

Epidemiological pattern of malocclusion in Brazilian preschoolers

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Abstract *This study aimed to evaluate the prevalence and distribution profile of malocclusion in Brazilian preschoolers and its association with macro-region, housing, gender, and self-reported race. In total, 6,855 children aged five years participating in the National Oral Health Survey (called SB Brasil 2010) were analyzed. Malocclusion was diagnosed according to the Foster and Hamilton index. We conducted descriptive, bivariate and multiple regression analyses (PR/CI95%). We identified that 63.2% of children had at least one of the occlusal problems evaluated: canines' key (22.9%), overjet (32.9%), overbite (34.6%), and posterior crossbite (18.7%) and, thus, were considered with malocclusion. Higher probability of the presence of malocclusion was identified among the residents of the Midwest (1.08/95%CI 1.01-1.15), Northeast (1.21/95%CI 1.14-1.28), Southeast (1.27/95%CI 1.20-1.34) and South (1.34/95%CI 1.26-1.42) regions when compared to residents in the North. It was also higher among female children (1.06/95% CI 1.02-1.09). No associations were identified concerning race and location of the municipality (capital/no capital). A high prevalence of malocclusion was identified in Brazilian preschoolers, and it was associated with gender and the macro-region. These findings may contribute to expanded public policies and greater access to treatment for this population.*

Key words *Malocclusion, Child, Preschool, Oral health, Prevalence*

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Introduction

The oral health conditions of Brazilian preschoolers are worrisome, since although there have been slight improvements in the last two epidemiological surveys carried out in the Brazilian population^{1,2}, such as around 6% increase in caries-free 5-year-olds, this population segment is still affected by a history of untreated disease, responsible for more than 80% in the index composition, and has different dental treatment needs besides the presence of occlusal problems². Dental care in the first years of life facilitates the identification of risk factors for oral diseases and problems, allowing the planning and implementation of preventive and curative procedures³, thus reducing the impact of these problems on the daily life of these individuals⁴.

The occlusion-related problems are characterized by alterations in the development of maxillaries, which can result in functional, aesthetic and psychosocial alterations in individuals^{5,6}, and are the result of an interaction of genetic and environmental factors⁷⁻⁹. Among preschoolers, occlusion-related problems have been associated with different factors, such as anthropometric deficit¹⁰, unhealthy habits, such as pacifier or finger sucking habit¹¹, dental eruption disorders¹² and other oral disorders, such as dental traumatism¹³ and dental caries¹⁴. Also, the presence of malocclusion in this age group has been associated with a negative impact on the quality of life of children and their families¹⁵. These findings have derived from population-based studies, contributing to the understanding of this issue in preschoolers.

In general, there is a high prevalence of occlusal problems among preschoolers, varying in different countries, with rates close to 20% in Spain¹⁶ and 70% in Lithuania¹⁷, as identified in previous population studies. In Brazil, the prevalence of occlusal problems in preschoolers has ranged from 28% to 80%, according to the location of the studies^{11,13,15,18}, which highlights the possibility of the association of regional characteristics in the occurrence of this problem, because malocclusion evaluation criteria used are different in these studies. According to data from the last two national oral health surveys of the Brazilian population^{1,2}, the presence of an occlusal problem in 5-year-olds increased by 28.2% between the two surveys¹².

However, literature evidenced no studies that have characterized the epidemiological pattern of occlusal problems among preschoolers, consider-

ing a representative sample of this population in Brazil. Besides, due to the different prevalence of this disease in the different Brazilian municipalities, pointed out by previous studies^{11,13,15,18}, the association of malocclusion with the geographic region of residence of these individuals, as well as other associated factors, must be evaluated. In this line of reasoning, regional differences in the pattern of impairment may guide the planning of preventive and corrective actions geared to the problem. Therefore, this study aimed to characterize the pattern of malocclusion among Brazilian preschoolers and identify the factors associated with its presence, based on data from the National Oral Health Survey conducted in 2010 (SB Brazil).

Methods

Design and sampling

This is a cross-sectional, analytical study based on the database of the epidemiological survey of the Oral Health conditions of the Brazilian population carried out in 2010².

The survey in question was conducted according to the criteria proposed by the WHO, in which a representative sample of the Brazilian population in the index age groups was interviewed and examined through clinical-epidemiological examinations performed by dentists under natural light in their households regarding oral health, demographic and socioeconomic conditions, use of dental services and subjective oral health issues. The sample consisted of residents from 177 Brazilian municipalities, from the five Brazilian macro-regions (North, Northeast, Midwest, Southeast, and South), including the 27 capitals, selected by multi-stage probabilistic sampling by conglomerates, with probability proportional to the size of the population and considering a design effect (deff) of 2.0. The examinations and interviews were performed by dental surgeons previously trained and calibrated by the consensus technique, with the minimum acceptable value of Kappa for each examiner, age group and injury being studied equal to 0.65¹⁹.

In this study, we considered a database selection of 5-year-olds who were examined for malocclusion (7,045) excluding those of yellow (138) or indigenous (52) ethnicity, due to low representativity²⁰, totaling a sample of 6,855 5-year-old preschoolers.

Evaluation of malocclusion

Malocclusion was diagnosed by the Foster and Hamilton Index²¹, which consists of four measures: canines' key, overjet, overbite, and posterior crossbite. The measurement (in millimeters) was performed with teeth in occlusion and the probe parallel to the occlusal plane. The child with at least one of these abnormalities was characterized as "malocclusion", otherwise, as "normal occlusion". In this study, the presence of malocclusion was adopted as the dependent variable (outcome).

Independent variables

The independent variables considered were: macro-region (North, Midwest, Northeast, Southeast, South), geographic location (capital, inland), gender (male, female) and self-declared ethnicity (white, black/brown). Such information was retrieved from questionnaires applied to those responsible for preschoolers.

Statistical analysis and ethical considerations

Initially, the variables were described through their frequency distributions. Concerning the variables underlying the Foster and Hamilton Index, as well as for the outcome (malocclusion), 95% confidence interval was estimated for their respective prevalence. In the bivariate analysis, the Chi-square test was used to evaluate the existence of an association between the outcome and the independent variables. Variables with a detailed level (p-value) less than or equal to 0.20 were selected for the multiple model. The Poisson regression model, with robust variance, using the prevalence ratio (PR) as a measure of association was adopted in the multiple analysis. Statistical analyses were performed in the SPSS program 18.0.

The epidemiological survey was carried out respecting the ethical principles of National Health Council Resolution N° 196/96 and was approved and registered by the National Research Ethics Commission (CONEP).

Results

A total of 6,855 five-year-old preschoolers were included in this study, most of which were males, residing in the Northeast and North regions of

the country and of black or brown skin color (Table 1).

Regarding the evaluation of malocclusion, 4,332 (63.2%) preschoolers had at least one of the occlusal problems evaluated and, thus, were considered as having malocclusion. They were characterized for the presence of canines' key, overjet, overbite and posterior crossbite (Table 2).

The bivariate analysis showed that only Brazilian macro-region and gender remained associated with malocclusion (Table 3). Significant associations of the presence of malocclusion with the Brazilian macro-region ($p = 0.000$ to 0.026) and gender ($p = 0.003$) were identified (Table 4) in the Poisson multiple regression analysis.

Discussion

The understanding of the pattern of malocclusion in Brazilian preschoolers allows us to estimate the regional demand characteristic for orthodontic treatment, besides knowing the profile of these individuals. From the viewpoint of public health, the identification of sociodemographic differences values the need for decentralized public oral health policies, which facilitates the understanding that regional characteristics interfere with the prevalence and severity of oral diseases and issues. The prevalence of malocclusion among Brazilian preschoolers, associated with the Brazilian macro-regions and gender of preschoolers, was 63.2%, that is, these individu-

Table 1. Distribution of 5-year-old children by region, geographic location, gender, and skin color. Brazil, 2010.

Variable	n	%
Region		
North	1,687	24.6
Midwest	1,091	15.9
Northeast	1,913	27.9
Southeast	1,248	18.2
South	916	13.4
Location		
Capital	5,232	76.3
Inland	1,623	23.7
Gender		
Male	3,456	50.4
Female	3,399	49.6
Skin color		
White	3,186	46.5
Black/brown	3,669	53.5

Table 2. Condition of dental occlusion assessed by the Foster and Hamilton index at five years of age. Brazil, 2010.

Occlusion Condition	n*	%	CI _{95%}
Canines' Key			
Class I	5,255	77.1	76.1-78.1
Class II	1,110	16.3	15.4-17.2
Class III	451	6.6	6.0-7.2
Overjet			
Normal	4,214	67.1	65.9-68.3
Augmented	1,432	22.8	21.8-23.8
Top-to-top	438	7.0	6.3-7.6
Anterior crossbite	196	3.1	2.7-3.6
Overbite			
Normal	4,085	65.4	64.2-66.6
Reduced	795	12.7	11.9-13.6
Open	696	11.1	10.4-11.9
Deep	673	10.8	10.0-11.5
Back crossbite			
Absence	5,532	81.3	80.3-82.2
Presence	1,276	18.7	17.8-19.7
Malocclusion			
Absent	2,523	36.8	35.7-38.0
Present	4,332	63.2	62.1-64.3

* Totals vary due to lack of information. CI_{95%}: 95% confidence interval.

Table 3. Distribution of dental occlusion by region location, gender and skin color in children five years of age. Brazil, 2010.

Variable	Normal occlusion		Malocclusion		P-value*
	n	%	n	%	
Região					<0,001
Norte	772	45,8	915	54,2	
Centro-Oeste	452	41,4	639	58,6	
Nordeste	660	34,5	1253	65,5	
Sudeste	391	31,3	857	68,7	
Sul	248	27,1	668	72,9	
Localização					0,247
Interior	617	38,0	1006	62,0	
Capital	1906	36,4	3326	63,6	
Sexo					0,003
Masculino	1332	38,5	2124	61,5	
Feminino	1191	35,0	2208	65,0	
Cor de pele					0,896
Preta/Parda	1353	36,9	2316	63,1	
Branca	1170	36,7	2016	63,3	
Total	2523	36,8	4332	63,2	

* Chi-square test.

als had at least one of the occlusal problems evaluated (canines' key, overjet, overbite or anterior crossbite). The characterization of malocclusion in 5 year-olds has not been well clarified in the literature, considering a representative sample of Brazil, hindering their comparison. Similar prevalence of malocclusion was found among children from Germany (72%)¹² and Lithuania (71%)¹⁷.

A different prevalence is observed when considering studies performed in different regions of Brazil pointing to local characteristics of the disease. A prevalence similar to that recorded in this study was identified in a previous work conducted in Bauru (SP)¹¹, with involvement in 50 and 60% among children aged 3 to 5 years, using different diagnostic criteria. A previous study carried out in another state (MG) identified a lower prevalence rate of 28.4%, using the Foster and Hamilton criteria for children aged 3-5 years¹⁵. On the other hand, a higher prevalence was identified in a municipality in the South region (Canoas, RS), with a rate of 69.9%⁴, considering different diagnostic criteria. Regional differences and the different diagnostic criteria used in the studies may explain the high variability in prevalence among the different Brazilian locations. Despite this, considering the adverse effect of this condition on the quality of life of preschoolers and their families¹⁵, as well as a possible presence of these conditions in the deciduous dentition will result in a greater need for orthodontic treatment in the permanent dentition²², the prevalence rate found is of concern.

Furthermore, we identified the association between the presence of malocclusion with the geographic region and gender of the preschoolers based on the adjusted analysis. Higher prevalence was identified among preschoolers residing in the Midwest, Northeast, Southeast and South regions, by increasing order of likelihood of affection when compared to the North region of the country. Similar differences among Brazilian regions in malocclusion were also identified in Brazilian 12-year-old students²³ and adolescents (15-19 years)²⁴. Other oral diseases in preschoolers, such as dental caries, have also shown differences of involvement according to the geographic region of Brazil²⁵. Considering the size of Brazil in territorial terms and the existence of regional and cultural differences, it may be that health behaviors are influenced by these differences and, consequently, impact health outcomes, such as malocclusion. The following stand out among these regional and cultural differences: the so-

Table 4. Analysis of the association between the prevalence of dental occlusion by region, location, gender and skin color in children five years of age. Brazil, 2010.

Variable	Crude analysis		Adjusted analysis	
	PR (CI95%)	P-value	PR (CI95%)	P-value
Region				
North	1.00		1.00	
Midwest	1.08 (1.01-1.20)	0.023	1.08 (1.01-1.15)	0.026
Northeast	1.21 (1.14-1.28)	<0.001	1.21 (1.14-1.28)	<0.001
Southeast	1.27 (1.20-1.34)	<0.001	1.27 (1.20-1.34)	<0.001
South	1.35 (1.27-1.43)	<0.001	1.34 (1.26-1.42)	<0.001
Location				
Inland	1.00			
Capital	1.03 (0.98-1.07)	0.247	n.s.	n.s.
Gender				
Male	1.00		1.00	
Female	1.06 (1.02-1.10)	0.003	1.06 (1.02-1.09)	0.003
Skin color				
Black/brown	1.00			
White	1.00 (0.97-1.04)	0.896	n.s.	n.s.

Poisson Regression Analysis. PR: prevalence ratio; CI95%: 95% confidence interval; n.s.: not significant.

cioeconomic level of families and municipalities, which may influence access to dental services; the educational level of the residents of the regions, which may influence behavior; behavioral differences due to cultural issues that may lead to the event of occlusal issues.

Behavioral differences between residents of different regions of Brazil can be exemplified by the country's use of health services^{2,26}. Also, some behaviors have been indicated as risk factors for the event of occlusal problems¹¹, and these may vary according to cultural differences, that is, different regions may lead to different behaviors that may affect the event of malocclusion. Also, the impairment profile of oral problems², as well as access and health care process may show differences among Brazilian regions²⁷, which may cause a higher occurrence of oral issues. Thus, health actions should consider such differences in order to adequately serve the population.

We also identified that malocclusion was higher among female preschoolers, which was also identified in a previous study conducted in a municipality in the Southeast region (Bauru – SP)¹¹. The association between malocclusion and gender, with a higher probability among girls, was also identified among Brazilian adolescents²⁴ and Indigenous²⁸. The opposite result was identified for Brazilian 12-year-old children, with a higher prevalence of male malocclusion²⁹. As for the dif-

ferences between Brazilian regions, sociodemographic issues are known to influence the event of oral health outcomes, such as malocclusion. It is noteworthy that, despite the identified association, in the field of health, the female gender has been considered a protective factor, with a lower occurrence of issues²³. One possible explanation for the difference in the association with gender between the ages of 5 and 12 is the current period of life of these children. At five years of age, health conditions and behaviors are mostly modulated by actions of those responsible, i.e., they are a reflection of the care or importance of the person responsible for the child, since it is a very early age and there is no independence concerning health. Therefore, this higher occurrence in females does not necessarily represent a risk profile. By the age of 12, the health condition becomes more reflexive of the behaviors and personality of the child itself. Another factor to be considered is the value of the prevalence ratio identified for the female gender in this study (1.06), which is close to 1, showing that despite the difference between genders, the likelihood of occurrence of malocclusion is quite high, that is, girls are only 6% more likely to have the outcome compared to boys.

The characterization of the epidemiological pattern of involvement and possible factors associated with malocclusion among Brazilian

preschoolers can support health actions and improvement in oral health public policies aimed at reducing this condition. Also, considering that preschoolers are a population segment that is more likely to accept new habits, at this stage, health education and education of their families, can be an effective alternative to affect oral health outcomes³⁰ positively. Thus, there is a need to create or streamline educational activities of a permanent nature³⁰ to reduce risk factors for malocclusion.

Occlusal problems can develop early, at early ages, and can hardly be self-corrected, which makes the deciduous teething phase an adequate period for the introduction of preventive measures or treatment. Furthermore, considering the negative impact of malocclusion on the child's quality of life, which may affect the family context, it is necessary to solve this problem as early as possible. Among the occlusal conditions evaluated, there was a significant class II affection of canines, increased overjet and posterior crossbite. Clinical studies have addressed different therapeutic modalities for the treatment of occlusal problems in preschoolers, as well as intervention measures to control possible risk factors^{31,32}. An example of this is a study by Lippold *et al.*³², which indicated initial maxillary expansion followed by U-bow activator therapy for the treatment of posterior crossbite in children with deciduous or mixed dentition from a clinical study³². Furthermore, the use of psychological interventions and orthodontic appliances, such

as the palatal arch, has been shown to be effective in the cessation of non-nutritive sucking habits that could lead to malocclusion among children, as shown by a systematic literature review³¹.

In this line, in Brazil, Dental Specialties Centers (CEOs) may include corrective orthodontic treatment in the list of specialties since 2011. However, removable orthopedic and orthodontic appliances can be performed both in primary care and at CEOs³³, procedures which would be of great value for the early correction of malocclusions, thus contributing to the improvement of oral health of a significant proportion of Brazilian preschoolers.

This study does not allow establishing cause and effect relationships among the factors studied. Therefore, future studies, mainly of a longitudinal nature, may clarify the possible influence of the associated factors in the occurrence of occlusal problems in Brazilian preschoolers. Also, considering the relevant Brazilian social inequalities, it is necessary to evaluate the possible influence of socioeconomic aspects in the occurrence of this problem. Despite this, the results shown are valid and representative of the population of a significant sample of 5-year-old Brazilian preschoolers, allowing further clarification on the prevalence and sociodemographic factors associated with malocclusion. A high prevalence of malocclusion among the Brazilian preschoolers was identified from the data, and this prevalence was higher among females and varying by Brazilian macro-regions.

Collaborations

JM Bauman and FM Flório participated in the data organization and analysis, paper drafting, critical review, and approval of the submitted version. JGS Souza and CD Bauman participated in the data organization and paper drafting.

References

1. Brasil. Ministério da Saúde (MS). *Projeto SB Brasil 2003: condições de saúde bucal da população brasileira 2002-2003: resultados principais*. Brasília: MS; 2004.
2. Brasil. Ministério da Saúde (MS). *Projeto SB Brasil 2010: condições de saúde bucal da população brasileira, resultados principais*. Brasília: MS; 2011.
3. Rodrigues LAM, Martins AMEBL, Silveira MF, Ferreira RC, Souza JGS, Silva JM, Caldeira AP. Uso de serviços odontológicos entre pré-escolares: estudo de base populacional. *Cien Saude Colet* 2014; 19(10):4247-4256.
4. Kramer PF, Feldens CA, Ferreira SH, Bervian J, Rodrigues PH, Peres MA. Exploring the impact of oral diseases and disorders on quality of life of preschool children. *Community Dent Oral Epidemiol* 2013; 41(4):327-335.
5. Peres KG, Tomita NE. Oclusopatias. In: Antunes JLF, Peres MA. In: *Epidemiologia da saúde bucal*. Rio de Janeiro: Guanabara Koogan; 2008. p. 83-101.
6. Peres KG, Barros AJD, Anselmi L, Peres MA, Barros FC. Does malocclusion influence the adolescent's satisfaction with appearance? A cross-sectional study nested in a Brazilian birth cohort. *Community Dent Oral Epidemiol*. 2008; 36(2):137-143.
7. Shaw WC, Addy M, Ray C. Dental and social effects of malocclusion and effectiveness of orthodontic treatment: a review. *Community Dent Oral Epidemiol*. 1980; 8(1):36-45.
8. Perillo L, Monsurro A, Bonci E, Torella A, Mutarelli M, Nigro V. Genetic Association of ARHGAP21 Gene Variant with Mandibular Prognathism. *J Dent Res*. 2015; 94(4):569-576.
9. Petersen PE. The World Oral Health Report 2003: continuous improvement of oral health in the 21st century--the approach of the WHO Global Oral Health Programme. *Community Dent Oral Epidemiol* 2003; 31(Supl. 1):3-23.
10. Thomaz EBAF, Valença AMG. Associação entre déficit de peso e apinhamento na dentição decídua. *J Pediatr* 2009; 85(2):110-116.
11. Tomita NE, Bijella VT, Franco LJ. Relação entre hábitos bucais e má oclusão em pré-escolares. *Rev Saude Publica* 2000; 34(3):299-303.
12. Salbach A, Schremmer B, Grabowski R, Stahl de Castrillon F. Correlation between the frequency of eruption disorders for first permanent molars and the occurrence of malocclusions in early mixed dentition. *J Orofac Orthop* 2012; 73(4):298-306.
13. Goettems ML, Azevedo MS, Correa MB, Costa CT, Wendt FP, Schuch HS, Bonow ML, Romano AR, Torriani DD. Dental trauma occurrence and occlusal characteristics in Brazilian preschool children. *Pediatr Dent* 2012; 34(2):104-107.
14. Marquezan M, Faraco-Junior IM, Feldens CA, Kramer PF, Ferreira SH. Association between occlusal anomalies and dental caries in 3- to 5 year-old Brazilian children. *J Orthod* 2011; 38(1):8-14.
15. Ramos-Jorge J, Motta T, Marques LS, Paiva SM, Ramos-Jorge ML. Association between anterior open bite and impact on quality of life of preschool children. *Braz Oral Res* 2015; 29(1):1-7.

16. Cardoso Silva C, Maroto Edo M, Soledad Alvaro Llorente M, Barbería Leache E. Primary molar infra-occlusion: frequency, magnitude, root resorption and premolar agenesis in a Spanish sample. *Eur J Paediatr Dent* 2014; 15(3):258-264.
17. Kasparaviciene K, Sidlauskas A, Zasciurinskiene E, Vasiliauskas A, Juodzbalsys G, Sidlauskas M, Marmaite U. The prevalence of malocclusion and oral habits among 5-7-year-old children. *Med Sci Monit* 2014; 20:2036-2042.
18. Hebling SRE, Cortellazzi KL, Tagliaferro EPS, Hebling E, Ambrosano GMB, Meneghim MC, Pereira AC. Relationship between malocclusion and behavioral, demographic and socioeconomic variables: a cross-sectional study of 5-year-olds. *J Clin Pediatr Dent* 2008; 33(1):75-80.
19. Roncalli AG, Silva NN, Nascimento AC, Freitas CHSM, Casotti E, Peres KG, Moura L, Peres MA, Freire MCM, Cortes MIS, Vettore MV, Junior MP, Figueiredo N, Goes PSA, Pinto RS, Marques RAA, Moyses SJ, Reis SCGB, Narvai PC. Aspectos metodológicos do Projeto SBBrazil 2010 de interesse para inquéritos nacionais de saúde. *Cad Saude Publica* 2012; 28(Supl.):s40-s57.
20. Peres KG, Frazão P, Roncalli AG. Padrão epidemiológico das oclusopatias muito graves em adolescentes brasileiros. *Rev Saude Publica* 2013; 47(Supl. 3):109-117.
21. Foster TD, Hamilton MC. Occlusion in the primary dentition: study of children at 2 and one-half to 3 years of age. *Br Dent J* 1969; 126(2):76-79.
22. Peres KG, Peres MA, Thomsom WM, Broadbent J, Hallal PC, Menezes AB. Deciduous-dentition malocclusion predicts orthodontic treatment needs later: Findings from a population-based birth cohort study. *Am J Orthod Dentofacial Orthop* 2015; 147(4):492-498.
23. Bauman JM, Souza JGS, Bauman CD, Flório FM. Aspectos sociodemográficos relacionados à gravidade da maloclusão em crianças brasileiras de 12 anos. *Cien Saude Colet* 2018; 23(3):723-732.
24. Freitas CV, Souza JGS, Mendes DC, Pordeus IA, Jones KM, Martins AMEBL. Necessidade de tratamento ortodôntico em adolescentes brasileiros: avaliação com base na saúde pública. *Rev Paul Pediatr* 2015; 33(2):204-210.
25. Ardenghi TM, Piovesan C, Antunes JLF. Desigualdades na prevalência de cárie dentária não tratada em crianças pré-escolares no Brasil. *Rev Saude Publica* 2013; 47(Supl. 3):129-137.
26. Pinheiro RS, Torres TZG. Uso de serviços odontológicos entre os estados do Brasil. *Cien Saude Colet* 2006; 11(4):999-1010.
27. Roncalli AG, Cortes MIS, Peres KG. Perfis epidemiológicos de saúde bucal no Brasil e os modelos de vigilância. *Cad Saude Publica* 2012; 28(Supl.):S58-S66.
28. Sanadhya S, Chadha M, Chaturvedi MK, Chaudhary M, Lerra S, Meena MK, Bakutra G, Acharya S, Pandey A, Tak M, Asawa K, Kamate S. Prevalence of malocclusion and orthodontic treatment needs among 12-15-year-old schoolchildren of fishermen of Kutch coast, Gujarat, India. *Int Marit Health* 2014; 65(3):106-113.
29. Brizon VSC, Cortellazzi KL, Vazquez FL, Ambrosano GMB, Pereira AC, Gomes VE, Oliveira AC. Fatores individuais e contextuais associados à má oclusão em crianças brasileiras. *Rev Saude Publica* 2013; 47(Supl. 3):118-128.
30. Oliveira RCN, Souza JGS, Oliveira CC, Oliveira LFB, Pelino JEP, Martins AMEBL, Almeida ER. Acesso a informações sobre como evitar problemas bucais entre escolares da Rede Pública de Ensino. *Cien Saude Colet* 2015; 20(1):85-94.
31. Borrie FR, Bearn DR, Innes NP, Iheozor-Ejiofor Z. Interventions for the cessation of non-nutritive sucking habits in children. *Cochrane Database Syst Rev* 2015; 3:CD008694.
32. Lippold C, Stamm T, Meyer U, Vegh A, Moiseenko T, Danesh G. Early treatment of posterior crossbite-a randomised clinical trial. *Trials* 2013; 14:20.
33. Brasil. Ministério da Saúde (MS). *Saúde de Família: passo a passo do departamento de atenção básica*. Brasília: MS; 2011.

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