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Original

Dental caries prevalence in Brazilian schoolchildren resident in Japan

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Abstract: The Brazilian community in Japan is the third largest of the ethnic groups within the Japanese population. However, the oral health condition of Brazilian schoolchildren resident in Japan has not been documented previously. This study was carried out to assess the prevalence of dental caries in Brazilian schoolchildren resident in Japan. The study population comprised 296 schoolchildren aged 6 to 12 years, attending Brazilian schools in Japan. Clinical examinations were performed by a single qualified examiner. The prevalence of dental caries found in this population was 64.9% (95% IC = 59.39 - 70.34%), the percentage of caries-free children being relatively high at 35.1% (95% IC = 29.7% - 40.6%). The mean decayed (D), missing (M), and filled (F) teeth (T) index at age 12 was 1.75 (95% IC = 1.03 - 2.47), and the mean dmft at age 6 was 3.50 (95% IC = 2.43 - 4.57). The proportion of treated teeth was higher than that of decayed teeth in both dentitions. With regard to the distribution of dental caries experience, only 8.4% of all schoolchildren had a DMFT > 3, suggesting a polarization phenomenon of dental caries in this population. Although the prevalence of dental caries among Brazilian schoolchildren resident in Japan is lower than that of their Japanese counterparts, oral health programs are necessary for those children in whom the disease is prevalent and have higher treatment needs. (J. Oral Sci. 48, 51-57, 2006)

Keywords: caries prevalence; Brazilian schoolchildren; Japan

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Introduction

For mainly social and economic reasons, Japan has been a destination for many immigrants from Asian and South American countries. The number of immigrants to Japan has increased in the last decade, and in the year 2000, 1.7 million foreign nationals were registered in Japan, accounting for 1.3% of the total population. Ninety percent of resident foreigners come from either Asia (74%) or South America (19%) (1).

Government policies in Japan in the late 1980s promoted the recruitment of *nikkeijin* (descendants of Japanese emigrants), who were granted residential status in Japan with no restriction on employment. The most important visible impact of the legal reform was an influx of *nikkeijin*, in particular Japanese-Brazilians. Between 1990 and 2002, the Brazilian population in Japan increased from 56,000 to about 273,000.

In the absence of a coherent integration policy at the national level, regional governments in Japan have faced the challenge of accommodating increasing numbers of foreign residents in their communities. Housing, education of immigrant children, health insurance, and medical/dental care are among the issues that are capturing attention. While there seems to be little public support for the idea of receiving immigrants on a large scale, policy discussions are more focused on programs for integration of the

growing ethnic diversity in many parts of the country.

People from Brazil began to arrive in Japan in the late 1980s due to the instability of the Brazilian economy, leading them to seek jobs and better lifestyles. Brazilians comprise the third largest ethnic group in Japan, with a population of some 250,000 (2).

Studies from a number of countries have demonstrated that the oral health status of immigrants is usually worse than that of their native-born counterparts, and further that immigrants make less use of dental services (3,4). These same studies have also indicated that immigrants should be regarded as groups "at risk" with regard to oral health. The disease status reflects the time span of the migration process, and the years in transit influence the accumulated treatment need. It can be assumed that a high prevalence of dental disease and neglected oral hygiene can also be the result of placing a low priority on oral health compared with more immediate problems related to resettlement. Cultural isolation, lack of communication, and language difficulties might also prevent newcomers from getting access to relevant information. Furthermore, immigrants may be less responsive to information about the importance of oral hygiene and diet for oral health, owing to language difficulties. If the oral health of immigrant children develops unfavorably, they should be considered a risk group, demanding special attention for planning of dental health programs. Several studies have reported that culture and age, as well as language and economic limitations, act as barriers to an ethnic minority obtaining dental care and maintaining good oral health (4,5).

The oral health condition of Brazilian schoolchildren residing in Japan has never been documented. The present study was therefore carried out to investigate the prevalence of dental caries in 6- to 12-year-old Brazilian schoolchildren resident in Japan and provide baseline data for this population.

Materials and Methods

Subjects

This study was carried out in 2002 and conducted in five Japanese cities: Hamamatsu, Yaizu, Anjo, Kamisato and Kani, located in the North Kanto and Tokai regions, where Brazilian workers have settled in large numbers. The sample size was calculated based on the prevalence of dental caries in Brazilian children aged 6 and 12 years obtained from the Brazilian National Oral Health Survey, with an error of 10% in the estimation, a power of 80% and a significance level of 5%. A list of all 35 Brazilian schools was obtained from the Association of Brazilian Schools in Japan. Five schools, one in each cited city, were chosen by a simple random method. A letter was sent to each school outlining the aims of the study and seeking their participation and assistance with arrangements for the children's clinical examinations. From a total number of 485 schoolchildren attending these five private Brazilian schools in Japan, the study population comprised 300 schoolchildren aged 6 to 12 years.

Clinical examinations

Informed consent was obtained from parents to examine their children on the understanding that no child would be examined against his or her will. The clinical examination was performed by a single qualified examiner (LNH) while the subjects were seated in a chair inside the classroom. Assistants were present to record the findings. The teeth of the subjects were not brushed or professionally cleaned prior to the examination. No radiographic examinations were performed. Diagnosis of caries was based on the detection of carious lesions at the cavitation stage, in accordance with the criteria recommended by the WHO (6) and documented using the decayed (D), missing (M), and filled (F) teeth (T) index. Caries diagnosis was based on visual-tactile criteria using a sterile mirror top connected to an artificial light (Oral Light Mirror®, Osada Co., Japan) and a blunt dental probe.

Statistical analyses

DMFT and dmft index scores for each child were computed for permanent and primary teeth. For the DMFT index, teeth that had been extracted for orthodontic purposes, or those that were missing due to trauma or congenitally absent, were excluded from the data processing and therefore did not contribute to the final score. Missing teeth were counted only if there was no doubt that tooth loss was due to caries. Descriptive statistics, including means, standard deviations, and frequency distribution, were calculated. The statistical program SPSS 9.0 for Windows was used to calculate the values.

Results

From the total of 300 schoolchildren, four were absent on the clinical examination day. Therefore, 296 pupils comprising 147 boys (49.7%) and 149 girls (50.3%) were examined. The average age was 8.89 ± 2.07 years with a median of 9 years (Table 1).

The prevalence of dental caries in the permanent dentition was 28.3% (95% IC = 23.2% - 33.54%). A total of 212 subjects had no caries in their permanent dentition (Table 2). There were 105 boys (71.4%) and 107 girls (71.8%) with sound permanent teeth (DMFT = 0). The proportion of children with DMFT = 0 decreased with increasing age: 95.8% of 6-year-olds, 91.3% of 7-year-olds, 79.2% of 8-

year-olds, 75.0% of 9-year-olds, 61.8% of 10-year-olds, 47.2% of 11-year-olds and 43.8% of 12-year-olds.

The caries indices of the permanent dentition are presented in Table 3. The DMFT index increased by 0.29 per year within these age groups. In the 12-year-old group, the components of decayed and filled teeth represented 26.1% and 73.8% of the DMFT index, respectively, while missing teeth accounted for 0% of the DMFT. In others age groups, a similar tendency was observed.

In the primary dentition, the prevalence of dental caries was 52.0% (95% IC = 46.3% - 57.7%). One hundred forty-two children (48.0%) - 66 boys (44.9%) and 76 girls (51.0%) - had no caries in this dentition (dmft = 0) (Table 2). The dmft index decreased as age increased, varying from 3.50 in 6-year-olds to 0.29 in 12-year-olds (Table 4). As expected, the proportion of children with sound and untreated primary teeth decreased with increasing age. The dmft index decreased by 0.74 per year within these age groups. In the 6-year-old group, decayed and filled teeth represented 41.9% and 58.0% of the dmft index, respectively, while missing teeth accounted for 0% of the dmft. In all age groups, filled teeth were the principal component of the dmft index. The participation of the component "M" (missing) was slightly significant in all age groups and in both dentitions. Filled teeth were the principal component of the DMFT and dmft indices. There were no statistically significant differences between the genders for the primary and permanent dentitions.

As observed in Table 5, the percentages of caries-free children (DMFT and dmft = 0) in each age group were: 39.6% in 6-year-olds, 39.1% in 7-year-olds, 29.2% in 8-year-olds, 36.1% in 9-year-olds, 29.4% in 10-year-olds,

Table 1 Composition of the study population by age and gender

Age	Gender				Total
	Female		Male		
	n	%	n	%	n
6	24	50.0	24	50.0	48
7	26	56.5	20	43.5	46
8	24	50.0	24	50.0	48
9	18	50.0	18	50.0	36
10	16	47.1	18	52.9	34
11	20	55.6	16	44.4	36
12	21	43.8	27	56.3	48
Total	149	50.3	147	49.7	296

Table 2 Distribution of dental caries experience for primary teeth (dmft), permanent teeth (DMFT) and number of caries-free Brazilian schoolchildren resident in Japan, 2002

	dmft n (%)			DMFT n (%)			Caries-free (dmft and DMFT = 0) n (%)
	0	1-3	> 3	0	1-3	> 3	
Total	142 (48.0)	84 (28.4)	70 (23.6)	212 (71.6)	59 (20.0)	25 (8.4)	104 (35.1)
Boys	66 (44.9)	43 (29.2)	38 (25.9)	105 (71.4)	32 (21.8)	10 (6.8)	51 (34.7)
Girls	76 (51.0)	41 (27.5)	32 (21.5)	107 (71.8)	27 (18.1)	15 (10.1)	53 (35.6)
6-year-olds	19 (39.6)	9 (18.8)	18 (37.7)	46 (95.8)	2 (4.2)	0 (0.0)	19 (39.6)
7-year-olds	20 (43.5)	12 (26.1)	14 (30.3)	42 (91.3)	3 (6.5)	1 (2.2)	18 (39.1)
8-year-olds	14 (29.2)	15 (31.3)	19 (39.5)	38 (79.2)	10 (20.9)	0 (0.0)	14 (29.2)
9-year-olds	13 (36.1)	14 (38.9)	9 (25.0)	27 (75.0)	6 (16.7)	3 (8.3)	13 (36.1)
10-year-olds	15 (44.1)	15 (44.1)	4 (11.8)	21 (61.8)	8 (23.5)	5 (14.7)	10 (29.4)
11-year-olds	17 (47.2)	17 (47.2)	2 (5.6)	17 (47.2)	13 (33.4)	7 (19.4)	12 (33.3)
12-year-olds	44 (91.7)	2 (4.2)	2 (4.2)	21 (43.8)	18 (37.5)	9 (18.7)	18 (37.5)

Table 3 Dental caries indices by component, DMFT and number of erupted teeth for the permanent dentition (mean ± SD) of Brazilian schoolchildren resident in Japan, 2002

	DMFT	DT	MT	FT	Number of erupted teeth
Total (n=296)	0.73 ± 1.56	0.13 ± 0.53	0.00 ± 0.00	0.60 ± 1.40	15.09 ± 7.97
Boys (n=147)	0.71 ± 1.70	0.18 ± 0.62	0.00 ± 0.00	0.52 ± 1.45	14.54 ± 7.93
Girls (n=149)	0.75 ± 1.40	0.00 ± 0.41	0.00 ± 0.00	0.67 ± 1.35	15.62 ± 8.00
6-year-olds (n=48)	0.00 ± 0.20	0.00 ± 0.14	0.00 ± 0.00	0.00 ± 0.14	5.23 ± 3.60
7-year-olds (n=46)	0.17 ± 0.68	0.00 ± 0.21	0.00 ± 0.00	0.13 ± 0.65	9.22 ± 2.63
8-year-olds (n=48)	0.33 ± 0.75	0.13 ± 0.33	0.00 ± 0.00	0.21 ± 0.65	12.13 ± 2.65
9-year-olds (n=36)	0.58 ± 1.23	0.00 ± 0.17	0.00 ± 0.00	0.56 ± 1.23	14.61 ± 4.09
10-year-olds (n=34)	1.09 ± 1.90	0.00 ± 0.51	0.00 ± 0.00	1.00 ± 1.61	18.88 ± 4.79
11-year-olds (n=36)	1.33 ± 1.67	0.31 ± 1.09	0.00 ± 0.00	1.03 ± 1.38	21.75 ± 4.98
12-year-olds (n=48)	1.75 ± 2.46	0.31 ± 0.62	0.00 ± 0.00	1.44 ± 2.32	26.21 ± 3.47

Table 4 Dental caries indices by component, dmft and number of erupted teeth for the primary dentition (mean ± SD) of Brazilian schoolchildren resident in Japan, 2002

	dmft	dt	mt	ft	Number of erupted teeth
Total (n=296)	2.08 ± 2.78	0.65 ± 1.55	0.00 ± 0.14	1.42 ± 2.19	8.88 ± 6.22
Boys (n=147)	2.20 ± 2.72	0.69 ± 1.38	0.00 ± 0.16	1.50 ± 2.16	9.35 ± 6.13
Girls (n=149)	1.96 ± 2.84	0.61 ± 1.70	0.00 ± 0.12	1.34 ± 2.23	8.40 ± 6.30
6-year-olds (n=48)	3.50 ± 3.68	1.52 ± 2.57	0.00 ± 0.00	1.98 ± 2.73	16.50 ± 2.71
7-year-olds (n=46)	2.52 ± 3.19	1.00 ± 2.01	0.00 ± 0.25	1.46 ± 2.25	13.63 ± 2.18
8-year-olds (n=48)	3.13 ± 2.94	0.60 ± 1.22	0.00 ± 0.24	2.46 ± 2.67	11.29 ± 2.41
9-year-olds (n=36)	1.97 ± 2.22	0.39 ± 0.80	0.00 ± 0.00	1.5 ± 2.09	9.11 ± 3.96
10-year-olds (n=34)	1.41 ± 1.92	0.26 ± 0.62	0.00 ± 0.00	1.18 ± 1.90	5.18 ± 4.16
11-year-olds (n=36)	1.36 ± 1.55	0.47 ± 1.03	0.00 ± 0.00	0.89 ± 1.26	3.50 ± 3.71
12-year-olds (n=48)	0.29 ± 1.03	0.00 ± 0.45	0.00 ± 0.00	0.21 ± 0.71	0.75 ± 2.07

Table 5 Dental caries indices for permanent and primary dentitions (mean ± SD) and percentage of caries-free children, with respective 95% confidence intervals, of Brazilian schoolchildren resident in Japan, 2002

	dmft	95% IC	DMFT	95% IC	Caries-free (%)	95% IC (%)
6-year-olds	3.50 ± 3.68	2.43-4.57	0.00 ± 0.20	0.00-0.10	39.6	25.2-53.9
7-year-olds	2.52 ± 3.19	1.57-3.47	0.17 ± 0.68	0.00-0.37	39.1	24.5-53.8
8-year-olds	3.13 ± 2.94	2.27-3.98	0.33 ± 0.75	0.11-0.55	29.2	15.8-42.5
9-year-olds	1.97 ± 2.22	1.22-2.72	0.58 ± 1.23	0.17-1.00	36.1	19.6-52.6
10-year-olds	1.41 ± 1.92	0.74-2.08	1.09 ± 1.90	0.43-1.75	29.4	13.3-45.5
11-year-olds	1.36 ± 1.55	0.84-1.89	1.33 ± 1.67	0.77-1.90	33.3	17.2-49.5
12-year-olds	0.29 ± 1.03	0.00-0.59	1.75 ± 2.46	1.03-2.47	37.5	23.3-51.7
Boys	2.20 ± 2.72	1.76-2.65	0.71 ± 1.70	0.43-0.99	34.7	26.9-42.5
Girls	1.96 ± 2.84	1.50-2.42	0.75 ± 1.40	0.52-0.98	35.6	27.8-43.3
Total	2.08 ± 2.78	1.76-2.40	0.73 ± 1.56	0.55-0.91	35.1	29.7-40.6

33.3% in 11-year-olds and 37.5% in 12-year-olds. The average percentage of caries-free children in this population was 35.1% (95% IC = 29.6% - 40.6%). With regard to the distribution of dental caries, only 8.4% of all schoolchildren had DMFT > 3, while for each age group (6- to 12-year-olds) the proportions were 0%, 2.2%, 0%, 8.3%, 14.7%, 19.4% and 18.7%, respectively (Table 2).

Discussion

The average period during which the Brazilian schoolchildren analyzed in this study had been in Japan was 3.38 ± 2.76 (mean ± standard deviation) years with a median of 3 years. In the Brazilian schools located in Japan, there are no periodic dental check-ups for schoolchildren, unlike the situation in Japanese schools. Thus, Brazilian schoolchildren resident in Japan do not have any oral health care within school. Most of their parents work in factories and live around their work place, forming close Brazilian communities. These communities, isolated from the Japanese system, experience cultural isolation, lack of communication and language difficulties when attempting to deal with the mainstream Japanese health and welfare systems. The oral health campaigns organized by local authorities in Japan do not reach these minorities, and so Brazilian schoolchildren and their parents have a lack of oral health information and assessment.

Previous studies have suggested that after arrival in a new country, immigrants might have limited access to dental care because of language and cultural barriers or lack of familiarity with the health care system (7). Furthermore, they may not seek dental care because of a lack of financial resources or because they are not covered by dental insurance plans.

There have been no previous reports about oral health conditions among Brazilian children resident abroad. However, some studies on the dental health of other foreign children resident in Japan have reached conflicting conclusions (8,9). A study of British schoolchildren resident in Tokyo concluded that they had better oral health than their Japanese counterparts, emphasizing the importance of parental access to information in their native countries (8). On the other hand, a study of Korean schoolchildren resident in Japan found that their oral health was similar to that of Japanese children, suggesting that environmental factors are more important than ethnicity (9).

The present study was designed to test a hypothesis that the prevalence of dental caries among Brazilian schoolchildren resident in Japan might be influenced by cultural and social differences in a new country. It was speculated that their dental status might be considerably worse than that of Japanese children, or similar to or worse than that of Brazilian children resident in Brazil. However, the mean DMFT index for 12-year-old Brazilian schoolchildren resident in Japan was 1.75, and 81.3% of the children showed DMFT ≤ 3. These values are lower than the mean DMFT for 12-year-old Brazilian children resident in Brazil, i.e. 2.78, and that for age-matched Japanese children, i.e. 2.4. The same tendency was observed for children aged 6, 7, 8, 9, 10 and 11 years.

For primary teeth, the dmft index for 6-year-olds in this population was 3.50, while that for Brazilian children resident in Brazil at age 5 was reported to be 2.8. The percentage of children with dmft = 0 was 39.6% at age 6, and 91.7% at age 12 years.

With regard to the percentage of caries-free children (DMFT and dmft = 0) in this population, approximately 35.1% had no caries. Also, in relation to age, 39.6% and 37.5% of 6- and 12-year-olds, respectively, had no caries. These percentages of caries-free children were higher than those reported by Freire et al. (10), who found values of 11.3% for 6 year-olds and 4.4% for 12-year-olds attending public schools in the Brazilian State of Goiás. However, in a Brazilian municipality with a fluoridated water supply, Saliba et al. (11) observed that 40.4% of 6-year-olds were caries-free, i.e. very close to the results we obtained in the present study.

With regard to the permanent dentition, 95.8% and 43.8% of 6- and 12-year-old Brazilian schoolchildren resident in Japan had no caries (DMFT = 0). Our results were in accord with those of Narvai et al. (12), who studied the evolution of dental caries in permanent teeth of schoolchildren in São Paulo city. They found that 94.7% and 39.8% of 6- and 12-year-olds, respectively, had DMFT = 0. Data from a recent Brazilian National Oral Survey indicated that 31.0% of 12-year-old children had no caries in the permanent dentition, which was a lower figure than that found in the present study.

In general, we found that most of the schoolchildren we examined had no, or only minimal, dental caries. In the case of primary teeth, we found that 76.4% of the schoolchildren had dmft ≤ 3, whereas for permanent teeth 91.6% of those examined had DMFT ≤ 3.

Many studies have indicated that many individuals suffer from dental caries even if the mean DMFT for that population is low (13,14). Only 8.4% of the the school-children we examined had DMFT > 3, confirming the polarization phenomenon of dental caries, for which the disease and its treatment needs are mostly concentrated in a small portion of the population, with a high percentage of children who are caries-free (15,16). Our data also place 12-year-old Brazilian children in Japan among the lowest index values for developed areas inside Brazil

(17,18), and are comparable with the lowest DMFT indices registered for industrialized western countries.

In Japan, Brazilian schoolchildren do not have access to a fluoridated water supply or dietary fluoride supplements, because systemic fluorides are not used domestically (19). However, they can access fluoride from dentifrices. According to Hashizume et al. (20), the most popularly used dentifrices on the Japanese market contain a stipulated amount of fluoride to control dental caries.

The present study population comprised schoolchildren attending private Brazilian schools. All the Brazilian schools located in Japan are private, and most Brazilian parents prefer to send their children to these schools rather than Japanese public schools. This suggests that the study population may represent a group with higher socio-economic status than that represented by Brazilian schoolchildren resident in Brazil. The influence of socioeconomic factors on caries prevalence has been demonstrated in several studies (21,22). However, this association should be interpreted with caution. In the present study, only descriptive data are presented, and appropriate statistical analyses must be done to test the significance of observed variables.

Comparing our results with those of other studies, it is evident that the prevalence of caries in Brazilian schoolchildren resident in Japan was lower than that in municipalities of Northern and Northeastern regions of Brazil, which are less well developed (10,23). Otherwise, studies conducted in Brazilian regions with a higher development index, such as the south and southeastern regions, obtained data similar to those of this study (24,25).

The results of the present study suggest that the prevalence of dental caries is low in Brazilian schoolchildren resident in Japan. However, the distribution of dental caries in this community appears to be polarized. By identifying children who have a higher incidence of caries (high DMFT and dmft indices), it may be possible to plan preventive strategies for this group.

Effective dental care programs should be instituted, giving due consideration to language problems. Although preventive programs and campaigns benefit most Japanese schoolchildren, these benefits do not extend to Brazilian schoolchildren resident in Japan. Social, cultural, economic and other environmental factors can create barriers for the Brazilian community when attempting to access and participate in preventive programs.

When planning oral health promotion programs, although identification of culturally relevant oral health beliefs and practices is crucial, other aspects should also be considered. The adoption of a transcultural perspective will help to bridge the gap between foreign patients and local services. These challenges are relevant to both organizers of oral health services and individual dental clinicians. A cross-cultural approach may help to improve the oral health care situation. More and better dental care programs need to be instituted, giving due consideration to language problems. Studies are now in progress to identify the needs of the present group and to create data to serve as a platform for implementing preventive and restorative dental health programs that meet the needs of Brazilian schoolchildren resident in Japan, especially those children who are most affected by caries.

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References

1. Kashiwazaki C (2002) Migration Policy Institute (MPI), Washington (available online at www.migrationinformation.org/Profiles/display.cfm ?ID=39)
2. Japan (2003) Registration of foreign residents, Immigration Bureau, Ministry of Justice, Tokyo (available online at www.moj.go.jp/ENGLISH/IB/ib-01.html)
3. Bradnock G, Jadoua SI, Hamburger R (1988) The dental health of indigenous and non-indigenous infant school children in west Birmingham. Community Dent Health 5, 139-150
4. Pollick HF, Rice AJ, Echenberg D (1987) Dental health of recent immigrant children in the Newcomer schools, San Francisco. Am J Public Health 77, 731-732
5. Aurelius G, Lindstrom B (1978) A longitudinal study of oral health in immigrant children in Sweden. Community Dent Oral Epidemiol 6, 264-268
6. World Health Organization (1997) Oral health surveys: basic methods. 4th ed, World Health Organization, Geneva
7. Vidal OP, Schröder U (1989) Dental health status in Latin-American preschool children in Malmö. Swed Dent J 13, 103-109
8. Mikami Y, Wakai S, Croucher R, Hector MP, Nakamura Y (2003) Children's dental health: British expatriate residents in Tokyo, Japan. Int Dent J 53, 280-284
9. Kawaguchi Y, Ohara S, Sasaki Y, Hirayama Y, Yonemitsu M (1997) Comparative study on oral health status of three ethnic groups of schoolchildren in Japan and Korea. Koku Eisei Gakkai Zasshi 47,

675-682 (in Japanese)
10. Freire MCM, Pereira MF, Batista SMO, Borges MRS, Barbosa MI, Rosa AGF (1999) Prevalence of dental caries and treatment needs in 6 to 12 year-old schoolchildren at public schools. Rev Saude Publica 33, 385-390 (in Portuguese)
11. Saliba NA, Orenha ES, Nakama L, Meneghin MC, Moimaz SAS (1998) Prevalence of dental caries in 3 to 6 years-old from Araçatuba-SP-Brazil, 1996. Rev Odontol UNESP 27, 207-213 (in Portuguese)
12. Narvai PC, Castellanos RA, Frazão P (2000) Dental caries prevalence in permanent teeth of schoolchildren in Brazil, 1970-1996. Rev Saude Publica 34, 196-200 (in Portuguese)
13. Burt BA (1998) Prevention policies in the light of the changed distribution of dental caries. Acta Odontol Scand 56, 179-186
14. Nishi M, Stjernsward J, Carlsson P, Bratthall D (2002) Caries experience of some countries and areas expressed by the Significant Caries Index. Community Dent Oral Epidemiol 30, 296-301
15. Murray JJ (1994) Comments on results reported at the Second International Conference “Changes in caries prevalence”. Int Dent J 44, 457-458
16. Vehkalahti M, Tarkkonen L, Varsio S, Heikkilä P (1997) Decrease in and polarization of dental caries occurrence among child and youth populations, 1976-1993. Caries Res 31,161-165
17. Bastos RS, Bijella VT, Bastos JRM, Buzalaf MAR (2002) Dental caries decline and increment on percentage of caries free schoolchildren, 12 years old, in Bauru, São Paulo, between 1976 and 1995. Rev Fac Odontol Bauru 10, 75-80 (in Portuguese)
18. Traebert JL, Peres MA, Galesso ER, Zabot NE, Marcenes W (2001) Prevalence and severity of dental caries among schoolchildren aged six and twelve. Rev Saude Publica 35, 283-288 (in Portuguese)
19. Kobayashi S, Yano M, Hirakawa T, Horii K, Watanabe T, Tsutsui A, Sakai O, Kani M, Horowitz AM (1994) The status of fluoride mouthrinse programmes in Japan: a national survey. Int Dent J 44, 641-647
20. Hashizume LN, Lima YBO, Kawaguchi Y, Cury JA (2003) Fluoride availability and stability of Japanese dentifrices. J Oral Sci 45, 193-199
21. Pattussi MP, Marcenes W, Croucher R, Sheiham A (2001) Social deprivation, income inequality , social cohesion and dental caries in Brazilian school children. Soc Sci Med 53, 915-925
22. Maltz M, Barbachan e Silva B (2001) Relationship among caries, gingivitis and fluorosis and socio-economic status of school children. Rev Saude Publica 35, 170-176 (in Portuguese)
23. Freire Mdo C, de Melo RB, Almeida e Silva S (1996) Dental caries prevalence in relation to socioeconomic status of nursery schoolchildren in Goiania - GO, Brazil. Community Dent Oral Epidemiol 24, 357-361
24. Baldani MH, Narvai PC, Antunes JL (2002) Dental caries and socioeconomic conditions in the State of Parana, Brazil, 1996. Cad Saude Publica 18, 755-763 (in Portuguese)
25. Moreira BH, Pereira AC, Oliveira SP (1996) Evaluation of the prevalence of dental caries in school-children from an urban area of Southeastern Brazil. Rev Saude Publica 30, 280-284 (in Portuguese)