

An overview of the prevalence of malocclusion in 6 to 10-year-old children in Brazil

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Abstract

Objective: To provide an overview of the malocclusions present in Brazilian children aged 6 to 10 years, and present two clinical situations often associated with these malocclusions, i.e., caries and premature loss of deciduous teeth. **Methods:** A sample comprised of 4,776 randomly and intentionally selected children was evaluated. Data collection was performed by clinical examination and anamnesis as part of the campaign “Preventing is better than treating” conducted in 18 Brazilian states and the Federal District involving orthodontists affiliated with the Brazilian Association of Orthodontics and Facial Orthopedics (ABOR). **Results and Conclusions:** It was noted that only 14.83% of the children had normal occlusion while 85.17% had some sort of altered occlusion, with 57.24% presenting with Class I malocclusion, 21.73%, Class II, and 6.2%, Class III. Crossbite was also found in 19.58% of the children, with 10.41% in the anterior and 9.17% in the posterior region. Deep overbite was found in 18.09% and open bite, in 15.85% of the sample. Caries and/or tooth loss were present in 52.97% of the children. Moreover, the need for preventive orthodontics was observed in 72.34% of the children, and for interceptive orthodontics, in 60.86%. It should therefore be emphasized that the presence of specialists in orthodontics—duly qualified to meet the standards established by ABOR and the World Federation of Orthodontists (WFO)—in attendance at public health clinics, can greatly benefit underprivileged Brazilian children.

Keywords: Prevalence. Epidemiology. Malocclusion.

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INTRODUCTION

As of 1899 with the malocclusion classification proposed by Angle⁴ and the acknowledgement of orthodontics as a dental specialty much has been published on the incidence and prevalence of malocclusion in the population. Data from the World Health Organization (WHO)¹⁷ show that malocclusion is the third most important condition in the ranking of oral health problems, outranked only by caries and periodontal disease. The situation in Brazil is identical, which renders malocclusion worthy of special attention. It is worrying to note, however, that financially underprivileged layers of the population must overcome serious hurdles when trying to access public oral health services since few government agencies offer a sector or implement programs to address this particular issue. Thus, the overwhelming need for orthodontic treatment is compounded by the fact that the most basic preventive resources are unavailable, let alone those required for more complex treatments.

Studies on the prevalence of malocclusion in public health provide important epidemiological data to assess the type and distribution of occlusal characteristics of a given population, its treatment need and priority and the resources required to offer treatment in terms of work capacity, skills, agility and materials to be employed.⁹ It is essential to identify and localize the wide range of deviations from occlusal development that may arise and that must be intercepted before the end of the active growth stage. As well as problems of a functional nature that arise from these morphological changes, which may become more complex skeletal problems in the future, aesthetic impairment often occurs, with serious psychosocial consequences for the developing individual.

Malocclusions have a multifactorial origin and can hardly ever be attributed to a single specific cause. Causes include general factors, such as genetic and hereditary components, nutritional deficiencies and abnormal pressure habits, or local

factors, located directly in the dental arch such as supernumerary teeth, tooth decay and premature loss of primary teeth.^{2,11,18} This realization underscores the need for a clear definition of diagnostic criteria in order to facilitate prevention and assistance planning.¹⁹

The WHO recommends that health authorities conduct epidemiological surveys of the major oral diseases at ages 5, 12 and 15 years and in age groups 35 to 44 and 65 to 74 years every five to ten years. In the last survey on oral health conducted by the Brazilian Ministry of Health³¹ in 2003 one objective was to identify the prevalence of malocclusion based on the criteria of the Dental Aesthetic Index (DAI). An incidence of 36.46% was found at age 5, 58.14% in 12 years-old, and 53.23% at 15 years of age. Although this is not the most suitable index as it does not consider problems such as crossbite, posterior open bite, midline deviations or deep overbite,²⁵ these findings indicate that knowledge of the characteristics of a population is crucial for developing proposals that respond to the needs and risks present in the population. Field work in this area is both extensive and underserved. Malocclusion assessment has not progressed toward a public health perspective, with most studies focusing on specific themes or on morphological or biomechanical issues.

Thus, the diagnosis of oral health status of populations is an asset of paramount importance to the planning and evaluation of health promotion actions.¹⁶ Assessment of malocclusion and treatment needs for public health purposes are instrumental in determining the priorities for treatment in publicly subsidized dental services and to properly estimate the number of professionals to be recruited as well as the financial resources necessary to provide this treatment. Although much research has been conducted in recent years, from an epidemiological standpoint the number of nationwide or even international studies is still rather scarce. In view of these considerations, the purpose of this study was to provide an overview

of the malocclusions present in Brazilian children aged 6 to 10 years, and present two clinical situations often associated with these malocclusions, i.e., caries and premature loss of deciduous teeth.

MATERIAL AND METHODS

This has been characterized as quantitative study, of a descriptive, exploratory and transversal nature. The sample was random and intentional: 4,776 Brazilian children aged between 6 and 10 years were evaluated without distinction of race or gender. None had received any previous orthodontic treatment. Prior to data collection, the examiners fully explained to the children's parents and/or legal guardians the purpose and importance of the study, highlighting its many benefits. Moreover, they were instructed on practices that can prevent or minimize future orthodontic problems in children.

Data collection was performed by clinical examination and anamnesis as part of the campaign "Preventing is better than treating" conducted in 18 Brazilian states and the Federal District involving orthodontists affiliated with the Brazilian Association of Orthodontics and Facial Orthopedics (ABOR). The campaign was part of a 2009 Global Action Project implemented by the Social Service for Industry (SESI) in partnership with Brazilian television network Rede Globo. ABOR—by means of its 19 regional branches—provided nearly 300 professionals, viz. member orthodontists or students of Orthodontics Specialization programs recognized by the Federal Council of Dentistry (CFO), who volunteered to participate. The evaluation was conducted in the states of Amapá, Alagoas, Bahia, Ceará, Espírito Santo, Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Paraíba, Paraná, Pernambuco, Piauí, Rio de Janeiro, Rio Grande do Norte, Rio Grande do Sul, Santa Catarina, São Paulo, and in the Federal District.

A partnership was also forged with Colgate®, which donated five thousand sets of toothbrush, toothpaste and explanatory leaflets for

distribution to all children. This action was geared toward providing guidance to children and their parents/legal guardians about the proper way to clean their teeth with instructions on brushing and flossing, among others.

Data collection was performed under an artificial light source with the child sitting in a chair and facing the examiner. Gloves, masks and disposable wooden spatulas were utilized.

Initially, an attempt was made to determine whether or not the individual had a normal occlusion. If not, the examiners checked whether the alteration was significant or whether there were only small changes that would not jeopardize the establishment of an appropriate occlusal relationship in the future, both in terms of function and aesthetics. Children with normal occlusion and those that had minor changes were categorized as favorable occlusion. In all others, the occlusion was considered unfavorable and therefore the malocclusion features present in anteroposterior, transverse and vertical directions were identified.

First permanent molar relationship was preferentially observed, or else canine relationship, on the right and left sides, to determine the type of malocclusion according to Angle's classification.⁴ The following groups were established: Class I, Class II division 1, Class II division 2 and Class III.

The presence of crossbite was then observed in the anterior region, when one or more anterior teeth were involved, or in the posterior region, when the crossbite involved teeth in this region. In this case, it was subdivided into bilateral when present in the right and left sides, or unilateral when involving only one side.

Regarding vertical changes, each child's anterior overbite was evaluated. Considering that most children would be in mixed dentition, a parameter of 50% overbite was set as normal, i.e., an overlap of up to half the clinical crown of lower incisors by the upper incisors. Any overlap greater than 50% was categorized as deep overbite while

the absence of overbite was defined as open bite. If the child was in primary dentition the measure of normality was an overbite of 10%, and if they were in permanent dentition, 20% to 30%.

The examiners also assessed the presence of clinically visible carious lesions and the loss of permanent teeth or premature loss of deciduous teeth. Early loss was defined as loss due to tooth extractions motivated by diseases or injuries outside the period considered as ideal for their exfoliation.

In the following step the examiners sought to determine whether the child required orthodontic care through either prevention or interception. Preventive orthodontic care was defined as guidance on the need for proper hygiene and occlusal development, space supervision and guidance on abnormal pressure habits and on proper breathing pattern. Interceptive care was defined as the need for space maintainers or regainers, serial extractions and orthodontic mechanics for the correction of crossbites and open bites, and orthopedic procedures for the correction of Class II or III malocclusions.

RESULTS

Regarding gender, 2,270 (47.53%) of the 4,776 children were males and 2,506 (52.47%) females.

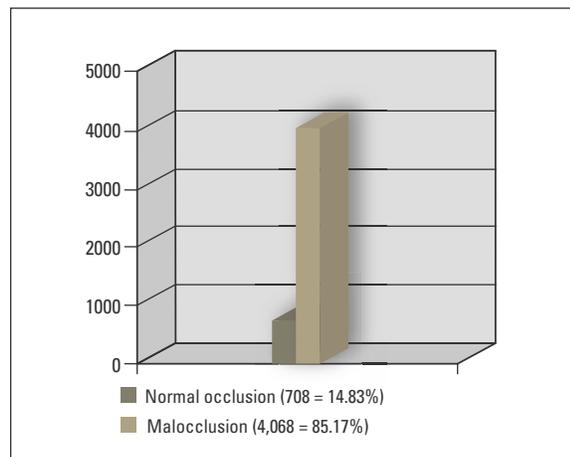


FIGURE 1 - Distribution of normal occlusion and malocclusion in children of the sample.

As described initially the examiners sought to analyze whether the children had normal occlusion. It was found that only 14.83% of the children fit this category while 85.17% had some kind of altered occlusion, as can be seen in Figure 1.

Subsequently, when reviewing occlusal characteristics in an attempt to determine whether the occlusion was favorable or not it was found that aside from children with normal occlusion some minor changes were present in 16.77%, although these alterations would not jeopardize the establishment of an appropriate occlusal relationship. Thus, the total number of children with favorable occlusion was 31.6% (Fig 2).

In children who had no occlusal characteristics supportive of establishing an adequate future relationship the malocclusion was examined in the anteroposterior, transverse and vertical directions. The results are depicted in Figures 3 to 5.

As can be seen in Figure 6, the presence of caries and/or tooth loss was observed in most of the children (52.97%).

As stated above, the examiners sought to determine whether each child required orthodontic care, be it preventive or interceptive. The former was required by 72.34%, and the latter, by 60.86% of the children (Figs 7 and 8).

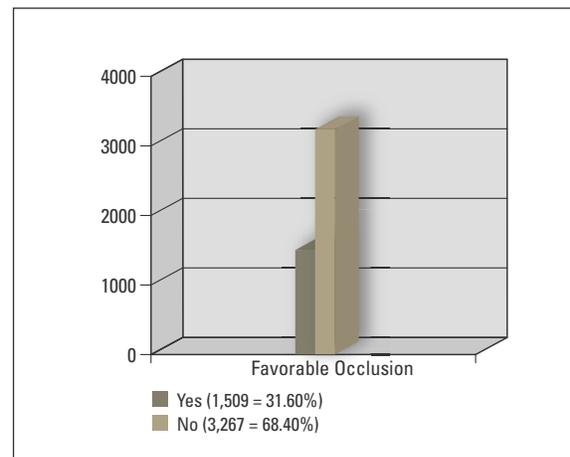


FIGURE 2 - Distribution of occlusions, in the examined children, that seemed favorable and unfavorable to the establishment of an appropriate occlusal relationship in the future.

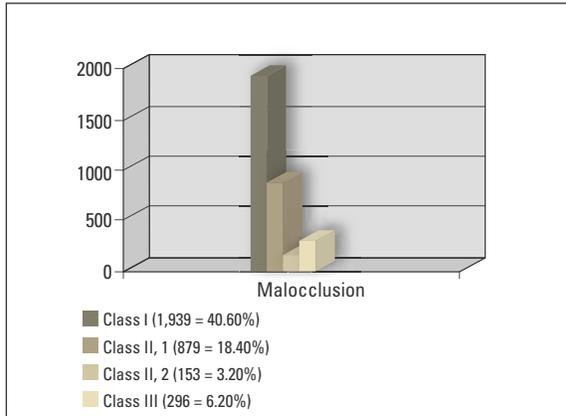


FIGURE 3 - Distribution of malocclusion type according to Angle's classification in children with unfavorable occlusion.

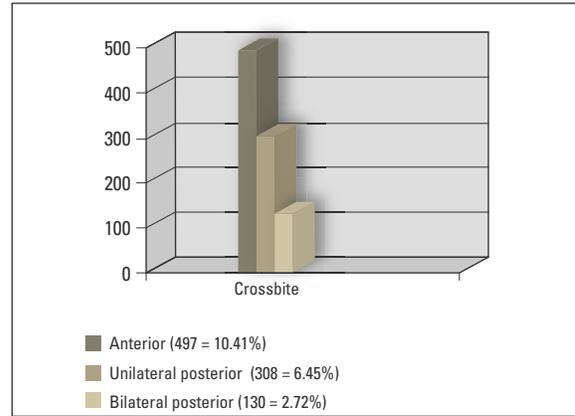


FIGURE 4 - Distribution of the presence of crossbite in children with unfavorable occlusion.

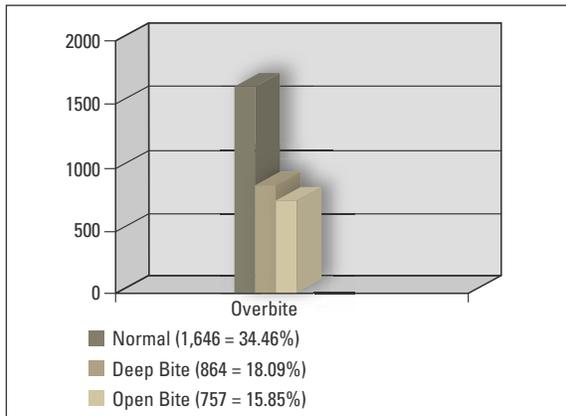


FIGURE 5 - Distribution of the presence of crossbite in children with unfavorable occlusion.

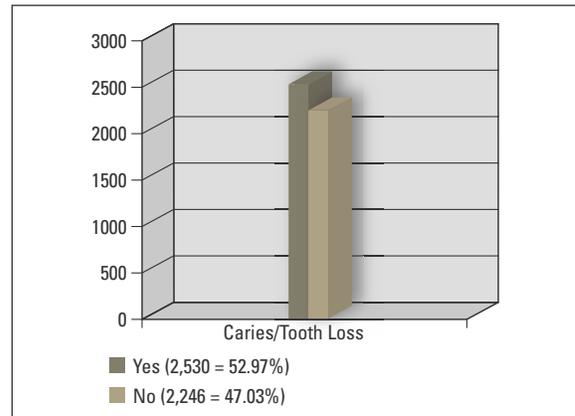


FIGURE 6 - Distribution of tooth decay and/or loss in the children of the sample.

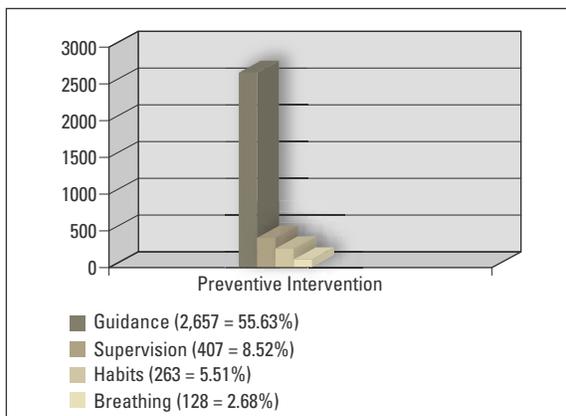


FIGURE 7 - Distribution of the type of preventive care that should be given to children involving guidance, space supervision and approaches related to abnormal pressure habits and mouth breathing.

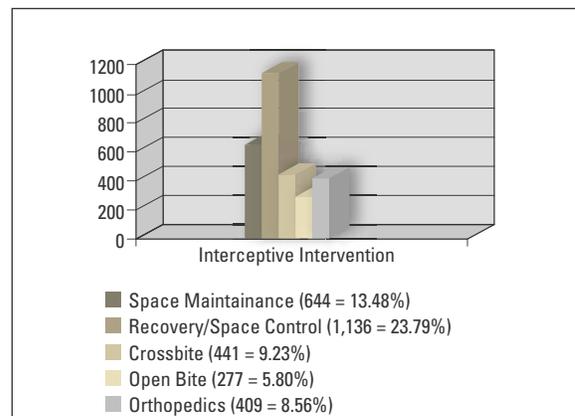


FIGURE 8 - Distribution of the type of interceptive care that should be delivered, involving the need for space maintenance, space recovery and/or control, crossbite and open bite correction, and orthopedic intervention for correction of Angle Class II or Class III malocclusion.

DISCUSSION

Although less prevalent than caries or periodontal disease malocclusion is endemic and widespread throughout the world. A study of the population of New York (USA) found that only 4.8% had normal occlusion, demonstrating the magnitude of the challenge that dentistry in general and orthodontics, in particular, has had to confront.⁵ Although the literature still discusses the concept of ideal occlusion,^{15,27} and perhaps for this reason its incidence varies considerably when different population groups are evaluated, its occurrence is known to be relatively rare. Therefore, the challenge remains. As can be seen in Figure 1, this research found that 85.17% of the children had some type of alteration, i.e., 57.24% had Angle Class I malocclusion, 21.73% Angle Class II malocclusion, and 6.2% Angle Class III malocclusion. Thus, only 14.83% of the children were considered to have normal occlusion. This high prevalence coincides with the study by Brito et al,⁷ who found a prevalence of 80.84% of malocclusion in children aged 9-12 years. On the other hand, Albuquerque et al¹ observed much lower prevalence (40.7%), which can be explained by the fact that their sample was comprised of children 1-3 years of age, suggesting a lower number of occlusal deviations in deciduous dentition vs. mixed or permanent dentition.

As already mentioned, the concept of normal occlusion is debatable. Thus, the examiners determined that 31.6% of the children showed favorable conditions to develop a normal occlusion. The reason for this was that in some of them the occlusal changes responsible for categorizing their malocclusion as Angle Class I were minimal and in no way compromised the establishment of an appropriate occlusal relationship in the future, both functionally and aesthetically. Therefore, the number of children who had abnormalities likely to compromise normal occlusal development fell to 68.4% (Fig 2).

In all others the occlusion was considered

unfavorable and the malocclusion features present in the anteroposterior, transverse and vertical directions were identified. In the anteroposterior direction it was found that the most prevalent malocclusion remained the Angle Class I, now affecting 40.6% of the children. As can also be observed, Class II appears as the second most prevalent with 21.6% but with a much higher prevalence of Class II Division 1 (18.4%) than Division 2 (3.2%). In agreement with the literature,^{7,21} Class III malocclusion was the least prevalent.

Also in the anteroposterior direction, it was noted that anterior crossbite was present in 10.41% of the children (Fig 4). This result is similar to investigations conducted on children in the states of Rio de Janeiro⁷ and Paraíba,⁸ and in Canada,¹² although much higher than the 3.2% observed by Tausche et al.²⁸

Regarding transverse issues, it is also possible to note in Figure 4 that posterior crossbite occurred in 9.17% of the children, with 6.45% unilateral and 2.72% bilateral. This result is somewhat lower than the finding reported by Brito et al⁷ and Cavalcanti et al,⁸ who found this alteration in 19.2% and 20.18% of the children, respectively, a higher percentage than the 5.31% reported by Karaiskos et al.¹²

It was observed that 33.94% of all children in the sample had problems in the overbite of the upper incisors in relation to the lower incisors. Deep overbite was present in 18.09%, and open bite, 15.85% (Fig 5) of the children. Cavalcanti et al⁸ found a similar value for deep overbite (20.5%), but a much higher prevalence of open bite (22.3%). Moreover, the value found in this study for the prevalence of open bite (18.5%) was close to the finding reported by Silva Filho et al²⁶ in the city of Bauru (SP), and higher than the 9.3% found by Alves et al³ in the city of Feira de Santana (BA), the 7.8% found by Brito et al⁷ in the city of Nova Friburgo (RJ) and the 8.3% recorded by Karaiskos et al¹² in Canada.

This study also intended to assess oral con-

ditions involving lesions caused by extensive tooth decay, and premature loss of primary teeth. Brazilian children have one of the highest rates of premature extractions with no maintenance of the remaining space, and their leading cause of premature loss is tooth decay.^{10,12} It has long been common knowledge that this is a factor often associated with malocclusions,^{13,24} since primary teeth should be kept healthy to provide support and preserve the integrity of the dental arch, thereby allowing the eruption of the succeeding permanent teeth.⁶ Untimely loss, depending on the region, occlusal relationship, individual skeletal features and periodontal conditions may cause overeruption of antagonist teeth.²² In this research, as shown in Figure 6, it was found that tooth decay and/or loss were present in 52.97% of the children. This result is much higher than that reported by Ribas et al,²² who found a prevalence of 16.58% of decay and/or premature loss in children between 6 and 8 years of age in Curitiba (PR).

The premature loss of deciduous teeth or the loss of permanent teeth with no immediate replacement are potential causes of malocclusion.^{2,11} Thus, loss avoidance can help to prevent orthodontic problems and ensure normal development of the dentition and occlusion. In this regard, as shown in Figure 7, this study showed that appropriate guidance—not only on the need for proper cleaning or restoration of compromised teeth—but also on the development of dentition, when provided by a qualified professional, had a positive impact on 55.63% of the children. Furthermore, 8.52% of the children exhibited an altered sequence when replacing primary by permanent teeth and therefore required professional monitoring (space supervision) with the purpose of attaining a more favorable sequence of eruption of permanent teeth from a physiological standpoint. Abnormal pressure habits were observed in 5.51% of the children and, although difficult to assess clinically, an abnormal respiration pattern

(mouth breathing) was observed in 2.68% of the total sample. Given that the literature establishes an unequivocal link between malocclusion and improper function of oral muscles,^{2,23,29,30} providing guidance to the children and/or their legal guardians was considered an essential preventive procedure to decrease the probability of future occlusal changes related to these problems in 8.19% of the children.

As depicted in Figure 8, tooth loss had occurred in 13.48% of the children, which required interceptive orthodontic intervention in order to maintain the remaining space until the eruption of the permanent successors. Moreover, 23.79% of the children already displayed problems related to a slight lack of space, either by migration of adjacent teeth to a region of early loss, or by a transient negative difference between the volume of deciduous and permanent teeth. In both cases, orthodontic appliances are indicated to minimize or correct these alterations, and space regainers could be used in the former case, as well as appliances which enable the use of leeway space, especially at the time of exfoliation of the second primary molars.

Although obvious, it should be stressed that only qualified professionals should be allowed to handle this stage since it is an extremely important phase in ensuring normal dentition development and establishing an appropriate occlusal relationship. In this sense, it is of paramount importance to distinguish patients who will benefit from interceptive treatment from those for whom corrective treatment is essential. Thus, it was determined that 441 (47.17%) of 935 children with crossbite could benefit from interceptive treatment. This represents 9.23% of all children examined in this study. Likewise, 277 (36.59%) of the 757 children who had open bite would have to be treated at this stage, i.e., 5.8% of the total. Additionally, 409 (30.80%) of the 1,328 children who had Angle Class II or Class III malocclusion also had skeletal disharmonies that

could be properly corrected at this stage, which translated into functional and aesthetic benefits to 8.56% of the children.

Given some difficulties in implementing a more specific and more detailed standardization, this study sought to provide only an overview of the occlusal situation of Brazilian children. However, with its participation in the project, ABOR has promoted an innovative activity, of great importance for public oral health services as the target audience comprised needy children aged between 6 and 10 years, who had no access to orthodontic guidance and assistance. It was felt that the lack of guidance and public policies aimed at this segment of the population are the key contributing factors to many of the occlusal problems encountered, especially those related to caries and/or tooth loss.

Needless to say, the planning of public health

policies should be grounded in knowledge about the needs of the population, by correlating causes, effects and solutions to the problems. With all the data presented here the authors hope to contribute to such planning by allowing the necessary material and human resources to be properly estimated. Regarding the latter, and taking into account the work published by Michael et al,¹⁴ which found that only 10.1% of undergraduate students from ten dental schools in the state of Rio de Janeiro could identify the characteristics of normal occlusal development, ABOR is aware of the fact that measures undertaken at this level require professionals to demonstrate their ability to perform diagnosis and an accurate treatment based on a solid training provided by a course that meets the requirements recommended by ABOR in Brazil, and by the World Federation of Orthodontists (WFO), in the international arena.

CONCLUSIONS

In light of the results of this research it is possible to conclude that:

» There was an 85.17% prevalence of malocclusion in the children, although it was verified that in 16.77% the occlusal alterations were minor, causing the rate of occlusions that are not conducive to normal development to be reduced to 68.4%.

» Among the children who had unfavorable occlusions, 40.6% had Class I malocclusion, 21.6%, Class II and 6.2%, Class III. Crossbite was present in 19.58%, with 10.41% in the anterior and 9.17% in the posterior region. Moreover, 34.46% had normal overbite, 18.09%, deep overbite and 15.85%, open bite.

» Considering the entire sample, the presence of caries and/or tooth loss was found in 52.97% of the children.

» The possibility of preventive orthodontic intervention was observed in a large portion of the children, including guidance (55.63%), space supervision (8.52%) and approaches related to abnormal pressure habits (5.51%) and to mouth breathing (2.68%).

» Likewise, the need for interceptive orthodontic intervention was detected, involving space maintenance (13.48%), space recovery and/or control (23.79%), crossbite correction (9.23%), open bite correction (5.8%), and orthopedic intervention for correction of Angle Class II or Class III malocclusion (8.56%).

» It became clear that the presence of specialists in orthodontics—duly qualified to meet the standards established by ABOR and the World Federation of Orthodontists (WFO)—in attendance at public health clinics, can greatly benefit underprivileged Brazilian children.

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Submitted: May 2010
Revised and accepted: July 2010

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