

# Dental caries experience in children attending an infant oral health program

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## Abstract

**Aim:** To investigate: a) caries experience in 5 year-old children and its relationship to the caries risk evaluation made before 1 year of age; b) compliance of parents to an infant oral health program as well as the abandonment reasons. **Methods:** Group A (GA) - 242 children (60-71 months old) who stayed in the program and had been enrolled since their first year of life underwent a clinical examination according to the WHO's criteria; their parents/caregivers were interviewed to ascertain their compliance to the program. Group B (GB) – parents of 60 children, who had dropped out of the program, were interviewed to check the reasons of withdrawing. The caries risk classification was based on the file at the first appointment. Chi-square test was used ( $\alpha=0.05$ ) for statistical analyses. **Results:** Most of the children were free of caries (71.1%). Caries risk evaluation showed low sensibility (34.3%, 95% CI = 22.4–46.1) and high specificity (74.4%, 95% CI = 67.6–81.2) to caries experience. Sixty-two mothers (25.6%) reported difficulty to follow the guidelines. The main reason for dropping out was changing to similar health services (40.0%). **Conclusions:** Caries risk in the first year of life was not efficient to predict dental caries experience at 5 years of age. Educational practice should be improved to increase the compliance of the parents to the program.

**Keywords:** dental education, prevention, behavior.

## Introduction

Prevalence, severity and level of dental caries progression have declined in the younger segment of the population of well developed countries over the last few decades<sup>1</sup>. In Latin America and the Caribbean, the decline in the severity of the disease has been less conspicuous in preschool age children (5-6 years old) than in schoolchildren (11-13 years)<sup>2</sup>. In the United States, the prevalence of caries has declined in 3 to 4-year-old children, but the severity of the disease has increased<sup>3</sup>.

The role of fluoride in reducing caries is well documented, but little emphasis has been given to the educational practices in dental caries prevention and control. However, since dental caries is a disease than can develop as early as the first year of life<sup>4</sup>, parents and pediatricians should be made aware of this condition through education<sup>5</sup>.

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In breast-fed infants, the guidance and motivation of parents to participate in caries prevention leads to their greater compliance in controlling the risk factors<sup>6</sup>. Moreover, as a preventive strategy, caries risk evaluations involving the identification of children with a potential for developing the disease enables dental health services to target those most in need of such services, providing greater efficiency of the procedures, appropriate levels of assistance, and economic effectiveness<sup>7</sup>. According to Twetman et al.<sup>8</sup>, the assessment of risk factors for the disease in the first year of life enhances the effectiveness of preventive procedures.

The aim of this study was to investigate: a) caries experience in 5 year-old children and its relationship to the caries risk evaluation made before 1 year of age; b) compliance of parents to an infant oral health program as well as the abandonment reasons.

## Material and methods

This transversal study included retrospective data collection. The sample comprised all children ( $n = 484$ ) between 60 to 71 months old enrolled in their first year of life at a Public Infant Oral Health Program in a Brazilian city with fluoride supplied water. The project was approved by the local Ethics in Research Committee.

The study began with an analysis of the patients' file to classify the children participation in the program as follow: a) those whose time interval between the last appointment and the research clinical examination did not exceed 10 months, classified as Group A (GA) "those that stayed in the program" b) those whose time interval between the last appointment and the research clinical examination exceed 10 months, classified as Group B (GB) "those that dropped out the program". The exclusion criteria were: a) refusal to participate in the survey; b) children with special needs<sup>9</sup>.

Among those that stayed in the program (GA), a caries risk classification based on the patient's case history recorded on his/her file at the first appointment in the first year of life was made. Patients classified as high risk were the ones presenting one or more caries risk indicatives, while those classified as low risk were infants presenting no indicative of caries risk or those who had no teeth, even when caries risk behaviors were encountered - i.e. nocturnal feeding. Figure 1 describes the criteria adopted for caries risk classification in the first year of life.

An oral examination was then carried out to diagnose dental caries in GA. All exams were carried out by a trained and qualified examiner (Kappa intra-rater index = 0.92). Ten percent of the total sample was reexamined during the data collection (Kappa = 0.98).

Caries diagnostic criteria were based on the methods recommended by the World Health Organization<sup>10</sup>. The teeth were dried with a gentle air stream and illuminated with artificial light. The examination was visual, aided by a flat-surfaced dental mirror. The dmft index was used to verify the caries experience of the participants in the study<sup>10</sup>.

The parents/caregivers were interviewed to ascertain

their compliance to the program, evaluating their difficulty to follow the guidelines of the program. The evaluated aspects were: nocturnal feeding, sugar intake, teeth brushing, use of fluoride and regular visits to the clinic. The data were recorded according to the frequency that the parents followed the guidelines of the program - regularly (regular frequency), occasionally (irregular frequency), and hardly ever (rarely).

The parents/caregivers enrolled in GB were interviewed by phone call, using a structured questionnaire to evaluate the possible cause for abandoning the program, as well as the continuity of their dental care in other locations. The data were analyzed using the statistical non-parametric chi-square test with 5% level of significance.

## Results

The evaluation of the patient's files indicated that the total sample comprised 484 children of both genders aged 60 to 71 months, who were divided into: GA - 300 (62.0%) who stayed in the program and had been enrolled since their first year of life; GB - 184 (38.0%) children who had left the program before the case histories were evaluated for this survey.

Among children belonging to GA there were 58 losses. The reasons for losses were: 2 parents/caregivers refused to participate, 39 dropped out the program without explanation while the research was being conducted, 8 were transferred to similar health services and 9 could not be encountered. The final sample of those that stayed at the program was composed by 242 children. Data about the age and number of erupted teeth registered on the patients records showed that at the first appointment: 23.8% were 6 months old or less and 76.2% were older than 6 months, 58.9% presented one or more erupted teeth and 41.1% did not. It was also observed that 85.3% had regular returns to the appointments, considered as children up to the age of 3, which time elapsed from one appointment to other did not exceeded 1 month of the scheduled appointment, and after this age, not exceeding 2 months.

About children who had dropped out of the program (GB), 60 parents/caregivers could be contacted.

a) Children attended the infant oral health program (GA)  
- Dental caries prevalence in 5 years old

At the time of the clinical examination, most of the children were free of caries (71.1%). The encountered dmft was 1.0 (SD = 2.1). No dental loss due to caries was recorded, and the number of filled teeth exceeded that of decayed (Table 1). The dmft for the group of children presenting caries ( $n = 70$ ) was 3.5 (SD = 2.5).

- Relationship between the caries experience and the caries risk evaluation

To evaluate if the caries risk indicators adopted in the program were efficient in predicting future caries lesions the sensibility and specificity of the method was calculated. The indicators adopted to determine the caries risk in the first year of life revealed low sensibility to caries experience at 5 years of age, once 34.3% (95% CI: 22.4 - 46.1) of the children with caries were identified as high risk at the

**Table 1.** dmft index and its components according to the number of lesions in GA

Number of lesions	n	dmft		d		m		f	
		mean	SD	mean	SD	mean	SD	mean	SD
0	172 (71.1%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1 to 3	43 (17.8%)	1.8	0.8	0.9	0.9	0.0	0.0	0.9	1.0
> 3	27 (11.1%)	6.1	2.1	2.5	2.0	0.0	0.0	3.6	2.2
Total	242 (100.0%)	1.0	2.1	0.4	1.1	0.0	0.0	0.6	1.4

**Table 2.** Distribution of sample (n, %) according to the caries risk before 12 months of age and dental caries experience at the age of 5 in GA

Caries risk before 12 months old	Caries experience at 5 years old					
	dmft > 0		dmft = 0		Total	
	n	%	n	%	n	%
High risk	24	35.3	44	64.7	68	100.0
Low risk	46	26.4	128	73.6	174	100.0
Total	70	28.9	172	71.1	242	100.0

n = number of children; Chi-square test:  $\chi^2 = 1.46$  with 1 g.l. and value of  $p = 0.226$

beginning of the program. However, the specificity was high, pointing out that among the children without caries at age 5, 74.4% (95% CI: 67.6 – 81.2) were identified as low risk in first year. The positive predictive value of the method was low, since 35.29% (95% CI: 23.2 – 47.4) of the children who entered the program with high risk developed the disease, while its negative predictive value is high, because it showed that 73.6% (95% CI: 66.7 – 80.4) of the children who entered the program with low risk did not develop the disease.

No significant associations ( $p > 0.05$ ) was encountered between the risk evaluation at the beginning of the program and caries experience at age of 5 (Table 2)

#### - Compliance of parents/caregivers

Sixty-two mothers (25.6%) reported having encountered some difficulty to follow the guidelines of the program, while 180 (74.4%) did not have problem.

The topics of the guidelines with more frequency of “occasionally” and “hardly ever” answers involved the control of nocturnal feeding (35.1%) followed by sugar intake (28.9%) (Table 3). On the other hand, greater compliance (“regularly”) was recorded for the regular visits to the clinic (94.2%) followed by the use of fluoride (93.0%).

#### b) children that dropped out the program (GB)

##### - Abandonment reasons to the program

The most frequent reason for abandoning the program

was changing to a similar health service (40.0%) in Londrina or in another city (Figure 2-A). According to the mothers’ report, 50.0% of the cases were due to the need of being attended in a place closer to their homes (Figure 2-B).

The current situation of dental care of those who dropped out of the program showed that 65.0% ( $n = 39$ ) were still receiving dental care. Among these, 79.9% ( $n = 30$ ) were in preventive treatments, 15.4% ( $n = 6$ ) in restorative treatment because of dental caries and 7.7% ( $n = 3$ ) in orthodontic treatment. Only 35.0% ( $n = 21$ ) affirmed not to be under any kind of dental care.

## Discussion

The program described in this paper has been operating to promote oral health for children since 1985. Inclusion criteria of the program are the age (the child must be under age of 12 months) and to be free of caries. The children are assisted from the first year of life up to the age of 71 months. The service is focused on parents’ education and preventive measures for the children, which are planned according to a periodic evaluation of caries risk. Parents’ education is based on a collective educational approach and an individual follow-up in order to evaluate and guide parents about their children’s needs. The preventive measures applied to infants involve the removal of dental plaque and fluoride

**Table 3.** Parents’ compliance (n, %) to guidelines in GA

Frequency of compliance to guidelines	Nocturnal feeding		Sugar intake		Brushing/cleaning		Use of fluoride		Regular visits to the clinic	
	n	%	n	%	n	%	n	%	n	%
Regularly	157	64.9	172	71.1	192	79.3	225	93.0	228	94.2
Occasionally	30	12.4	32	13.2	34	14.1	9	3.7	9	3.7
Hardly ever	55	22.7	38	15.7	16	6.6	8	3.3	5	2.1
Total	242	100.0	242	100.0	242	100.0	242	100.0	242	100.0

n = number of mothers/caregivers

Criteria*	High risk	Low risk
Nocturnal cleaning or brushing	Absent or irregular	Diary done
Nocturnal feeding (breast, bottle or both)	Present	Absent
Nocturnal feeding followed by oral hygiene	Absent	Present
Sugar intake(including intake at meals and between meals - on demand use of bottle/sippy cup containing liquid other than water; consumption of juice, carbonated beverages, or sports drinks; use of sweetened medications)	$\geq 6$	$< 6$

\*a single risk indicator in any area of the "high risk" category classifies a child as being "high risk"

Fig. 1. Criteria used for initial classification of risk

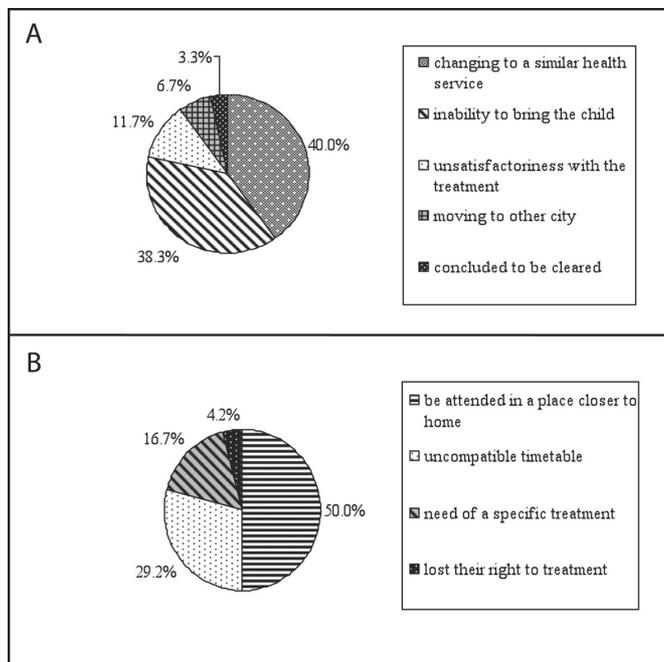


Fig. 2. Reasons for abandoning the program (A) and justifications for changing service (B) in GB

application. For the children enrolled in the program before dental eruption, the mothers behaviors and the children habits related to oral health are evaluated previously to the educative measures be performed. The parents' education and preventive measures performed at every visit to the clinic generate feedback for their children oral health improvement<sup>11</sup>. The appointments were scheduled tri-monthly to the child up to 3 years old, and at a 6-month interval thereafter. There is some flexibility in the schedule of the dental appointments to assure parental compliance to the program. The Nucleus of Dentistry for Babies is funded by the SUS (Brazilian Public Health System) and integrated to the Municipal Health System of Londrina, state of Parana, Brazil. It provides health services to all socioeconomic levels of the local and regional community, with more than 17,000 infants enrolled in the program.

The dmft found in 5-year-old children participating in the program (1.0, SD = 2.1) was lower than that reported for Brazil (2.8, SD = 3.5), according to an epidemiological survey conducted by the SB Brazil 2003 project<sup>12</sup>. The results

of the dmft index by macro-region in Brazil were also higher than those of the program (North - 3.2, SD = 3.6; Northeast - 3.2, SD = 3.7; Southeast - 2.5, SD = 3.3; South - 2.6, SD = 3.4; Mid-West - 2.7, SD = 3.3)<sup>12</sup>. Although the living conditions are different, the number of caries-free children (71.1%) was similar to that found in oral health programs in well-developed countries such as Finland<sup>13</sup>, Denmark<sup>14</sup> and France<sup>15</sup>. These findings are also in agreement with those of Ismail et al.<sup>16</sup>, who reported a significant correlation between regular visits to the dentist and low caries indices. In addition, the results confirm the importance of oral health promotion programs as an effective mean to facilitate the adoption of healthy behaviors and, hence, better health for children<sup>6,17-21</sup>. The successful promotion of health is associated with the development of different parental skills allied to the guidelines offered by the health services and the child's regular visits to the clinic<sup>17</sup>.

The method employed in the caries risk evaluation in the first year of life revealed a low positive predictive and a high negative predictive value for dental caries experience at the age of 5. In this way, the findings of this survey confirm the need for establishing specific protocols for risk evaluation in different age groups, since children's habits are being formed and, if inappropriately established, they become resistant to changes. Additionally, the importance of determining caries risk in preventive treatment planning are pointed and are in agreement with data reported in the literature, which identify risk evaluation as the key to a successful prediction of disease in all age groups<sup>13,22-23</sup>.

The specificity of the method used in this study was good. The test demonstrated that among the children that were classified as low risk at the beginning of the program, 74.4% were free of caries. On the other hand, the sensibility was low, once from those children that were diagnosed as high risk at the beginning of the program only 34.3% developed caries lesions. The low sensibility may be related to the interpositional of educative and preventive measures to reverse the caries risk from high to low since the first patients' appointment to the clinical examination at 5 years old. Legal and ethical aspects must be considered in this situation because the dentist is supposed to promptly advise the parents/caregivers when a patient is diagnosed as high caries risk. Another element to be considered is the major dietary changes occurring at the period of transition from breast or

bottle-feeding to familiarly diet in childhood. An obstacle to the clinical implementation of caries risk evaluation is the lack of studies investigating how the application of the risk evaluation methodology affects future oral health<sup>24</sup>. Moreover, there is no single risk factor or combination of factors that has reached high positive and negative predictive values<sup>25</sup>, although previous caries experience is still the best indicator of the future development of caries. However, the caries experience is not commonly used with children because it is important to determine the risk of caries before the disease manifest<sup>24</sup>, especially in infants (1-23 months).

The parents' motivation through personalized guidelines shows a stronger effect in caries prevention compared to traditional health education<sup>6</sup>. However, this survey revealed that even with the personalized educational practices provided by the program, 25.6% of the parents reported finding some difficulty to follow the guidelines, especially those involving control of nocturnal feeding and sugar intake. Thus, a more specific approach is required for individual assessment of each child. In addition to this, personalized alternatives could be indicated to control these factors, such as: a) feeding throughout the first year of life, but before eruption of the first teeth; b) establishing a maximum limit of 12 to 14 months for breast and bottle feeding<sup>26</sup>. These measures established in the first year of life could control the free demand for sugar intake from juices, soft drinks and other cariogenic liquids via bottles or cups.

Parents abandon oral health promotion programs for several reasons, e.g., choose to take their children to be treated by the family dentist, change their address, mothers may begin or go back to work when their children are old enough, lack encouragement or they may be even financial reason<sup>17</sup>. In this study, the most frequent reason for abandoning the program was changing for similar health service (40.0%), which demonstrates the program's ability in become parents conscious of their role in promoting their children oral health. The change from one clinic to another rather than giving up of oral health promotion means that the program has been reaching some of its goals. Although the program offers daily services from Mondays through Fridays, morning and afternoon, difficulties were reported to appointment times, resulting in the child's losing the place in the program due to consecutive absences.

The continuity of dental care by those who dropped out of the program can be considered an indicative of the education importance to a parents/caregivers preventive conscious. Despite of the parents' compliance difficulties, the educative-preventive measures lead to good oral health when adopted since the first year of life, independently of the caries risk in this age.

The findings of this survey showed that caries risk in the first year of life was not efficient to predict dental caries experience at 5 years of age. The caries risks must be systematically checked between 1 and 5 years when hygiene and diet undergo drastic changes. The importance of oral health promotion should also be highlighted since the first year of the children's life. Although dental health promotion

through educational and preventive practices since the child first year of life leads to a good oral health, educational practices should be improved to increase the compliance of the parents to the guidelines of the oral health program. The change from one clinic to another rather than giving up of oral health promotion program means that the program has reached some of its goals, showing that the parents become conscious of the importance of dental health promotion for their children.

## References

1. Brambilla E, Garcia-Godoy F, Strohmenger L. Principles of diagnosis and treatment of high-caries-risk subjects. *Dent Clin North Am.* 2000; 44: 507-40, vi.
2. Bonecker M, Cleaton-Jones P. Trends in dental caries in Latin American and Caribbean 5-6- and 11-13-year-old children: a systematic review. *Community Dent Oral Epidemiol.* 2003; 31: 152-7.
3. Douglass JM, Montero MJ, Thibodeau EA, Mathieu GM. Dental caries experience in a Connecticut Head Start program in 1991 and 1999. *Pediatr Dent.* 2002; 24: 309-14.
4. Ferreira SH, Beria JU, Kramer PF, Feldens EG, Feldens CA. Dental caries in 0- to 5-year-old Brazilian children: prevalence, severity, and associated factors. *Int J Paediatr Dent.* 2007; 17: 289-96.
5. Adewakun AA, Beltran-Aguilar ED. Early childhood caries in Anguilla, British West Indies. *Gen Dent.* 2003; 51: 42-7.
6. Weinstein P, Harrison R, Benton T. Motivating parents to prevent caries in their young children: one-year findings. *J Am Dent Assoc.* 2004; 135: 731-8.
7. Stamm JW, Disney JA, Graves RC, Bohannon HM, Abernathy JR. The University of North Carolina Caries Risk Assessment Study. I: Rationale and content. *J Public Health Dent.* 1988; 48: 225-32.
8. Twetman S, Garcia-Godoy F, Goeperd SJ. Infant oral health. *Dent Clin North Am.* 2000; 44: 487-505.
9. American Academy of Pediatric Dentistry. 2007-08 Definitions, Oral Health Policies, and Clinical Guidelines. *Pediatr Dent.* 2007.
10. Oral health surveys: basic methods. 4th ed. Geneva: World Health Organization; 1997.
11. Walter LRF, Ferelle A, Issao M. Educación odontológica: necesidades educativas. In: *Odontología para el bebé: odontopediatría desde el nacimiento hasta los 3 años.* Caracas: Amolca; 2000. p.73-92.
12. Brazil. Bureau of Health Care Secretary, Department of Basic Care. Project SB Brazil 2003: oral health conditions of Brazilian population: main results. Brasília; 2004. p.1-68.
13. Mattila ML, Paunio P, Rautava P, Ojanlatva A, Sillanpaa M. Changes in dental health and dental health habits from 3 to 5 years of age. *J Public Health Dent.* 1998; 58: 270-4.
14. Wendt LK, Carlsson E, Hallonsten AL, Birkhed D. Early dental caries risk assessment and prevention in pre-school children: evaluation of a new strategy for dental care in a field study. *Acta Odontol Scand.* 2001; 59: 261-6.
15. Adam C, Eid A, Riordan PJ, Wolikow M, Cohen F. Caries experience in the primary dentition among French 6-year-olds between 1991 and 2000. *Community Dent Oral Epidemiol.* 2005; 33: 333-40.
16. Ismail AI, Sohn W. The impact of universal access to dental care on disparities in caries experience in children. *J Am Dent Assoc.* 2001; 132: 295-303.
17. Harrison RL, Wong T. An oral health promotion program for an urban minority population of preschool children. *Community Dent Oral Epidemiol.* 2003; 31: 392-9.
18. Nurko C, Skur P, Brown JP. Caries prevalence of children in an infant oral health educational program at a WIC clinic. *J Dent Child.* 2003; 70: 231-4.
19. Scavuzzi AI, De Franca Caldas Junior A, Couto GB, De Vasconcelos MM, De Freitas Soares RP, Valença PA. Longitudinal study of dental caries in Brazilian children aged from 12 to 30 months. *Int J Paediatr Dent.* 2007; 17: 123-8.
20. Sgan-Cohen HD, Mansbach IK, Haver D, Gofin R. Community-oriented oral health promotion for infants in Jerusalem: evaluation of a program trial. *J Public Health Dent.* 2001; 61: 107-13.
21. Kalyvas DI, Taylor CM, Michas V, Lygidakis NA. Dental health of 5-year-old children and parents' perceptions for oral health in the prefectures of Athens and Piraeus in the Attica County of Greece. *Int J Paediatr Dent.* 2006; 16: 352-7.

22. Ramos-Gomez FJ, Tomar SL, Ellison J, Artiga N, Sintes J, Vicuna G. Assessment of early childhood caries and dietary habits in a population of migrant Hispanic children in Stockton, California. *ASDC J Dent Child*. 1999; 66: 395-403, 366.
23. Tinanoff N. Dental caries risk assessment and prevention. *Dent Clin North Am*. 1995; 39: 709-19.
24. Tinanoff N, Douglass JM. Clinical decision making for caries management in children. *Pediatr Dent*. 2002; 24: 386-92.
25. Zero D, Fontana M, Lennon AM. Clinical applications and outcomes of using indicators of risk in caries management. *J Dent Educ*. 2001; 65: 1126-32.
26. Nainar SM, Mohammed S. Diet counseling during the infant oral health visit. *Pediatr Dent*. 2004; 26: 459-62.