

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, Dent alveolar 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 dent alveolar 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 over jet 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 multiple-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 analyzes 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 over jet (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).

	n	%
Data Collection		
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 in Salvador-BA, Brazil. 2018. (n = 2788).

	n	%
Dento-alveolar trauma		
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).

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

Malocclusion					
	No		Yes		p-value
Gender	n	%	n	%	
Female	815	59.53	554	40.97	0.615
Male	858	60.47	561	39.53	
Age					
36-54 months	752	58.89	525	41.11	0.267
55-71 months	921	60.95	590	39.05	
Data Collection					
Health units	347	56.98	262	43.02	0.084
Nurseries and Public schools	1326	60.85	853	39.25	
Lip frenum					
Normal	1494	61.05	953	38.95	0.002
Abnormal	179	52.49	162	47.51	

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	n	%	n	%	
Female	1116	81.52	253	18.48	0.001
Male	1083	76.32	336	23.68	
Age					
36-54 months	995	77.92	282	22.08	0.255
55-71 months	1204	79.68	307	20.32	
Data Collection					
Health units	491	80.62	118	19.38	0.231
Nurseries and Public schools	1708	78.38	471	21.62	
Lip frenum					
Normal	1946	79.53	501	20.47	0.024
Abnormal	253	74.19	88	25.81	
Malocclusion					
No	1370	81.89	303	18.11	0.000
Yes	829	74.35	286	25.65	

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).

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-

BA, who had a prevalence of 86.70% of class I [17]. Vilain et al. [18] found an 81% frequency of class I in a group of 100 children in 5 health districts of Criciúma, Santa Catarina. Class II was found in 5.42% of children in this study and class III in 5.70%. In the study by Vilain et al. [18] these values were equal to 4% and 15%, respectively. In the research by Morais et al. [17], these values were 11.1% and 2.2%, respectively. The increased overbite was found in 8.46% of the children evaluated in this investigation. In contrast, Morais et al. [17] identified a prevalence of only 1.1% of this change. Regarding the top-to-top bite, a prevalence of 6.64% was identified in this sample from Salvador-BA, while in the investigation by Morais et al. [17] this frequency was equal to 2.80%. The anterior crossbite was verified in 5.60% of the children, whereas in the study conducted by Morais et al. [17] this prevalence was 2.2%. 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. [18]. 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. [18] 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, but without a statistically significant difference in the present study. Other studies have found a statistically significant relationship between malocclusion and age, which is more prevalent among older children [22,23].

The interincisal diastema represents an occlusal alteration and may result from the low insertion of the labial frenum. In this investigation, there was a statistically significant association between malocclusion in the primary dentition and the low insertion of the labial frenulum. The labial brake with abnormal insertion can be associated with loss of papillae, gingival retraction and midline diastema, difficulty in brushing and poor alignment of teeth. There is interference from the bad positioning of the brake on the function of the lips, impairment of aesthetics and regression in orthodontic treatments. [24,25] Besides, the well-positioned lip brake acts with great relevance in stabilizing the midline of the lip and prevents excessive exposure of the gingival mucosa

[26]. Cavalcante et al. [27] also highlighted the association between the interincisal diastema and the lip brake with abnormal insertion. Dent alveolar trauma to the primary dentition has a high rate of occurrence, which is why it can be considered a public health problem. It is one of the main causes of the search for urgency in dentistry, affecting the physical and emotional health of the affected individual and their family members, who are quite apprehensive about this occurrence [28]. In this study, a prevalence of 21.13% of trauma was identified, being higher in males (57.93%). Souza Filho et al. [29] identified a prevalence of 31.8% of this child illness in the city of Teresina, Piauí, which was more common in females (51.4%). In the city of Presidente Prudente, São Paulo, a 44.8% prevalence of dental trauma was observed in children aged 0 to 06 years. 28 Most of them were male (68.5%), as in this study. Kramer et al. [30] identified that being male represents 15% more chance of showing trauma. In contrast, born et al. [31] did not identify an association between dental trauma and sex among children in North Carolina (USA), where there was a 47% prevalence of trauma among children aged 24 to 71 months. In general, male children are the main victims of dent alveolar trauma, this is because boys play and play sports more violently, exposing themselves more to problem [28,30]. It is also worth mentioning that the youngest children were the main victims of dental trauma in this research, in agreement with the literature. [28,30]. For Mendoza, Gonzales and Iglesias [32], a trauma in the primary dentition tends to occur more frequently in the first three years of life, a fact associated with the greater 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 over jet 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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