Prevalence and associated factors of malocclusion in the primary dentition

Prevalência e fatores associados à maloclusão na dentição decídua

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ABSTRACT

Objective
To estimate the prevalence and factors associated with malocclusion in primary dentition.

Methods
A cross-sectional study consisting of all children living in areas covered by the Family Health Units in the municipality of Pedra Preta - Mato Grosso. Data collection consisted of two steps: an interview with the mother and / or guardian and the child's clinical dental examination. The interviews were conducted by two previously trained assistants and clinical examination by a dentist previously trained and calibrated (intrarater kappa = 0.96). A total of 374 children aged three to five years were examined. Criteria for classifying normal occlusions and malocclusions were: terminal relationship primary second molars, canine relationship, transverse relationship, goodwill and presence / absence of crowding.

Results
Was used the Poisson regression. The prevalence of malocclusion was 53.2% (95% CI: 48.3, 58.6). An association of malocclusion with the following variables: presence of oral habits, exclusive breastfeeding ≤ 3 months, facial profile of the type / concave and convex arc-shaped jaw V.

Conclusion
The prevalence of malocclusion in primary dentition was high, however some are associated with avoidable factors: early diagnosis and preventative measures can prevent and / or intercept the establishment of these changes, even in the primary dentition.

Indexing terms: Breast feeding. Dentition primary. Habits. Malocclusion.

RESUMO

Objetivo
Estimar a prevalência e fatores associados à maloclusão na dentição decídua.

Método
Estudo transversal constituído pelo total de crianças residentes nas áreas de abrangência das Unidades de Saúde da Família do município de Pedra Preta, Mato Grosso. A coleta de dados foi composta por duas etapas: entrevista com a mãe e/ou responsável e exame clínico odontológico da criança. As entrevistas foram realizadas por duas auxiliares previamente treinadas e o exame clínico por um cirurgião dentista previamente treinado e calibrado (Kappa intraexaminador: 0,96). Foram examinadas 374 crianças na faixa etária de 3 à 5 anos. Os critérios para classificar as oclusões normais e maloclusões foram: relação terminal dos segundos molares decíduos, relação de caninos, relação transversal, trespasses e presença/ ausência de apinhamento.

Resultados
Utilizou-se a Regressão de Poisson. A prevalência de maloclusão foi de 53,2% (IC 95%: 48,3; 58,6). Verificou-se associação de maloclusão com as seguintes variáveis: presença de hábitos bucais, aleitamento materno exclusivo ≤ 3 meses, perfil facial do tipo côncavo/convexo e arco maxilar em forma de V.

Conclusão
A prevalência de maloclusão na dentição decídua foi elevada, entretanto alguns fatores associados são evitáveis: o diagnóstico precoce e medidas preventivas podem impedir e/ou interceptar o estabelecimento destas alterações, ainda, na dentição decídua.

Termos de indexação: Aleitamento materno. Dentição primária. Hábitos. Má oclusão.

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INTRODUCTION

Malocclusion is a developmental anomaly of teeth and/or dental arches that may occur in both primary and permanent dentition, which causes esthetic discomfort in milder cases and functional damage and disability in more severe cases[1]. It is usually caused by the interaction of hereditary, congenital and acquired factors of a general or local order, and due to the presence of oral habits[2].

Due to the high prevalence of malocclusion, the World Health Organization (WHO) considers it one of the major dental public health problems worldwide[3]. More importantly, it is possible to prevent and treat this alteration, which may cause a negative social impact by interfering with quality of life of the individuals affected, harming their social interaction and psychological well-being[4-5]. The reduction in the incidence of dental caries in children and adolescents over the last few decades has drawn more attention to other oral problems such as malocclusions[5]. Due to this, it is important to clearly define the factors associated with this condition in order to facilitate the planning of prevention and care actions.

The study of malocclusions and their etiology is of fundamental importance to dentists who can prevent and/ or intercept problems that are difficult to solve in the long term through early diagnosis and preventive measures, and by increasing patients and/or guardians' awareness of the problem[6].

By identifying the prevalence and factors associated with malocclusion in primary dentition, this study is justified due to need of the public sector to obtain action parameters to prevent this condition, with the formulation of programs that include measures to prevent and intercept occlusal disorders in the initial period of orofacial development.

METHODS

This is a cross-sectional study whose population consisted of children resident in the coverage area of Family Health Units (FHU) in the municipality of Pedra Preta - Mato Grosso. The city has 16,461 inhabitants[7], three Family Health Units and three Family Health Program teams (FHP). The proportion of the population covered by the Family Health Program in 2009 was 73% with 3,720 families enrolled in the Primary Care Information System (Sistema de Informação da Atenção Básica - SIAB), totaling 12,015 people[8]. All families registered in the Primary Care Information System with children between the ages of 3 and 5 years were selected by community health agents (CHA) and the initial population was composed of 432 children.

The following exclusion criteria were adopted: children with permanent teeth, partially or fully erupted (mixed dentition); children with one or more teeth with extensive caries lesion (remnant of clinical crown limited to the gingival third), and children who have undergone or are undergoing orthodontic treatment.

Drop-outs were considered when the children refused to participate or their parents/guardians did not provide authorization; those who were not found at home after three attempts at different times; and those whose addresses were not found or were inexistent.

Data collection was performed in two stages: home interview with the mother and/or guardian; clinical dental examination conducted at school or day-care center or at home (for those children who did not attend school).

For the home interview, the residence was found using the address registered in the A Record of the Primary Care Information System. The clinical exam of occlusion was performed on another day by a dentist, previously trained and calibrated (intrarater Kappa: 0.96).

The children were evaluated during classes, seated on a school chair, in front of the examiner, in a room with natural light. When the examination was performed at home, the child remained seated on a chair. The oral exam was performed with aid of a disposable wooden spatula, black pencil No 2 and millimeter ruler. All information was noted on an individual clinical chart.

The morphological aspects of the children's occlusion were evaluated according to the classification of Baume[9] for the anteroposterior relationship of the second deciduous molars, and Foster & Hamilton[10] for the deciduous canine relationship. The following characteristics were also analyzed: horizontal overlap, vertical overlap, tooth crowding/spacing, anterior open bite, complete crossbite, unilateral or bilateral anterior and posterior crossbite. According to these conditions, occlusion was classified as normal or as malocclusion.

Occlusion was classified as normal when habitual maximum intercuspation of the child had the following characteristics: terminal plane relationship of second deciduous molars in a straight and/or mesial plan with canine in Class I; absence of crossbite and/or open bite; normal overjet and overbite; positive measurements up to 2 mm.

The outcome of the study was the presence of malocclusion. The independent variables analyzed were: sex, age, type of birth, prenatal, respiratory disease diagnosed by a physician, dental appointment, sleep disorders, duration of exclusive breastfeeding, presence of oral habits and clinical aspects.

After performing the epidemiological survey, the data were digitized using the EPI INFO 3.3.2 software. The associations between the exposure and outcome variables were assessed at a level of significance of 95% by the Chi-square test (X^2) and the Fisher's Exact test, when necessary, due to the reduced number of cases in an analysis category. The variables that presented a value of $p < 0.20$ by the X^2 test were pre-selected to compose the Poisson regression model. The multivariate analyses were performed by the Stata 8.0 program.

The study was approved by the Ethics Committee on Research in Human Beings of the Federal University of Londrina, in accordance with resolution No 196/6, in report No 252/08. For this purpose authorization of the local health authority was requested, and the children's legal guardians signed a term of free and informed consent authorizing the procedures to be performed in the children and their participation in the study.

RESULTS

Data collection occurred between April and June 2009. According to the census conducted, the list initially obtained contained 432 children, however, 33 (7.6%) were excluded during the research process: 10 had moved away from the coverage area of the Family Health Units, 6 had extensive caries with clinical crown remnant limited to the gingival third and 17 had mixed dentition. The non-reply rate was 5.8%, in which: eight children were not found after three visits or the address was not found, six guardians were unable to provide accurate information, five mothers/guardians refused participation, and six children refused to participate in the clinical examination.

The mean age of the children was 4.2 years of age (±0.8 years) with a larger number of boys within the age group of 5 years (Table 1).

Mean time of exclusive breastfeeding (EMB) was 4.41 months and the mode was 6 months. The prevalence of one or more oral habits in children was 94.9% (95% CI: 92.0; 96.8). The most common oral habit was use of the feeding bottle (87.2%; 95% CI: 83.3; 90.4), followed by biting objects (45.2%; 95% CI: 40.1; 50.4) and use of a pacifier (39%; 95% CI: 34.1; 44.2), as shown in Figure 1.

Only 5.1% (95% CI: 3.2; 8.0) of the children did not present any type of oral habit. Of these children, 78.9% had normal occlusion and all received exclusive breastfeeding for three months or longer.

The prevalence of malocclusion was 53.2% (95% CI: 48.3; 58.6) and some types of malocclusion were concomitant. The most frequent types were crowding (23.0%; CI 95%: 18.9; 27.7) overjet (16.6%; 95% CI: 13.0; 20.8) and anterior open bite (16.0%; 95% CI: 12.6; 20.2), as shown in Figure 2.

With regard to the terminal plane relationship of the second deciduous molars, the highest frequency found was for the group with mesial step (47.1%) followed by the straight plane (43%) and distal step (4.8%). Approximately 5% of children presented an asymmetrical (left-right) molar relationship. The most prevalent canine relationship was Class I (76.5%), followed by Class II (14.7%) and Class III (8.8%).

The children's characteristics that were significantly associated (p<0.05) with malocclusion were as follows: physician-diagnosed respiratory disease, sleep disorders, ptyalism and/or snoring, presence of one or more oral habits and the fact that the child did not receive exclusive breastfeeding or to have been breastfed for less than six months (Table 1).

A significant relationship was found between malocclusion and the following habits: bottle-feeding, pacifier and finger sucking habits and mouth breathing (Table 2). For the variables bottle-feeding and finger sucking habits, the fact that the child did not abandon the habit, was why it was associated with malocclusion.

Considering the clinical aspects evaluated in the children, the convex facial profile, and the V-shaped and deep maxillary arch were significantly associated with malocclusion (Table 3).

By the multivariate analysis, in the Poisson regression, it was found that the categories with negative association with malocclusion were as follows: the concave+convex facial profile in comparison with the straight profile, the V-shaped maxillary arch in comparison with the semicircular arch, and exclusive breastfeeding for ≤ 3 months ≥ in comparison with 4 months, and the presence of one or more oral habits in comparison with the absence of habits (Table 4).
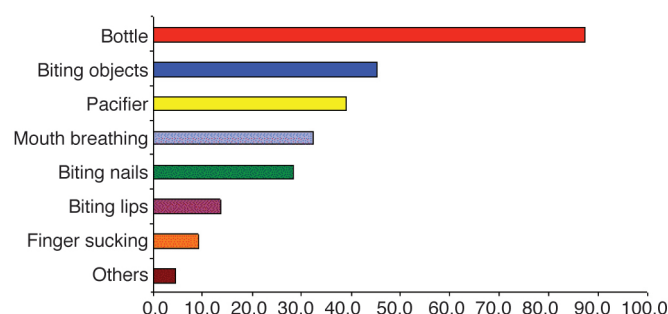
Figure 1. Frequency (%) of oral habits in children between 3 and 5 years of age, Pedra Preta, Mato Grosso (2009).
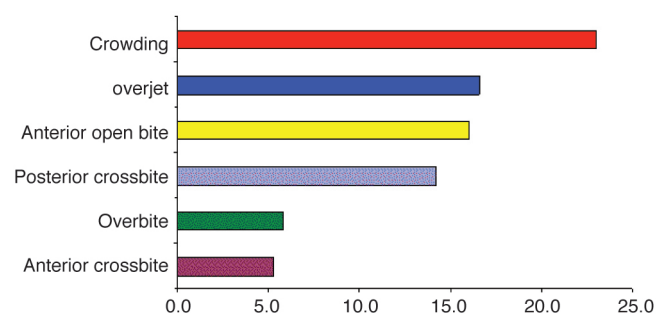

Figure 2. Frequency (%) of types of malocclusion in deciduous dentition, Pedra Preta, Mato Grosso (2009).

Table 1. Distribution of prevalence of malocclusion in children between 3 and 5 years of age according to the variables related to the child, Pedra Preta, Mato Grosso (2009).

Variables	Malocclusion				95% CI	p*
	Total	n	%	PR		
Sex						
Girls	172	97	56.4	1.11	0.92-1.34	0.346
Boys	202	103	51.0	1.00	Reference	
Age (years)						
3	106	62	58.5	1.18	0.95-1.48	0.312
4	96	53	55.2	1.12	0.88-1.41	
5	172	85	46.4	1.00	Reference	
Type of birth						
Vaginal	203	117	57.6	1.19	0.98-1.44	0.098
Cesarean	171	83	48.5	1.00	Reference	
Respiratory disease						
Yes	63	44	69.8	1.39	1.14-1.69	0.006
No	311	156	50.2	1.00	Reference	
Dentist appointment						
No	267	60	56.1	0.94	0.76-1.15	0.600
Yes	107	140	52.4	1.00	Reference	
Sleep disorders						
Snoring	99	62	62.6	1.32	1.05-1.66	0.026
Nocturnal ptyalism	98	60	61.2	1.29	1.03-1.62	
Tooth Grinding	112	56	50.0	1.02	0.70-1.71	
No	154	74	48.1	1.00	Reference	
Oral habit						
Yes	355	196	55.2	2.62	1.09-6.30	0.007**
No	19	4	21.1	1.00	Reference	
Duration of exclusive breastfeeding (months)						
Not breastfed	42	26	61.9	1.62	1.18-2.23	<0.001
< 6	196	122	62.2	1.63	1.28-2.07	
≥ 6	136	52	38.2	1.00	Reference	

Note: * X² test with Yates' correction, 2 degrees of freedom. ** Fisher's Exact Test

Table 2. Distribution of prevalence of malocclusion in children between 3 and 5 years of age according to the presence of oral habits, Pedra Preta, Mato Grosso (2009).

Habits	Malocclusion				95% CI	p*
	Total	n	%	RP		
Bottle fed						
Yes, still is	201	130	64.7	1.93	1.28-2.92	<0.001
Yes, but abandoned	125	54	43.2	1.30	0.83-2.03	
Never was	48	16	33.3	1.00	Reference	
Pacifier sucking						
Yes, still does	26	25	96.1	2.19	1.86-2.59	<0.001
Yes, but abandoned	120	75	62.5	1.42	1.16-1.74	
Never did	227	100	44.0	1.00	Reference	
Digital sucking						
Yes, still does	28	26	92.8	1.85	1.59-2.14	<0.001*
Yes, but abandoned	6	3	50.0	0.99	0.44-2.23	
Never did	340	171	50.3	1.00	Reference	
Mouth breathing						
Yes	121	74	61.1	1.23	1.02-1.48	0.050
No	253	126	49.8	1.00	Reference	

Note: * X² test with Yates' correction, 2 degrees of freedom. ** Fisher's Exact Test

Table 3. Distribution of malocclusion prevalence in children between 3 and 5 years of age according to clinical characteristics, Pedra Preta, Mato Grosso (2009).

Clinical Characteristics	Malocclusion				95% CI	p*
	Total	n	%	RP		
Facial profile						
Convex	185	112	56.0	1.35	1.10-1.66	0.007
Concave	17	11	64.7	1.45	0.98-2.13	
Straight	172	77	44.8	1.00	Reference	
Lip sealing						
No	40	26	65.0	1.25	0.97-1.60	0.168
Yes	334	174	52.1	1.00	Reference	
Maxillary arch shape						
V-shaped	86	77	89.5	2.10	1.80-2.44	<0.001
Semicircular	288	123	42.7	1.00	Reference	
Arch depth						
Deep	183	118	64.5	1.50	1.23-1.83	<0.001
Shallow	191	82	42.9	1.00	Referência	

Note: * X² test with Yates' correction, 2 degrees of freedom.

Table 4. Distribution of prevalence of malocclusion in children according to Poisson regression, prevalence ratio and respective 95% confidence interval and value of p<0.05 of the variables selected by the backward method, Pedra Preta, Mato Grosso (2009).

Variables	Malocclusio	%	PR[b]	PR[a]	95% CI	p
Facial profile						
Convex/concave	123	60.9	1.35	1.07	1.01-1.14	0.023
Straight	77	44.8	1.00	1.00	Reference	
Maxillary arch shape						
V-shaped	77	89.5	2.10	1.35	1.26-1.46	<0.001
Semicircular	123	42.7	1.00	1.00	Reference	
Exclusive breastfeeding (months)						
≤ 3	112	70.4	1.19	1.15	1.07-1.23	<0.001
≥ 4	88	40.9	1.00	1.00	Reference	
Oral habits						
Yes	196	55.2	2.62	1.14	1.04-1.25	0.005
No	4	21.1	1.00	1.00	Reference	

Note: [b] Raw Prevalence Ratio in the bivariate model; [a] Prevalence Ratio adjusted in the Poisson regression model with variable selection; RP - prevalence ratio, CI - confidence interval.

DISCUSSION

Some studies conducted in Brazil have pointed out the high prevalence of malocclusions in the child population during the deciduous dentition period with values higher than 70%[11-12]. However, other studies have shown a similar tendency to the one found in the present study in which approximately 50% (95% CI: 48.3; 58.6) of the sample presented some type of malocclusion[13-15].

The most frequent type of malocclusion reported in the literature is anterior open bite[16-19]. In the studied population, crowding, overjet and anterior open bite showed estimates per overlapping intervals, although the point estimate of crowding was higher. One supposes that this finding resulted from the following fact: the majority of children in this study never had some of the habits that have been established in the literature, such as those associated with anterior open bite - pacifier use and finger sucking; and the majority of children who previously had these habits, had abandoned them by the time of data collection (> 90%).

Although different methods are reported in the literature, the distribution of sagittal relationship in this study population is in agreement with some studies that have highlighted the predominance of mesial step, followed by the straight plane and distal step. However, the majority of studies in the existent literature show a greater prevalence of the straight terminal plane[9,10,20-22]. The prevalence of 8.8% of the relationship between canines in Class III shown in this study was higher than that found in the studies of Farsi & Salama[22] - 3.3%, and Foster & Hamilton[10]. These differences might be due to the variations in the application of the methodology and also ethnicity, since Brazil is a country marked by miscegenation.

Many studies have shown an association between the presence of malocclusion and oral habits[11-18,23-25], type of (breast/bottle) feeding[13,16,23-25] and mouth breathing[14,25]. These associations were confirmed in the present study, in which the pacifier, predominantly mouth breathing, and current use of bottle and finger sucking were significantly associated with the presence of malocclusion.

In the literature, pacifiers have been reported as the predominant oral habit among children[13], however, in the present study, the most frequent habit was the use of the feeding bottle, which is in agreement with the studies of Silva Filho et al.[12]. This datum draws attention to the fact that the pacifier has been offered to children less frequently, due to campaigns and/or awareness among parents; nevertheless, it clearly demonstrates that the problem related to the use of the feeding bottle persists and needs to be addressed.

The duration of breast/bottle feeding has a strong influence on the development of oral habits[6,13,24]. Considering the data shown in this study, it can be affirmed that exclusive breastfeeding for a period equal to or longer than six months has a positive influence, as a way to prevent the use of bottles and pacifiers, and the development of malocclusions.

The results confirm a high number of children who were exclusively breastfed, with an average of 4.41 months of breastfeeding, therefore, suggesting that the studied population received this protective effect of breastfeeding against oral habits and malocclusions.

Viggiano et al.[23] observed the protective effect of breastfeeding on the development of posterior crossbite in deciduous dentition. Furtado and Vedovelho Filho[24] also found that the duration of breastfeeding influenced the presence of malocclusion, because children who were breastfed for a longer period showed reduced frequency of malocclusion, corroborating the data obtained in this study.

The majority of studies on the prevalence of malocclusion in deciduous dentition refer to research conducted among schoolchildren[11-15,17,19,21] and there are few population-based studies. The design of this study is outstanding because it included all the children living in areas covered by FHU in a small municipality. These data are therefore important for organizing dental services in similar communities that represent the majority of the type of which the country is composed. The present study was designed to provide data of prevalence and factors associated with malocclusion in the child population of a community. The data, however, show the dimension of the problem and the need for further longitudinal studies that deepen the understanding of the subject. This is required in order to provide better support for prevention strategies against factors associated with the development of malocclusions, which are controllable, in addition to obtaining assistance for this vulnerable population from the public sector.

CONCLUSION

The prevalence of malocclusion in children living in areas covered by the FHU in the municipality of Pedra Preta (MT) was high (53.2%) and the factors that were associated with malocclusion, using Poisson regression, were shown to be: presence of oral habits, exclusive breastfeeding ≤ 3 months, convex/concave facial profile and V-shaped maxillary arch.

Collaborators

JM MASSUIA participated in the literature review, developed the initial research, collected the data, interviewed the parents/guardians of the children, conducted dental examinations of all children, digitized the database, organized the statistical analysis of the results and wrote the article. WO CARVALHO participated in the literature review, reviewed the article, prepared the tables and figures, checked the database, organized the statistical analysis of the results and wrote the article.

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