Comparative assessment of anterior spacing in Japanese-Brazilian and Caucasian children in the deciduous dentition

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Abstract

Objective: To carry out a comparative evaluation of prevalence of anterior spacing characteristics in Japanese-Brazilian and Caucasian children in the deciduous dentition. **Methods:** Two samples of children aged 2-6 years were selected: 405 Japanese-Brazilians from 36 schools in the State of São Paulo and 510 Caucasian children from 11 public institutions in São Paulo city. Spacing features in the maxillary and mandibular arches were assigned to four categories: Generalized spacing, only primate spaces, no spacing and crowding. Logistic regression was used to analyze the effect of age, gender and ethnic group on the prevalence of the occlusal characteristics ($\alpha = 0.05$). **Results:** In Japanese-Brazilians, generalized spacing was the most prevalent characteristic in the maxillary (46.2%) and mandibular (53.3%) arches. The frequency of primate spaces was higher in the maxillary arch (28.2% versus 15.3%). Concerning no spacing (21.7% – 26.4%) and crowding (4% – 4.9%), the variation between arches was relatively small. In Caucasian children, no spacing and exclusive presence of primate spaces showed distributions similar to that observed in Japanese-Brazilians. Generalized spacing was diagnosed in approximately 50% of the arches. Crowding prevalence was higher in the mandibular arch (12.8% versus 3.9%). The regression model adjusted for crowding prevalence was the only significant one. Only the ethnical factor was significant (p<0.001). **Conclusions:** It may be suggested that anterior spacing features in the deciduous dentition would not be influenced by age or gender. Nevertheless, Caucasian children would have 2.8 times more chances of presenting crowding in the mandibular arch, in comparison with Japanese-Brazilians.

Keywords: Dental occlusion. Diastema. Deciduous dentition.

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INTRODUCTION

Concerning the deciduous dentition, generalized spacing in the anterior region is the most common characteristic[1,2,4,9,10,12,15] and is accepted by some authors as favorable for the alignment of permanent anterior teeth.[3,4,8,15] On the other hand, the presence of proximal contacts or even crowding is not a definitive predictor of malocclusions due to lack of space in the permanent dentition.[5,20,21] However, some authors[24] explain that crowding constitutes a problem not only from an orthodontic point of view, but also because it predisposes to greater retention of dental plaque. A study[16] has mentioned that the crowding of deciduous incisors is probably followed by crowding of permanent incisors and advocated that this characteristic should be considered a malocclusion. Furthermore, even though growth and development cause dimensional and cephalometric changes between the deciduous and permanent dentitions, some children may deviate from the normal pattern.[20] Thus, it may be assumed that the follow-up of children with crowding in the deciduous dentition up to the permanent dentition would be a method of Preventive Orthodontics.

Several studies have been conducted on Brazilian children in order to determine the prevalence of anterior spacing characteristics in the deciduous dentition,[6,7,9,20-23] yet few studies have addressed populations of Japanese-Brazilian individuals. Notably, other occlusal characteristics have also been analyzed, including the association with non-nutritive sucking habits.[11] Nonetheless, the anterior spacing has not yet been studied in detail in this population. Considering that ethnicity may influence the occlusal pattern, this study was conducted to comparatively evaluate the prevalence of anterior spacing characteristics in the deciduous dentition in Japanese-Brazilian and Caucasian Brazilian children.

MATERIAL AND METHODS

This cross-sectional epidemiological study was conducted in accordance with the rules and guidelines foreseen in the Resolution 196/96 of the Brazilian Ministry of Health, and was approved by the Committee of Ethics in Researches of University of São Paulo City (UNICID) under protocol No. 13259823.

Study groups

The sample of Japanese-Brazilians comprised 405 healthy children of both genders (203 females and 202 males), aged 2 to 6 years, registered at 36 primary education schools directed to the Japanese community in different cities in the State of São Paulo: Arujá, Bastos, Botucatu, Campinas, Ibiúna, Marília, Mogi das Cruzes, São Paulo and Suzano. The children were considered to be Japanese-Brazilians if they were born in Brazil and presented at least 50% of direct Japanese ancestry, i.e. they should have at least one parent, two grandparents or four great grandparents, either maternal or paternal, born in Japan. Despite the possibility of miscegenation in the group of Japanese-Brazilian children, this was not an exclusion criterion if the 50% of direct Japanese ancestry could be checked. The children's ancestry was analyzed by a genealogical survey, evaluating the nationalities of their parents, grandparents and great grandparents. It was observed that nearly 70% of the children did not have a mixed ancestry, i.e. they had 100% of direct Japanese ancestry. This sample was divided into two age groups: 2-4 years (n = 257) and 5-6 years (n = 148).

The sample of 510 Caucasian Brazilian children, presumably healthy, of both genders (265 females and 245 males), aged 2 to 6 years, was selected from a total of 1,377 children attending six primary education schools run by the municipality and five nursery centers at the Eastern region of São Paulo city. This sample was also divided into two age groups: 2-4 years

(n = 240) and 5-6 years (n = 270). Selection of these children for comparison with the Japanese-Brazilians was based on studies in which Caucasian individuals were evaluated as target population or comparison sample.[3,14,17,20,21] It should be highlighted that, even though the sample of Caucasian children presented ethnic miscegenation, it was selected because this group had a reasonable number of individuals and presents one ethnic characteristic in common, namely the white color of the skin.

Assessment of occlusal characteristics

Before onset of clinical examinations, the study comprised training of five examiners. This training included two occlusal assessments of 24 children, with a 15-day interval between evaluations. This procedure was conducted on preschool children in one of the schools selected, at the school environment, to simulate the conditions of the epidemiological survey. The intra-examiner agreement was analyzed by the Kappa statistics (κ coefficients from 0.76 to 1.00). Spearman correlation tests were also applied to evaluate the consistency of diagnoses performed by the examiners, analyzed two by two, during the clinical examinations (Rs > 0.90).

All children were examined at their school environment, comfortably seated under an artificial light source. Visual inspection of the dental arches was performed with the aid of disposable tongue depressors to retract the soft tissues, in both maximum intercuspation and maximum opening positions.

The maxillary and mandibular dental arches were separately classified in four categories, according to the anterior spacing characteristics:[9]

• **Generalized spacing**: The anterior teeth presented generalized interproximal spaces, including the primate spaces bilaterally. In case of doubt, the examiner considered that the maxillary and mandibular arches should present at least four and six spaces, respectively, to be included in this category.

• **Only primate spaces**: These arches presented visibly perceptible spaces bilaterally between the maxillary deciduous lateral incisors and canines, as well as between the mandibular deciduous canines and first molars.

• **No spacing**: The anterior teeth presented proximal contacts. In these arches, there was absence of interincisors and primate spaces, bilaterally.

• **Crowding**: In addition to the absence of interproximal spaces, one or more deciduous teeth were deviated in buccal and/or lingual direction in relation to their respective alveolar processes.

Children included in the study groups met the following criteria:

» Free and informed consent forms signed by the parents/caretakers.
» Complete deciduous dentition, without erupted or erupting permanent teeth.
» Absence of extensive carious lesions, crown destructions or proximal restorations that might alter the mesiodistal width of the teeth.
» Absence of early loss of deciduous teeth.
» Absence of dental anomalies of shape, number, structure and eruption.
» Absence of syndromes or cleft lip and palate.
» No previous orthodontic treatment and/or speech therapy.

Statistical analyses

The relative frequencies of the occlusal characteristics assessed, according to age and gender, for each ethnic group, were plotted and comparatively analyzed by the chi-square test with Bonferroni correction. Thereafter, the effect of age group (2-4 years and 5-6 years), gender (male and female) and ethnic group (Caucasian and Japanese-Brazilian) on the prevalence of each characteristic related to

anterior spacing in the maxillary and mandibular arches was analyzed using adjusted logistic regression models (α = 5%).

RESULTS

Figures 1 and 2 present the distribution of the characteristics analyzed in the maxillary and mandibular arches, respectively, for Japanese-Brazilian and Caucasian children. Generalized spacing was the most prevalent characteristic in Japanese-Brazilians. It should be highlighted that primate spaces were more frequent in the maxillary arch compared to the mandibular arch. The prevalence of crowding was very similar in both arches, ranging from 4% to 4.9%. Generalized spacing was also the most prevalent characteristic in Caucasian children. Once again, the primate spaces were more frequent in the maxillary arch compared

to the mandibular arch. However, the prevalence of crowding was higher in the mandibular arch (12.8% compared to 3.9%).

Analysis of each characteristic separately in the maxillary and mandibular arches revealed no significant differences between age groups and genders, both for Japanese-Brazilian and Caucasian children.

Anterior spacing characteristics were analyzed in the maxillary and mandibular arches using logistic regression models. The factors analyzed included age range, gender and ethnic group. The only model presenting a significant factor was that adjusted for the prevalence of crowding in the mandibular arch. Only the ethnic factor was significant (p < 0.001). As demonstrated in Tables 1 and 2, Caucasian children presented a 2.81 times greater chance of developing crowding in the mandibular arch compared to Japanese-Brazilians.
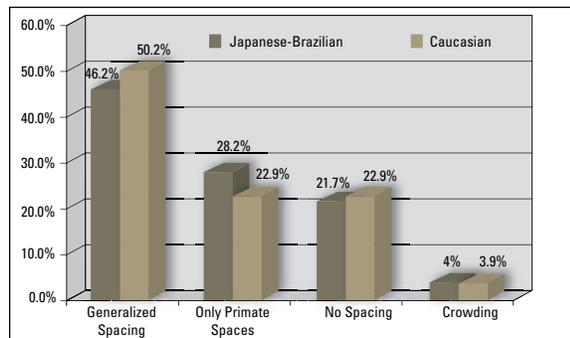

FIGURE 1 - Prevalence of anterior spacing characteristics in the maxillary arch among Japanese-Brazilian and Caucasian children.
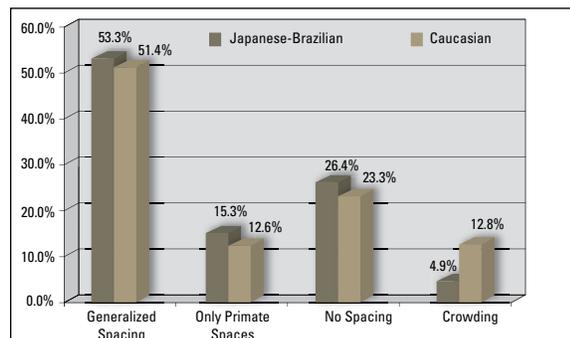

FIGURE 2 - Prevalence of anterior spacing characteristics in the mandibular arch among Japanese-Brazilian and Caucasian children.

TABLE 1 - Logistic regression model for the prevalence of crowding in the mandibular arch.

Factors	Crowding				Logistic Regression		p-value
	no		yes				
	n	%	n	%	OR	(CI 95%)	
2-4 years	459	92.4	38	7.6			
5-6 years	371	88.8	47	11.2	1.33	(0.84; 2.09)	0.227
male	408	91.3	39	8.7			
female	422	90.2	46	9.8	1.11	(0.71; 1.75)	0.640
Caucasian	445	87.3	65	12.7			
Japanese-Brazilian	385	95.1	20	4.9	0.37	(0.22; 0.63)	0.000**

OR = *odds ratio*. ** = p < 0.001.

TABLE 2 - Logistic regression model for the prevalence of crowding in the mandibular arch, considering only the ethnic groups.

Ethnic Group	Crowding				Logistic Regression		p-value
	no		yes				
	n	%	n	%	OR	(CI 95%)	
Japanese-Brazilian	385	95.1	20	4.9	2.81	(1.67; 4.72)	0.000**
Caucasian	445	87.3	65	12.7			

OR = *odds ratio*. ** = p < 0.001.

DISCUSSION

Assessment of the occlusal patterns in different ethnic groups is relevant and also very useful from a clinical point of view. Several Brazilian and international authors have conducted comparative investigations on the occlusal characteristics in the deciduous dentition. A study conducted in the 90's[14] revealed that children of African descent presented significantly less crowding compared to Finnish children, of Caucasian descent. This observation was corroborated later.[3] Considering data from a single country with marked ethnic traits, it is interesting to mention the study that evaluated children of the three major ethnic groups in Nigeria (Yoruba, Ibo and Hausa).[18] Spacing was more frequent among children of Ibo ethnicity (48.4%) and less frequently observed in Hausa children (19.8%), p<0.001. The distribution of primate spaces bilaterally also evidenced significant differences for the mandibular arch, being more prevalent in Ibo children (49.4%) compared to Hausa (21.3%) and Yoruba children (29.3%), p<0.001.

Most people of Japanese descent live in the State of São Paulo, accounting for nearly 76% of all such individuals in Brazil.[11] This high indicator justifies the accomplishment of comparative epidemiological studies on these people, who are called Japanese-Brazilians because they were born in Brazil and have strong Japanese genetic inheritance (at least 50% of direct ancestry).

Investigation of the occlusal characteristics in Japanese-Brazilians has already been conducted. However, no studies had addressed the anterior spacing in the deciduous dentition in this population. Moreover, if the anterior spacing was not an important aspect of occlusion, there would not be classical[4,10,17] and contemporary studies[3,9,18] on this subject.

In the present study, generalized spacing was the most prevalent characteristic both in Japanese-Brazilian and Caucasian children.

These findings are in agreement with the results of other studies.[1,4,8,9,13,19,22] However, the reports evidence a noticeable variability, from 86.65%[22] to 37,7%[19] in the maxillary arch; and from 79.96% to 44% in the mandibular arch, according to the same scientific investigations. A study conducted on Egyptian children[8] reported similar results as those observed in the present study.

The second most frequent characteristic in the ethnic groups was related to the presence of primate spaces, specifically in the maxillary arch. If the frequency of the exclusive presence of primate spaces is combined to the values obtained for the prevalence of generalized spacing, it may be assumed that the present results agree with several studies that reported prevalence of primate spaces in more than 60% of the samples.[1,3,6,13,17,19,23] The explanation would lie in the combination of percentage values. The results of this investigation are corroborated by two studies[8,9] conducted in different countries, which used a similar classification for the diagnosis and observed higher percentage values of this characteristic in the maxillary arch.

The absence of spacing, though less common, is not a sign of abnormality in the deciduous dentition. In this study, the frequency of dental arches with absence of spacing ranged from 21.7% to 26.4% in Japanese-Brazilians and from 22.9% to 23.3% in Caucasian children, with higher percentages for the mandibular arch. Similarly, other authors[8,10,19] reported greater predominance of absence of spacing in the mandibular arch. The comparison with other studies[1,2,4,12,19] is impaired by the grouping of two variables: Absence of spacing and crowding. These variables were analyzed individually in the present study, because crowding was considered a deviation from a clinically satisfactory deciduous dentition.[24,25] Also, there is scientific evidence based on longitudinal studies to advocate the follow-up of children

with crowding in the deciduous dentition as a valid approach, aiming at the detection and early interception of its influence in the mixed and permanent dentitions.[5,21]

In Caucasian children, as observed in the permanent dentition, the prevalence of crowding was higher in the mandibular arch (12.8% compared to 3.9%). This result is in accordance with the report of a previous study conducted on children having distinct ethnic characteristics.[9] Interestingly, in the sample of Japanese-Brazilian children, the values relative to the prevalence of crowding were very similar, ranging from 4% in the maxillary arch to 4.9% in the mandibular arch. The difference in the study groups was corroborated by the logistic regression analysis (Tables 1 and 2). Caucasian children presented a 2.8 times greater chance of having crowding in the mandibular arch, compared to Japanese descents.

There was no gender dimorphism for the anterior spacing characteristics in Japanese-Brazilian and Caucasian children. Several other authors have analyzed the aspects related to anterior spacing and also did not observe differences between boys and girls.[2,6,7,9,22,24] However, other researchers mentioned this type of dimorphism.[1,3,23] The primate spaces would be significantly wider and more frequently diagnosed in boys compared to girls.[1,3]

Concerning the possibility of changing the anterior spacing characteristics with the increase in age, the statistical analysis did not demonstrate differences between age groups. A Brazilian study revealed a significant decrease in the number of children with interproximal spacing with the increase in age, suggesting a tendency to space closure.[23] Other study evidenced a significantly reduced frequency of primate spaces at the age range from 4 to 6 years (p<0.05), in comparison to the group of children aged 2 to incomplete 4 years.[6] An author mentioned that the prevalence of crowding in the anterior region increased with age both in Caucasian children (3-4 years: 5%; 5-6 years: 16%) and those of African descent (3-4 years: 5%; 5-6 years: 9%).[14] However, regarding to crowding, other authors did not find statistically significant difference between age groups.[24]

Longitudinal studies might allow a more reliable analysis of the changes in anterior spacing with the increase in age. Nevertheless, prospective studies require more time and are subjected to remarkable sample reduction during the follow-up interval. This aspect relative to the logistic demand would be even more unfavorable in a sample of Japanese-Brazilian children, considering that the present study included children from nine different cities in the State of São Paulo.

CONCLUSIONS

» In the sample of Japanese-Brazilian children, generalized anterior spacing was the most prevalent characteristic in the maxillary and mandibular arches. The frequency of primate spaces was higher in the maxillary arch. However, for the characteristics related to absence of spaces and crowding, there was relatively small variation between percentages calculated for both arches.

» In the sample of Caucasian Brazilians, the frequencies of characteristics related to absence of interproximal spaces and presence of primate spaces demonstrated similar distributions as observed in Japanese-Brazilians. It should be highlighted that generalized spacing was observed in nearly 50% of the dental arches. However, the prevalence of crowding was higher in the mandibular arch.

» In both study samples, there was no significant difference between age groups (2-4 years and 5-6 years), nor gender dimorphism.

» Caucasian children would have a 2.8 times greater chance of presenting crowding in the mandibular arch compared with Japanese-Brazilians.

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