Longitudinal study of dental caries in Brazilian children aged from 12 to 30 months

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Objective. The purpose of the present study was to investigate caries in a sample of young children in Brazil.

Methods. A prospective longitudinal study of dental caries was carried out on a sample of 186 children aged from 12 to 30 months in Feira de Santana, Bahia, where the water supply is optimally fluoridated. The sample was composed of children accompanied by their mother or guardian and was part of a public health child care programme. After 11 months, all the mothers or guardians and children who took part in the initial examination were contacted, of whom 85.7% attended follow-up. Oral examinations for the detection of dental caries, visible plaque (VP) and white spots (WS) were performed at the beginning of the study and after one year. The statistical analysis consisted of frequency distributions, means and standard deviations, bivari-

ate analysis, and calculation of relative risk, adopting confidence intervals of 95%.

Results. The prevalence of dental caries at the initial examination was 6.4%, rising approximately threefold by 12 months. When the presence of WS also took the form of dental caries, the prevalence of the disease almost doubled. A statistically significant difference was seen between the decayed, missing and filled primary teeth (dmft) found at the initial examination and that at the end of the study. In addition, there was an increase in the dmft index during the course of the study, both for the children who presented with WS and VP, and for those without these conditions.

Conclusions. A low prevalence of dental caries was observed among the children studied at the initial examination, but around 20% of these children presented with new disease during the period of the study. Amongst children with lesions at the start, the presence of caries almost doubled between examinations.

Introduction

Despite the recently observed decrease in the prevalence of dental caries in children below the age of 3 years in Brazil¹, the epidemiological profile in this age group can still be considered quite a critical one, particularly since such young children are involved. Nonetheless, few Brazilian longitudinal studies have reported the increase in dental caries in this age group².

Even though children under the age of 2 years are still not considered a priority as far as dental care is concerned, according to the national journals dealing with this question, a number of

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studies have shown that the appearance of dental caries lesions in very young children increases the risk of this infant population developing new lesions before the primary dentition is complete^{3–8}.

It has already been well established that the occurrence of caries in the primary dentition is associated with the development of caries in the mixed and permanent dentition^{9–12}.

Thus, the purpose of this research was to longitudinally study, over a 12-month period, the experience of dental caries in Brazilian children aged from 12 to 30 months in the municipality of Feira de Santana, Bahia.

Subjects and methods

A quantitative and analytic study of a concurrent prospective cohort was carried out in Feira de Santana, Bahia.

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An error of 5% was accepted for the purpose of calculating the sample size, and the size was estimated on the basis of an expected prevalence of caries of 13%¹³. Using the proportion-based sample calculation formula¹⁴, a sample of 174 children was obtained for the study. To allow for drop-out during the study, the initial size was increased by 20% since the statistical analysis might otherwise have been invalidated. Therefore, 217 children were selected to take part.

The inclusion criteria for the subjects were: an age between 12 and 30 months; no serious illness at the time of the examination; considered mentally and physically normal; taking part in the Child Care Project of the local urban social centre; the presence of at least two primary teeth with totally erupted crowns; and the signature of the parent or guardian giving free and informed consent to their child's participation in the study. The study was approved by the Ethics Committee of the State University of Pernambuco, Olinda, Pernambuco.

After 12 months, all the mothers of the 217 children who participated in the initial examination were contacted by letter. One hundred and eighty-six children attended the second examination (87.5% of the initial sample). The families of 13 children had moved, 11 were not at home at the time of the home visit and the addresses of the remaining seven children could not be located.

All the examinations were performed by a single dental surgeon, who had been calibrated prior to each examination interval (the value of kappa for intra-examiner agreement was 0.94 for the first examination and 0.91 for the second). The children were examined in the knee-to-knee position, and all the examinations were performed in the same well-lit room of the urban social centre. The dental examination was carried out with the aid of a plain mouth mirror, using a torch with white light (Solitaire, Maglite, Ontario, CA, USA). A Number 5 blunt exploratory probe was used for removing dental plaque from the tooth surface.

The children were examined at the start of the study and after one year for the presence of visible plaque (VP)¹⁵ and white spots (WS), the early lesions of dental caries⁵ on the vestibular surfaces of the upper incisors. All the tooth surfaces were examined to calculate the

dmft index¹⁵ using World Health Organization diagnostic criteria¹⁷.

Data were recorded using a microcomputer database, and then transferred to and processed using the SAS, Version 6.12 (SAS, Cary, NC, USA), computer program, and McNemar and Wilcoxon signed ranks tests. Statistical significance was set at P < 0.05, and the confidence intervals were determined at the 5% level.

Results

The mean (\pm standard deviation) age of the children at the start of the study was 17.12 \pm 5.47 months, and the mean interval between first and final examinations was one year (12.46 \pm 0.78 months).

The 186 children studied included 93 boys and 93 girls.

The data on dental caries prevalence based on the dmft index are presented in Table 1. Differences between the first and final examinations were analysed using the Wilcoxon signed ranks test since the difference was not normally distributed.

Table	1.	Components	of	the	dmft	index	at	baseline	and
after	on	e year.							

Variable	Baseline	After one year	<i>P</i> -value†
Number of t	eeth:		
n	9.815	17.035	
mean	52.77	91.59	< 0.001*
SD	23.07	10.54	
Caries-free:			
n	9.769	16.787	
mean	52.52	90.25	< 0.001*
SD	22.82	10.47	
Decayed teet	th:		
n	46	241	
mean	0.25	1.30	< 0.001*
SD.	1.09	4.04	
Missing teeth	า:		
n	0	15	
mean	0	0.08	0.5000
SD	0	0.82	
Filled teeth:			
n	0	0	
mean	0	0	1.000
SD	0	0	
dmfs:			
n	46	256	
mean	0.25	1.38	< 0.001*
SD	1.09	4.48	

*Significant difference at the 5% level. †Wilcoxon signed ranks test.

Table 2.	Distribution	of the	children	in	accordance	with	the
dmft ind	dex.						

	Ва	seline	After one year			
Dmfs index	Number	Percentage	Number	Percentage		
0	174	93.5	149	80.1		
1	1	0.5	10	5.4		
2	4	2.2	6	3.2		
3	0	-	4	2.2		
4	4	2.2	1	0.5		
≥5	3	1.6	16	8.6		
Total	186	100.0	186	100.0		

The distribution of the children in accordance with the dmft index in the examinations performed is shown in Table 2.

Table 3 shows the prevalence of caries at the initial and final examinations in the 186 children studied, and reveals a strong association between the initial condition and that prevailing 12 months later. This was confirmed by results of the McNemar and relative risk tests (P < 0.001).

The data on the presence of dental caries, including WS and/or cavities, are shown in

Table 4, and also reveal a strong association between the initial condition and that at 12 months using the McNemar test (P < 0.01).

Table 5 shows the values of the dmft index at the two examinations according to the presence of WS at the initial examination, the Wilcoxon ranked ranks test showing differences between the two examinations. The results showed that dmfs was lower in every case among children without white spot lesions at baseline (Table 6).

Discussion

A total of 186 children were included in this study; an estimated representative sample of 174 children had been selected, but 217 were examined at the start of the study, which ensured that the drop-out rate of 14.3% was acceptable. The reasons for the drop-outs were unrelated to the study and regarded as a 'loss by chance', and being less than the 20% expected, seemed unlikely to have produced a significant effect on the results of the investigation¹⁸.

Table 3.	Prevalence	of	dental	caries	at	baseline	and	after	one	year.

				After o	ne year			
Variable	Baseline (total)		Dent	al caries	Car	ies-free		
	Number	Percentage	Number	Percentage	Number	Percentage	P-value ⁺ and relative risk (RR)	
Dental caries	12	6.4	12	100.0	-	_	<i>P</i> < 0.001*	
Carios frog	174	02.6	25	111	140	9E C	KK = 6.69	
Total	174	100.0	37	14.4	149	80.1	4.70 < KK < 9.54	

*Significant difference at the 5% level. \pm McNemar test (P < 0.01).

Table 4.	Distribution of	f children a	according t	o the pi	resence of	dental	caries	(white	spots a	and/or	cavity) a	at bas	seline a	and a	after
one yea	ar.														

			After o	one year			
Baseline (total)		Dent	al caries	Cari	ies-free		
Number	Percentage	Number	Percentage	Number	Percentage	P-valuet and relative risk (RR)	
23	12.4	22	95.7	1	4.3	<i>P</i> < 0.001* RR = 4 21	
163	87.6	37	22.7	126	77.3	3.13 < RR < 5.67	
	Baseli Number 23 163 186	Baseline (total) Number Percentage 23 12.4 163 87.6 186 100.0	Baseline (total)DentNumberPercentageNumber2312.42216387.637186100.059	Baseline (total) Dental caries Number Percentage Number Percentage 23 12.4 22 95.7 163 87.6 37 22.7 186 100.0 59 21.7	After one year Baseline (total) Dental caries Cari Number Percentage Number Percentage 23 12.4 22 95.7 1 163 87.6 37 22.7 126 186 100.0 50 21.7 127	After one year Baseline (total) Dental caries Caries-free Number Percentage Number Percentage Number Percentage 23 12.4 22 95.7 1 4.3 163 87.6 37 22.7 126 77.3 186 100.0 50 21.7 127 68.3	

*Significant difference at the 5% level. \pm McNemar test (P < 0.01).

		Examination							
	Base	line	After or	ne year					
at baseline	Mean	SD	Mean	SD	P-value [†]				
Presence	0.75	1.44	8.00	9.95	< 0.001*				
Absence	0.20	1.04	0.75	2.94	< 0.001*				

*Significant difference at the 5% level. †Wilcoxon signed ranks test.

		Examination								
1041-14	Base	line	After or	ne year						
at baseline	Mean	SD	Mean	SD	<i>P</i> -value†					
Presence	0.51	1.56	2.97	6.49	< 0.001*					
Absence	0.06	0.43	0.20	0.88	0.0078*					
Total	0.25	1.09	1.38	4.48	0.001*					

Table 5. Mean and standard deviation of the dmfs index at baseline and after one year according to the presence or absence of dental caries.

Table 6. Mean and standard deviation of the dmfs index at baseline and after one year according to the presence of white spots.

*Significant difference at the 5% level. †Wilcoxon signed ranks test.

The data concerning the epidemiological survey of dental caries based on the dmft index suggested an initial dmft of 0.25 ± 1.09 . According to Cerqueira *et al.*²⁰, a dmft of up to 1.1 at 30 months of age is considered low for Brazilian populations, and therefore, these results cannot be regarded as worrying in relative terms as far the prevalence of disease in this age group of the population is concerned. After one year, the dmfs was 1.38 ± 4.48 . Furthermore, according to Cerqueira *et al.*²⁰, a dmfs from 1.3 to 2.6 at 36 months of age is considered moderate. It can also be seen from Table 1 that the increases in the mean numbers of decayed teeth and decayed surfaces, as well as in the mean dmfs index were statistically significant (P < 0.001), suggesting a significant worsening of dental caries in the primary dentition at this age.

Using the classification of Cerqueira *et al.*²⁰ regarding the gravity of the dmft index, it was shown that, initially, 93.5% of the children had a dmfs of zero, demonstrating a low prevalence, but this fell to 80.1% after one year. Some 2.7% and 8.6% of the children had a dmfs between 1 and 2 at the initial and final examinations, respectively, or in other words, a moderate prevalence of dental caries; and 3.8% and 9.1% had a dmfs equal to or greater

than 3 in the initial and final examinations, respectively, indicating a high prevalence in a minority of children.

Overall, the percentage of children with caries rose from 6.4% to 19.9% over the 12-month period, representing an approximately threefold increase. From this perspective, the results provide a warning of potential geometric progression of the disease, should these children continue to be deprived of appropriate oral health care. When the results of other longitudinal studies of this nature were compared to this one, a much higher incidence of dental caries was observed in the studies of Wendt et al.²⁰ (a 15.4-fold increase after one year), Schroder et al.²¹ (a 28-fold increase after 18 months) and Kawabata et al.²² (an 11.4-fold increase after 18 months). This increase, however, was lower in the studies of Alaluusua and Malmivirta¹⁵ (a 1.7-fold increase after 18 months), and Yonezu and Machida⁷ (a 2.4-fold increase after 18 months).

An association between breast-feeding and early childhood caries was reported by Rosemblatt⁹ among children from poor families in Recife, Brazil. The prevalence of early childhood caries in 12–36-month-old children from poor families in Recife is in accordance with rates found in other Brazilian cities and is extremely high compared to that of general population. The prevalence of early childhood caries increased, with age and the number of sugary snacks between meals and a cariogenic diet were strongly related early childhood caries.

In addition to the diagnosis of the condition of all the tooth surfaces, according to the World Health Organization¹⁷, this study included specific examinations of the vestibular surfaces of the upper incisors for the presence of WS lesions in order to order to ascertain early signs of the disease in these with greater confidence.

From an epidemiological perspective, examination for the earliest signs of caries is difficult to perform because an accurate diagnosis depends on appropriate clinical conditions. Nonetheless, as this study dealt with very young children and these sites are the earliest to be affected, such a diagnosis is crucial in determining the activity of the disease^{5,23–25}. In this study, the methodology used to diagnose the WS of caries proved satisfactory, facilitating viewing and drying.

When the classification for the presence of a caries lesion was considered, including the presence of WS resulted in a greater prevalence of the disease at both examinations, namely 12.4% and 31.7% at the initial and final examinations, respectively. The same situation was found by Roeters *et al.*²⁶ and Grindefjord *et al.*^{5,24} In fact, with the inclusion of the lesions of early caries, an increased prevalence of the disease in the population was to be expected.

Although no attempt was made to quantify the association, when children with WS at the initial examination were separated from those without, the mean dmfs was lower in both the first and final examinations in every case among those who had no WS at the outset. It was also seen, however, that there was a statistically significant increase in dmfs (P < 0.001) among both those children who had and those who did not have this condition at baseline, although the increase was greater among the children who presented with WS at the beginning of the study.

The recording of VP on the vestibular surfaces of the upper incisors was another factor considered in this study. As described by Alaluusua & Malmivirta¹⁵, VP was considered as present only when the recording was made on all four surfaces, indicating a more stringent criterion. The results showed that dmfs was lower in every case among the children without VP at baseline. This was true for both examinations. There was a statistically significant increase in the dmfs between those children with and those without this condition at baseline (P < 0.05), but as in the case of those with WS lesions, this increase was greater in children presenting VP at baseline.

What this paper adds

• From this perspective the results provide a warning of potential geometric progression of disease should these children continue to lack appropriate oral health care.

Why this paper is important to paediatric dentists

- The presence of initial injuries of caries dental and/or socket, in the initial examination, it is a factor associated with the experience of future caries.
- The data of the present research strengthens the unquestionable importance of the necessity of precocious treatment in the inquiry of the risk of the dental caries in this age.
- Accomplishment of precocious injunctions and curatives for control and reversion of the process health-illness.

Conclusions

It possible to draw the following conclusions from the results of this study:

1 A low prevalence of dental caries was observed among the children studied at the initial examination, but the figures were around three times higher after one year, revealing that around 20% of the children presented with new disease over the period of the study. Amongst children with WS lesions at the start, the presence of caries almost doubled between examinations.

2 There was a statistically significant increase in the dmfs index during the period of the study, both for children with WS and VP, and for those without these conditions, this increase being greater among those who showed WS and VP at the initial examination.

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