Malocclusion and Dentoalveolar Trauma in 3-5 Years-Old Children From Salvador-Ba, Brazil

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ABSTRACT

Malocclusion and dentoalveolar trauma are common oral disorders in children. Objective: to analyze the prevalence of malocclusion and dentoalveolar trauma in children aged 3 to 5 years in Salvador-BA. Methodology: A cross-sectional study was carried out with children aged 36 to 71 months in Salvador-BA. Data collection was carried out in family health units (FHU) and municipal public day care centers. The Malocclusion Index and the criteria of Foster and Hamilton were used for the analysis of malocclusion, and the criteria proposed by Andreasen were used to assess dental trauma, in addition to the registration of the variables age, sex, skin color, collection site and low lip brake. Descriptive and univariate analyzes were performed, looking for potential associations. Results: 2788 children, mostly male (50.90%) and black or brown (92.97%), were analyzed. Of the total, 21.13% had dento-alveolar trauma, and 39.99% malocclusion. The canine key was predominantly class I (88.38%), about 20% had some change in overjet and, 27% overbite. In the univariate analysis of malocclusion, an association was observed with the low insertion of the lip brake (p = 0.002). In the dentoalveolar trauma, there was a statistically significant association with the male gender (p = 0.001), malocclusion (p = 0.001) and low insertion labial brake (p = 0.024). Conclusions: The high prevalence of occlusal problems and dental trauma in the primary dentition stands out, indicating the need for public policies to prevent specific oral problems for this age group.

Keywords
Malocclusion, Dental trauma, Children, Epidemiology, Oral health.

Introduction

The oral conditions of Brazilian children are marked by the high occurrence of early caries, but also by malocclusions and dentoalveolar trauma [1,2]. Malocclusion is the second most frequent condition in children under 5 years of age and is considered an alteration in development and growth that negatively interferes in the positioning of teeth and the individual’s quality of life [3]. It is usually triggered by an association of inherited, congenital, acquired factors, of environmental or local origin, as well as by the presence of harmful oral habits, which favor the establishment or installation of this condition [4]. Dental occlusion is essential to preserve the child's biological balance, as it interferes with their development and quality of life, and can negatively influence aesthetic and psychological issues, as a disharmonious smile can be a pretext for bullying and difficulties in interaction social [3,5]. There are several ways to intervene early in a malocclusion, for example, through the use of preventive and interceptive orthodontic resources, such as loop band, space maintainer, control of harmful oral habits, treatment of cross bite and open bite, where it aims to prevent or ameliorate the severity of malocclusions in children. From a public health standpoint, these treatments are infrequent [5]. Dent alveolar trauma is also quite common among children under 5 years of age. This injury is caused by a thermal, chemical or mechanical modification suffered by the dental structures.
and adjacent tissues, whose impact exceeds the resistance of the dental and bone tissues. It presents itself as a public health problem in Brazil, affecting a significant portion of the population, with consequences that are difficult to reverse depending on the intensity and type of the injury [6]. The most common etiology of infantile dental trauma is the fall from its height, which affects the anterior deciduous teeth, especially the central incisors [7,8]. It is highlighted in the literature that trauma is associated with several conditions. Considering the socioeconomic conditions, studies indicate that children who are inserted in unfavorable socioeconomic contexts are more susceptible to trauma, since the environment in which it is inserted, can favor the occurrence of the same [3,6]. Regarding systemic conditions, the literature points out that respiratory pathologies and speech disorders can lead to the development of harmful oral habits, which can cause malocclusion and trauma [6]. Anatomical factors such as severe overjet and lack of lip sealing also contribute to trauma in the primary dentition [3,9]. Thus, this study aims to describe the occurrence of malocclusion and dent alveolar trauma in children aged 3 to 5 years in Salvador-BA. Exploratory, some potential factors associated with these oral problems were evaluated, such as some sociodemographic aspects and the presence of other oral changes.

**Methodology**

A cross-sectional study, representative of the population of the municipality of Salvador, capital of the state of Bahia, was developed in children aged 3 to 5 years. Sampling took place through a multi-stage process, with the sample being calculated considering 10% of the prevalence of the least occurring event 1.2, standard error of 2.9%, and a 95% confidence interval. A minimum sample size of 941 children was estimated, and a correction factor of 2.5 was used. Thus, the sample size was 1412 individuals. To reduce possible losses, the sample was increased by 15% and totaled a minimum number of 1623 children. The sample distribution was proportional to each administrative region of the municipality, through the random sampling of municipal public daycare centers and health units. During the performance of clinical examinations, all children between 36 and 71 months of age were evaluated. Ten examiners - dentists and undergraduate dentistry students were involved in data collection. All of them participated in theoretical and practical training and were calibrated for the conditions analyzed. The inter-examiner calibration took place in a public daycare center, with 30 children aged 3 to 5 years. The intra-examiner calibration was assessed during data collection when 10% of the exams were repeated after 07 days of the first assessment. The Kappa coefficient and the agreement index were used (inter and intra-examiner agreement rates equal to or greater than 90% and Kappa equal to or greater than 0.77 for all evaluated oral conditions). At the time of the exams, the children were sitting in a chair, under natural light. The examination was performed with the aid of a mirror, a periodontal probe from the World Health Organization (WHO), and personal protective equipment. The classification proposed by Andreasen et al. [10] was used as a clinical criterion for the diagnosis of dentoalveolar trauma. The presence of any alteration according to the criteria of Andreasen et al. [10] was considered to be the presence of trauma during data analysis. In the malocclusion assessment exam, the Foster and Hamilton [11], Index was used, which is composed of four measures: canine key, overjet, overbite, and posterior crossbite. In addition, we also opted for the use of the Malocclusion Index for the evaluation of malocclusions. This was established in 1987 by the WHO, is used for primary and permanent dentition. Occlusion can be classified as normal, mild, and moderate/severe malocclusion [1].

The presence of malocclusion in the analyzes was defined based on the diagnosis of the presence of mild or moderate/severe malocclusion. The data collection form used for the clinical examination also had child identification data and demographic data: gender (male/ female), age (36-55 months/ over 55 months) and skin color (black, brown, white, indigenous, yellow). The presence of malocclusion and trauma were the two dependent variables considered in the exploratory (univariate) analyzes. Demographic conditions, such as the child's age, sex, skin color, location of data collection, as well as the occurrence of other oral conditions (presence of labial brake with low insertion), were evaluated as independent variables. Data entry was performed at EXCEL and analysis at STATA. Descriptive analyses of the sociodemographic conditions and the investigated oral conditions were performed. Pearson’s chi-square test was used in exploratory analyzes of potential associated factors, observing a significance level of 5%. The study was approved by the Research Ethics Committee of the Faculty of Dentistry of the Federal University of Bahia (Brazil) (number 78351317.0.0000.5024).

**Results**

In total, 2788 children aged 36 to 71 months (mean age 54 months) took part in this study, most of whom were male (50.90%), 78.16% of them were examined in daycare centers or public schools, and were from black or brown (92.97%) (Table 1). About the injuries identified, 21.13% of these children in Salvador-BA were affected by dent alveolar trauma and 39.99% had malocclusion in the primary dentition. The canine key was predominantly Class 1 (88.38%); it was identified that the majority of the sample had a normal overjet (79.3%), and in 8.46% of the individuals it was increased. The normal overbite was observed in 72.74% of the sample, 13.24% had an open bite and 10.87% deep. The unilateral posterior cross bite was present in 5.74% of the children examined and a low insertion lip brake was observed in 12.23% of them. (Table 2) Among children with some type of dent alveolar trauma, the most common was the occurrence of enamel-limited fracture (63.10%), followed by color change (26.30%). In the univariate analysis, concerning malocclusion, a statistically significant relationship was observed between this problem and the low-insertion lip brake (p = 0.002). (Table 3) Regarding the dent alveolar trauma, there was a statistically significant relationship between it and the male sex (p = 0.001), with the presence of malocclusion (p = 0.00) and with the labial brake of the low insertion (p = 0.024) (Table 4).
who found a prevalence of 46.2% of malocclusion in primary children from Salvador-BA (35.98%) and Carminatti et al. [13], here was similar to that found by Almeida et al. [12] also among Malocclusion Index. The prevalence of malocclusion revealed severe malocclusion (23.78%), according to the criteria of the presented some type of malocclusion, most of them with moderate/severe malocclusion (23.78%), according to the criteria of the Malocclusion Index. The prevalence of malocclusion revealed here was similar to that found by Almeida et al. [12] also among children from Salvador-BA (35.98%) and Carminatti et al. [13], who found a prevalence of 46.2% of malocclusion in primary
dentition in Porto Alegre, Rio Grande do Sul. In a study carried out in Shanghai, China, a prevalence of 83.9% of malocclusion was identified with different severities present in children aged 3 to 5 years, with no statistically significant difference between genders [14]. In Rome, Italy, a 38% prevalence of moderate and severe malocclusion was identified in children aged 3 to 6 years [15]. In Brazil, the prevalence of occlusal problems in this age group ranges from 28% to 80%, according to the location of the studies.

This brings the reflection that the particularities of each region can interfere in such results [16]. When comparing the results of the latest national oral health surveys, SB BRASIL 2003 and SB BRASIL 2010, an increase of 28.2% was observed in the presence of occlusal problems in children aged 5 years. The Northeast was the second region with the highest prevalence of malocclusion, behind only the Midwest [1,2]. About the types of occlusal changes, there was a higher occurrence of class I (88.38%), as well as in children evaluated in the municipality of Feira de Santana.

Discussion
In this study, approximately 40% of the examined children presented some type of malocclusion, most of them with moderate/severe malocclusion (23.78%), according to the criteria of the Malocclusion Index. The prevalence of malocclusion revealed here was similar to that found by Almeida et al. [12] also among children from Salvador-BA (35.98%) and Carminatti et al. [13], who found a prevalence of 46.2% of malocclusion in primary

| Data Collection | n   | %    |
|-----------------|-----|------|
| Health units    | 609 | 21.84|
| Nurseries and Public schools | 2179 | 78.16|
| Age             |     |      |
| 36-54 months    | 1277| 45.80|
| 55-71 months    | 1511| 54.10|
| Gender          |     |      |
| Female          | 1369| 49.10|
| Male            | 1419| 50.90|
| Skin colour     |     |      |
| Whites          | 196 | 7.03 |
| Black and others| 2592| 92.97|

Table 1: Description of the study population analyzed in Salvador-BA. Brazil. 2018. (n = 2788).

| Dento-alveolar trauma | n   | %    |
|-----------------------|-----|------|
| No                    | 2199| 78.87|
| Yes                   | 589 | 21.13|
| Má Oclusão            |     |      |
| No                    | 1673| 60.01|
| Yes                   | 1115| 39.99|
| Malocclusion Index    |     |      |
| Normal                | 1673| 60.01|
| Mild                  | 452 | 16.21|
| Moderate/severe       | 663 | 23.78|
| Canine Key            |     |      |
| Class 1               | 2464| 88.38|
| Class 2               | 151 | 5.42 |
| Class 3               | 159 | 5.70 |
| No examination        | 14  | 0.5  |
| Overjet               |     |      |
| Normal                | 2211| 79.30|
| Increased             | 236 | 8.46 |
| None                  | 185 | 6.64 |
| Anterior crossbite    | 156 | 5.60 |
| Overbite              |     |      |
| Normal                | 2028| 72.74|
| Lower                 | 87  | 3.12 |
| Open bite             | 369 | 13.24|
| Deep                  | 303 | 10.87|
| Posterior Crossbite   |     |      |
| No                    | 2590| 92.90|
| Unilateral            | 160 | 5.74 |
| Bilateral             | 36  | 1.29 |
| Lip frenum            |     |      |
| Normal                | 2447| 87.77|
| Abnormal              | 341 | 12.23|

Table 2: Absolute distribution and percentage of oral disorders identified in children aged 3 to 5 years old from Salvador-BA. Brazil in 2018. (n = 2788).

| Malocclusion | No | Yes | p-value |
|--------------|----|-----|---------|
| Gender       |    |     |         |
| Female       | 815| 59.53| 554| 40.47|
| Male         | 858| 60.47| 561| 39.53|
| Age          |    |     |         |
| 36-54 months | 752| 58.89| 525| 41.11|
| 55-71 months | 921| 60.95| 590| 39.05|

Table 3: Prevalence of malocclusion and absolute and percentage distribution according to sociodemographic variables, place of collection and oral disease in children aged 3 to 5 years-old. Salvador-BA. Brazil. 2018. (n = 2788).

| Dento-alveolar Trauma | No | Yes | p-value |
|-----------------------|----|-----|---------|
| Gender                |    |     |         |
| Female                | 1116| 81.52| 253| 18.48|
| Male                  | 1083| 76.32| 336| 23.68|
| Age                   |    |     |         |
| 36-54 months          | 995| 77.92| 282| 22.08|
| 55-71 months          | 1204| 79.68| 307| 20.32|

Table 4: Prevalence of dento-alveolar trauma and absolute and percentage distribution according to sociodemographic variables, place of collection and oral disorders in children aged 3 to 5 years-old. Salvador-BA. Brazil. 2018. (n = 2788).
The lip and prevents excessive exposure of the gingival mucosa. The lip brake acts with great relevance in stabilizing the midline of the mouth in orthodontic treatments. Besides, the well-positioned insertion of the labial frenulum can prevent malocclusion, as the low insertion of the labial frenum may result from the low insertion of the labial frenum. In this study, the prevalence of malocclusion in the primary dentition in males was 22.2%. The anterior open bite affected 13.24% of the children in this study, however, this condition occurred in 8% of the individuals examined by Villain et al. Among the malocclusions analyzed, the most prevalent was openbite, as well as in a study carried out in the city of Domingos Martins, state of Espírito Santo, which was 16%.[19]. The anterior open bite is often caused by deleterious oral habits, examples of a pacifier and digital suction.[20] Non-nutritive sucking can modify the normal tendency of growth and development of facial bones, significantly modifying the morphology of the hard palate. The prevalence of non-nutritive sucking habits in childhood is around 17% to 50% and the incidence of malocclusion cases associated with these habits have been progressively increasing.[16]. In the present study, there was a prevalence of 10.87% of deep bites among children; in the state of Santa Catarina Villain et al. identified a frequency of 5% of deepbite. There was a higher prevalence of malocclusion in primary dentition among girls, although the difference between genders was not statistically significant in this study. Such an association between malocclusion and female sex has been verified in other investigations.[12,16]. Caruso et al.[21] identified a 2.74 times greater chance of female children developing malocclusion. Morais et al.[17] identified more cases of malocclusion in the primary dentition in males. Regarding age, children up to 54 months had a higher prevalence of malocclusion, as the child is still acquiring control of motor coordination, medullary spaces of the bone and their flexibility. In this period of life, the child is still acquiring control of motor coordination, and this can lead to greater vulnerability to trauma.[33]. Among the types of trauma, the tooth enamel fracture was the most found among preschoolers in Salvador-BA, corroborating with another research carried out with individuals of the same age group in Rio Grande do Sul.[30] The variation in the prevalence of trauma may be due to the interdependence between behavioral patterns, growth and development of the individual.[29]. In this analysis, an association was demonstrated between dent alveolar trauma and the presence of malocclusion, as well as the lip brake with low insertion. The increased overjet of the incisors and the anterior open bite are predisposing factors for trauma.[3]. We can add that, as previously discussed, the labial brake with low insertion is associated with occlusal problems.[24,26] which may explain the association verified empirically between these children of Salvador-BA. The control and prevention of these oral diseases in childhood investigated in Salvador-BA involves a system of epidemiological surveillance and constant monitoring of local health services and point to the need to implement more effective prevention and treatment actions in primary and secondary care services, with the direct participation of families and educational institutions, specifically the municipal centers for early childhood education. We emphasize that the epidemiological methodology used was that of a cross-sectional study, which implies limitations in the analysis of the causality of the factors associated with the diseases in question.
Conclusion
Among children aged 3 to 5 years in Salvador-BA, there was a prevalence of 21.13% of dent alveolar trauma and 39.99% of them had malocclusion in the primary dentition. In the univariate analysis, malocclusion was associated with low insertion of the labial frenum (p = 0.002) and dent alveolar trauma with males (p = 0.001), with malocclusion (p = 0.000) and with low insertion lip brake (p = 0.024).

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