and attention should be focused on them so that preventive and health promotion measures are taken in an attempt

to reverse this situation. One of these risk groups is composed of children born prematurely.^{5,17}

Prematurity may be a predisposing factor for the development of caries.^{3,4,10,19} However, other factors, such as diet, oral hygiene habits, and bacteria in the oral cavity, cannot be left out of any study about this disease. In a study of the effects of

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diet, breast-feeding and weaning, Davenport *et al.*⁴ (2004) and Burt, Pai³ (2001) concluded that prematurely born, low-birthweight children had a greater intake of sugar than children born at full term, and had, consequently, a greater number of caries.

Several authors report that children born prematurely have a higher prevalence of enamel defects in the primary dentition than children born at full term.^{1,6,9} This prevalence varies greatly according to study criteria, indices and study sample. Enamel hypoplasia may indicate a greater risk of caries.^{7,8,14,16} Rough surfaces promote plaque formation by *Streptococcus mutans* adhesion and colony forming, and may lead to quick progression of the disease.^{12,13} Less mineralized enamel is more susceptible to caries. In a symposium on early childhood caries, Seow¹⁵ (1998) called attention to the fact that enamel defects are an important but currently little investigated area in caries research.

Fadavi *et al.*⁵ (1993) reported a high prevalence of caries in prematurely born children, and associated it with low birthweight. Children whose birthweight was below 1,000 g had a prevalence rate of 56%; those whose birthweight was between 1,000 and 1,500 g and those whose weight was above 1,500 g had prevalence rates of 47% and 43%, respectively. They concluded that low birthweight is a risk factor for the development of dental caries. Similar results were reported by Maatouk *et al.*¹¹ (1996), who also found a significant association between caries and low birthweight.

TABLE 1 - Characteristics of the two groups.

	Full term (G1)		Premature (G2)	
	Mean	SD	Mean	SD
Age (months)	40.72	16.33	30.44	14.43
Gestational age (weeks)	38.93	1.17	30.63	2.90
Birthweight (grams)	3,294.3	501.06	1,421.38	601.91

SD: standard deviation.

TABLE 2 - Characteristics of the two groups.

		Full term (G1)		Premature (G2)		Total	
		N	%	N	%	N	%
Sex	Female	45	46.9	54	56.2	99	51.6
	Male	51	53.1	42	43.8	93	48.4
Total		96	100.0	96	100.0	192	100.0

Conversely, Fearne *et al.*⁶ (1990) found a greater prevalence of cavitated lesions in children born at full term than in children born prematurely. Their results were assigned to the fact that the premature children evaluated in their study came from a more privileged social and economic group and received fluoride supplementation.

In a systematic review of literature, Burt, Pai³ (2001) did not find enough evidence to support the assertion that children whose birthweight was low were at a greater risk of caries. However, those authors suggested that findings be cautiously interpreted due to the scarcity of studies; they also underscored the need for further studies to investigate the association between prematurity and/or low birthweight and dental caries.

Predisposition to dental caries in premature children is somewhat controversial. Several factors should be evaluated together, such as oral hygiene, diet, fluoride supplementation, dental visits, and other secondary or adjuvant factors. The purpose of this study was to evaluate the prevalence of dental caries in children who were born prematurely or at full term.

MATERIAL AND METHODS

One hundred and ninety-two children (96 born at full term and 96 born prematurely) with primary teeth were included in the study. Children's ages ranged from 10 to 72 months, and mean ages were 40.72 months for the full term group (G1) and 30.44 months for the premature group (G2). Mean birthweight for children born prematurely was 1,421 g, and for children born at full term, 3,294 g. The premature group (G2) was classified according to birthweight into three subgroups: very low birthweight (VLBW < 1,500 g), low birthweight (LBW ≥ 1,500 and ≤ 2,500 g) and normal birthweight (NBW > 2,500 g) (Tables 1 and 2). Both G1 and G2 groups were subdivided according to two age subgroups: 0 to 3 and 4 to 6 years.

Clinical examination was performed in the pediatric outpatient clinic of a regional hospital in Brazil, by one single examiner. This hospital provides health care to pregnant women and children, and is a reference hospital for extended health care of children born prematurely. Only children that came to the hospital for routine consultations were examined. The children re-examined for calibration were randomly chosen among children that had to return for a control visit. The examiner conducted the visual inspection under natural lighting and with the aid of a mouth mirror and dental probe after cleaning and drying dental surfaces with a piece of gauze while the child was lying down on a hospital stretcher. Caries were diagnosed according to the criteria proposed by the WHO,¹⁸ and the index used for the diagnosis of caries was the dmft. All data were recorded and noted down on a clinical form by the examiner. Before examinations, intraobserver agreement for the diagnosis of caries was checked: two clinical examinations were performed in 10% of the sample at a mean interval of one week. Values obtained were $k = 1.00$ and $p = 0.02$. Calibration was conducted with this sample in the first study time point.

Data collection

Data about the study subjects, such as birthweight and gestational age at birth, were collected from hospital records.

Ethical considerations

This study was conducted in accordance with Resolution 196/96 of the Brazilian National Health Board and its complements. An informed consent term was signed by parents or legal guardians expressing agreement to answer the questionnaire and granting authorization for the child's participation in the study. This study was approved by the Ethics in Research Committee of the Health Department, Distrito Federal, Brazil, under number 005/2004.

TABLE 4 - Comparison of dmft for prematurely born children according to age and birthweight subgroups (Kruskal-Wallis test).

Age subgroup	Dmft						p
	VLBW		LBW		NBW		
	Mean	SD	Mean	SD	Mean	SD	
0 to 3 years	0.00	0.00	0.00	0.00	0.33	0.58	< 0.011*
4 to 6 years	0.50	1.10	2.50	3.36	1.00	1.15	0.132

VLBW = very low birthweight; LBW = low birthweight; NBW = normal birthweight. *Statistically significant at $p \leq 0.05$. SD = Standard Deviation.

Data analysis

Student's *t* test for independent samples, the Fisher exact test, and the chi-square test were used for comparison of variables. The Kruskal-Wallis test was used to check the prevalence of caries in birthweight subgroups of the group of prematurely born children. For the two tests, the null hypothesis was that measures were equal, and level of significance was $p \leq 0.05$. The Kappa coefficient was used to check intraobserver reproducibility.

RESULTS

Table 3 shows the dmft values for children in the premature and full term groups according to age subgroups.

Table 4 shows the dmft values in the group of prematurely born children according to birthweight in the different age subgroups.

Table 5 shows the number of children free of caries in G1 and G2 according to age subgroups.

DISCUSSION

Children born prematurely had a lower dmft than children born at full term in this study. In the 0-to-3 age subgroup, dmft was 0.43 for G1 and 0.01 for G2, with a statistically significant difference in G2 ($p = 0.047$; Table 3). In the 4-to-6 age

TABLE 3 - Comparison of dmft between the two groups (Student's *t* test).

Age subgroup	Dmft				p
	Full term (G1)		Premature (G2)		
	Mean	SD	Mean	SD	
0 to 3 years	0.430	1.26	0.015	0.12	0.047*
4 to 6 years	1.710	3.65	1.10	2.19	0.427

*Statistically significant at $p \leq 0.05$. SD: Standard Deviation.

TABLE 5 - Comparison of children free of caries in the two groups (chi square test).

Age group	Caries	Full term		Premature		p
		N	%	N	%	
0 to 3 years	yes	5	12.5	1	1.5	0.028*
	no	35	87.5	65	98.5	
4 to 6 years	yes	16	28.6	11	36.7	0.472
	no	40	71.4	19	63.3	
0 to 6 years	yes	21	21.9	12	12.5	0.088
	no	75	78.1	84	87.5	

*Statistically significant at $p \leq 0.05$.

subgroup, the values were 1.71 for G1 and 1.1 for G2 (Table 3). These results are in agreement with those reported by Fearné *et al.*⁶ (1990), who attributed the low prevalence of caries in the group of prematurely born children evaluated in their study to the fact that they came from a more privileged social and economic group and received fluoride supplementation. Fadavi *et al.*⁵ (1993) reported a high prevalence of caries in prematurely born children, and associated it with low birthweight. However, their study did not include a control group, and the classification by weight was different from the one adopted here, which complicates comparison of results. The scarcity of similar studies in the literature makes comparisons with our results difficult. More studies in the area of cariology with children born prematurely should be conducted, and results should be used to establish preventive measures and health promotion programs to give children a better quality of life. The low dmft found in this study for the group of prematurely born children may be explained by the fact that these children were routinely followed-up and received instructions about diet and oral hygiene habits from the neonatology team in the hospital, and were discharged according to individual needs. However, the group of children born at term did not receive pediatric follow-up in the same hospital, but were referred to health stations close to their homes instead. They only returned to this hospital when they had more complicated health problems, such as allergies, ophthalmologic problems, or problems that required tests that the health stations were not prepared to conduct. After 3 years of age, dmft increased to 1.7 and 1.1 in the full term and premature groups, respectively, but no statistically significant difference was found between groups (Table 3). Although mean dmft values increased in the 4-to-6 age subgroup, results

were still satisfactory according to Brazilian standards. From 4 years of age on, values were similar between groups, maybe due to a series of factors that are inherent to the child's age. At 4 the child becomes more independent and chooses foods with a greater cariogenic potential. Also, they experience more freedom and less diet control by parents. This correlation between age and a higher dmft indicates that the development of caries increases with age and is probably associated with the fact that, from 3 years on, children already have a complete primary dentition, that is, a larger number of teeth. These results are in agreement with those reported by Fadavi *et al.*⁵ (1993) and Bezerra² (1990), who also found this same association.

Of the 96 children examined in G2, 84 (87.5%) were free of caries; that is, only 12 children had caries, which corresponded to 12.5%. In G1, 75 children were free of caries (78.1%) and 21 had caries (21.9%) (Table 5).

Fadavi *et al.*⁵ (1993) studied 31 prematurely born children classified by birthweight and found that 16 were free of caries, which corresponded to 51.6%. However, they studied only a small sample and did not have a control group. The comparison of dmft with birthweight in the 0-3 age group revealed greater dmft values for children with normal birth weight than for children with low birthweight or very low birthweight. However, in the 4-6 age group, no statistically significant difference was found in the comparison of birthweight subgroups. The lack of similar studies make comparison of results difficult.

Most caries were found in only a small number of the children participating in our study, which suggests a highly skewed distribution of the disease. In the 0-to-3 age subgroup of G1 (40 children), only 5 children were responsible for the dmft value found, and in the same age subgroup in G2 (66 children), only one child, who met the characteristics of this study group, was responsible for the value found (Tables 4 and 5). Although this study was conducted in one single hospital, the results described here are in agreement with the current falling trend in the prevalence of caries in Brazil, which may be attributed to factors such as the increase in the number of people with access to water fluoridation programs in many cities in the Southeastern, Southern and Mid-Western regions, addition of fluoride to toothpaste, and changes in dental practice paradigms, with priority being attributed to preventive and health promotion programs.¹⁸

Reports in the literature show a high prevalence of enamel defects in children born prematurely and point out that these defects may be predisposing factors for a higher number of caries in these children.⁷ However, our results showed that a high prevalence of caries was not found in these children, and this may be attributed to early dental assistance and to frequent follow-up that contributed to minimize risk factors. Instructions about dental health and the development of healthy dietary and oral hygiene habits, as well as the adoption of efficient preventive measures, are relevant and important factors in achieving

and maintaining oral health. Longitudinal studies with larger samples should be conducted to determine actual dental health conditions in this population.

CONCLUSION

Under the conditions of this study, a lower dmft value was found in the group of premature children than in the group of children born at term. No significant association was found between prematurity and a higher prevalence rate of caries in primary dentition.

REFERENCES

1. Aine L, Backstrom MC, Maki R, Kuusela AL, Koivisto AM, Ikonen RS *et al*. Enamel defects in primary and permanent teeth of children born prematurely. *J Oral Pathol Med*. 2000;29(8):403-9.
2. Bezerra ACB. Estudo clínico epidemiológico da prevalência de cárie em crianças pré-escolares de 18 a 48 meses de idade [Tese de Doutorado]. São Paulo: Faculdade de Odontologia da USP; 1990.
3. Burt BA, Pai S. Does low birthweight increase the risk of caries? A systematic review. *J Dent Educ*. 2001;65(10):1024-7.
4. Davenport ES, Litenas C, Barbayiannis P, Williams CE. The effects of diet, breast-feeding and weaning on caries risk for pre-term and low birth weight children. *Int J Paediatr Dent*. 2004;14(4):251-9.
5. Fadavi S, Punwani I, Vidyasagar D. Prevalence of dental caries in prematurely-born children. *J Clin Pediatr Dent*. 1993;17(3):163-5.
6. Fearné JM, Bryan EM, Elliman AM, Brook AH, Williams DM. Enamel defects in the primary dentition of children born weighing less than 2000 g. *Br Dent J*. 1990;168:433-7.
7. Gerlach RF, Sousa MLR, Cury JA. Esmalte dental com defeitos: de marcador biológico a implicações clínicas. *Rev Odonto Ciênc*. 2000;15(31):87-102.
8. Ismail AL. The role of early dietary habits in dental caries development. *Spec Care Dentist*. 1998;18(1):40-5.
9. Lai PY, Seow WK, Tudehope DI, Rogers Y. Enamel hypoplasia and dental caries in very-low birthweight children: a case-controlled, longitudinal study. *Pediatr Dent*. 1997;19(1):42-9.
10. Li Y, Navia JM, Bian JY. Caries experience in deciduous dentition of rural Chinese children 3-5 years old in relation to the presence or absence of enamel hypoplasia. *Caries Res*. 1996;30(1):8-15.
11. Maatouk F, Belgacem B, Belgacem R, Ghedira H, Jemali B. Prevalence of dental caries in children with low birth weight. *East Mediterr Health J*. 1996;2(2):311-4.
12. Machado FC, Ribeiro RA. Defeitos de esmalte e cárie dentária em crianças prematuras e/ou de baixo peso ao nascimento. *Pesq Bras Odontoped Clin Integ*. 2004;4(3):243-7.
13. Mattee M, Hof MV, Maselle S, Mikx F, Helderma WP. Nursing caries, linear hypoplasia, and nursing and weaning habits in Tanzanian infants. *Community Dent Oral Epidemiol*. 1994;22(5/6):289-94.
14. Oliveira AFB, Rosenblatt A. Defeitos do esmalte: o que o odontopediatra precisa saber. *Rev ABO Nacional*. 2002;10(5):274-7.
15. Seow WK. Biological mechanisms of early childhood caries. *Community Dent Oral Epidemiol*. 1998;26(Suppl 1):8-27.
16. Slayton RL, Warren JJ, Kanellis MJ, Levy SM, Islam M. Prevalence of enamel hypoplasia and isolated opacities in the primary dentition. *Pediatr Dent*. 2000;23(1):32-6.
17. Weyne SC. A construção do paradigma de promoção de saúde – um desafio para as novas gerações. In: Kriger L. *Aboprev promoção de saúde bucal – Paradigma ciência humanização*. 3ª ed. Porto Alegre: Artes Médicas; 2004. p. 1-20.
18. World Health Organization. Ottawa Charter for Health Promotion. [accessed 2005 Mar 10]. Available from: http://www.who.int/hpr/NPH/docs/ottawa_charter_hp.pdf.
19. Zou J, Li S, Wang W. A study on the relationship between deciduous tooth caries in pre-school children and their neonatal condition. *Hua Xi Kou Quiang Yi Xue Za Zhi*. 2001;19(5):328-9.

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