Original Article

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Clinical status of permanent first molars in children aged seven to ten years in a Brazilian rural community

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Abstract

Aim: To evaluate the clinical status of permanent first molars and associations with dental caries, gingival bleeding, dental fluorosis and malocclusion. **Methods**: An observational study was carried out in a rural community denominated Morro do Saboó in the city of São Roque, state of São Paulo, Brazil. A total of 194 children aged seven to ten years were examined for dental caries using the index proposed by the World Health Organization. Other conditions were determined using the Gingival Alterations Index, Dean's Index and Dental Aesthetic Index. The chi-squared test was used for the statistical analysis of the data. **Results**: A total of 85.5% of the sample exhibited gingival bleeding and 69.9% exhibited malocclusion. A total of 53.6% had a clinical aspect of normality with regard to dental fluorosis. There was a predominance of sound teeth in the upper arch and teeth with carious lesions in the lower arch. No significant differences were found between sexes regarding gingival bleeding, dental fluorosis or malocclusion. Significant associations were found between tooth status and oral alterations (gingival bleeding, malocclusion and fluorosis) in teeth 16, 26 and 46 and between tooth status and gingival bleeding in tooth 36 ($p<0.001$). **Conclusions**: Caries activity in the permanent first molars was mainly associated with dental fluorosis and malocclusion. Strategies aimed at health promotion should be adopted on a large scale to minimize the prevalence of oral diseases.

Keywords: dental caries, molar, fluorosis, dental, gingivitis, malocclusion.

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Introduction

Oral health status is mainly analyzed by the occurrence of dental caries and periodontal disease. Dental caries is estimated to affect 60 to 90% of children in industrialized countries and constitutes the most prevalent oral condition in Asia and Latin America[1]. The establishment of the "Brazil Smiling Program" in 2003 led to the expansion of public dental services in Brazil. This greater access to oral health care (including prevention actions and specialized treatment) has

contributed to an increase in the number of children who are free of caries (44%)[2].

Permanent first molars play a fundamental role in the maintenance of the masticatory function. The development of carious lesions is common during the eruption of the first molars due characteristics that are favorable to the buildup of bacterial plaque[3], such as pits and fissures[4]. In the absence of preventive measures, these teeth may experience all the repercussions stemming from the development of caries[5-6].

Gingivitis is the most common form of periodontal disease in children and adolescents[1] and is related to the presence of gingival bleeding. The early onset of aggressive periodontal disease affects approximately 2% of young patients and can lead to tooth loss[1]. The increase in the prevalence of gingivitis from childhood to puberty may be attributed to the number of sites at risk, with the buildup of bacterial plaque and inflammatory changes related to the process of exfoliation and eruption as well as hormonal factors related to age[7].

While dental caries and periodontal disease are the most common oral manifestations[1], other factors should also be taken into consideration in the analysis of oral health status. Dental fluorosis is a formation disorder in which the developing enamel is hypomineralized due to a change in the secretion of ameloblasts caused by an excess of fluoride ions[8]. Malocclusion is a growth and development disorder that affects the occlusion (bite) of the teeth[9] and can have a considerable impact on affected individuals, causing discomfort as well as functional and social limitations[10]. These conditions can have both functional and esthetic repercussions, with an impact on quality of life[11-12], and should therefore be identified so that proper intervention steps can be taken.

The aim of the present study was to evaluate the clinical status of permanent first molars and associations with dental caries, gingival bleeding, dental fluorosis and malocclusion.

Material and methods

An observational study was carried out involving the analysis of permanent first molars with regard to the presence of dental caries and other oral problems, such as gingival bleeding, dental fluorosis and malocclusion, in 194 children aged seven to ten years at a school located in a rural community denominated Morro do Saboó in the city of São Roque, state of São Paulo, Brazil, during a collective action. The study received approval from the Human Research Ethics Committee of the Universidade Federal de São Paulo, Brazil, under project number 1374/07. Parents/guardians of the participants signed a statement of informed consent allowing their children to participate in the study.

The evaluations were performed by a single, calibrated operator, using a mouth mirror and periodontal probe under natural light with the child seated and the examiner standing. The findings of the exam were recorded on an individual clinical chart for each child.

Assessment of dental caries

The assessment of dental caries was performed on the permanent first molars (teeth 16, 26, 36 and 46). The following codes and criteria were used for the classification of the teeth: (0) sound; (1) with carious lesion; (2) restoration with carious lesion; (3) restoration without carious lesion; (4) loss due to caries; (5) loss for other reasons (6); presence of occlusal sealant; (7) bridge support or crown; (8) non-erupted; (9) excluded tooth (applied to any tooth that could not be examined); (T) trauma/fracture. This assessment was based on the criteria proposed by the World Health Organization[13] and employed in Brazilian Oral Health surveys[14].

Assessment of gingival bleeding

Gingival bleeding was determined with the use of a periodontal probe, which was lightly inserted in the entrance of the gingival sulcus and run along its length – Gingival Alterations Index[15].

Assessment of Dental fluorosis

Dental fluorosis was determined based on Dean's index and coded as follows: (0) normal; (1) questionable; (2) very mild; (3) mild; (4) moderate; and (5) severe[13].

Assessment of malocclusion

Malocclusion was determined based on the abnormal positioning of the teeth using the index proposed by Cons et al. (1989) denominated the Dental Aesthetic Index (DAI)[16]. The following criteria were used for the classification of normal occlusion: class I relationship of permanent first molars; canines in normal relationship (upper canine in the space between the lower canine and lower first premolar or primary first molar); absence of anterior or posterior crossbite; vertical overjet not surpassing 3 mm; horizontal overjet not surpassing 2 mm; presence or absence of inter-incisor diastema and primate spaces; absence of crowding; absence of tooth anomalies in shape and number; and absence of tooth rotation.

Statistical analysis

Data analysis was performed using the SPSS 17 program (IBM Corp., Chicago, IL, USA). For such, the chi-squared test was employed, with the level of significance set to 5% ($p < 0.05$).

Results

The sample was made up of 194 children aged seven to ten years; 51.03% (n = 99) of the children were female. Table 1 displays the distribution of the children with regard to gingival bleeding, malocclusion and fluorosis according to sex. No significant difference between sexes was found regarding these oral conditions. A total of 84.5% of the participants (n = 164) exhibited gingival bleeding and 69.9% exhibited malocclusion (n = 135). With regard to fluorosis, 53.6% (n = 104) had a clinical aspect of normality, 32% (n = 62) were classified with questionable fluorosis, 10.3% (n = 20) were classified with questionable very mild fluorosis and 4.1% (n = 8) were classified with questionable mild fluorosis.

Table 1. Distribution of participants with regard to gingival bleeding, malocclusion and fluorosis according to sex, São Paulo, Brazil, 2011.

		Male		Female			
		n (%)		n (%)		Total	*p*-value
Gingival bleeding	No	17	56.7%	13	43.3%	30 (100.0%)	
	Yes	78	47.6%	86	52.4%	164 (100.0%)	0.236
Malocclusion	No	25	42.4%	34	57.6%	59 (100.0%)	
	Yes	70	51.9%	65	48.1%	135 (100.%)	0.224
Fluorosis	Normal	53	51.0%	51	49.0%	104 (100.0%)	
	Questionable	28	45.2%	34	54.8%	62 (100.0%)	0.911
	Very mild	10	50.0%	10	50.0%	20 (100.0%)	
	Mild	4	50.0%	4	50.0%	8 (100.0%)	

*chi-squared test

Table 2. Clinical status of permanent first molars in children analyzed, São Paulo, 2011.

Tooth 16		
Status	**n**	**%**
Sound	68	35.1
Carious	60	30.9
Restored with caries	14	7.2
Restored without caries	51	26.3
Lost due to caries	1	0.5
Total	194	100.0
Tooth 26		
Status	**n**	**%**
Sound	72	37.1
Carious	68	35.1
Restored with caries	27	13.9
Restored without caries	26	13.4
Lost due to caries	1	0.5
Total	194	100.0
Tooth 36		
Status	**n**	**%**
Sound	56	28.9
Carious	70	36.1
Restored with caries	21	10.8
Restored without caries	41	21.1
Lost due to caries	6	3.1
Total	194	100.0
Tooth 46		
Status	**n**	**%**
Sound	60	30.9
Carious	61	31.4
Restored with caries	13	6.7
Restored without caries	53	27.3
Lost due to caries	7	3.6
Total	194	100.0

Table 2 displays the results of the classification of dental caries status of the permanent first molars. There was a predominance of sound teeth in the upper arch and teeth with carious lesions in the lower arch. Tooth loss was recorded in both the upper and lower arches. Significant associations were found between caries activity and oral alterations (gingival bleeding, malocclusion and fluorosis) in teeth 16, 26 and 46 and between caries activity and gingival bleeding in tooth 36 (Table 3) ($p < 0.001$).

Discussion

The present results demonstrate no statistically significant associations between sex and gingival bleeding, malocclusion or fluorosis. However, tooth status was associated with all these conditions in teeth 16, 26 and 46 and with gingival bleeding in tooth 36. There was a predominance of sound teeth in the upper arch and carious teeth in the lower arch.

Data from the National Brazilian Oral Health survey demonstrate an increase in the number of children who are free of caries[2]. However, variables related to social context remain predictors of caries, which underscores the need for integrated health actions, as occurs with other childhood diseases[17]. The present study revealed a large number of carious lesions in the sample analyzed, which may be attributed to the rural region in which the school is located, which has no access to public health care or fluoridated water.

A previous study involving children and adults in a rural community in the state of Minas Gerais, Brazil states that deficient oral health is to be expected in this population given the fact that preventive and curative care hinges on access to dental treatment[18]. Another study carried out in a different region of the same state reports a greater prevalence of dental caries and lesser access to dental services as well as evidence of greater social deprivation among rural schoolchildren in comparison to their urban counterparts[19]. The findings described in a study carried out by de Abreu et al. (2004) suggest that underprivileged populations as well as families with a slightly higher income and greater schooling are more prone to adopt behavior that leads to dental caries[20]. However, a study conducted abroad states that children who participate in preventive oral health programs made available at school have less caries experience[21].

The molars play a fundamental role in the maintenance of the stomatognathic system[16]. The first molars are the first

Table 3. Presence of gingival bleeding, malocclusion and fluorosis according to carious lesions in permanent upper first molars, São Paulo, Brazil, 2011.

		Caries lesions					
		No		Yes		Total	*p*-value
		n (%)		n(%)			
Tooth 16							
Gingival bleeding	No	29	(96.7%)	1	3.3%	30 (100.0%)	<0.001*
	Yes	90	(54.9%)	74	45.1%	164 (100.0%)	
Malocclusion	No	46	(78.0%)	13	22.0%	59 (100.0%)	= 0.001*
	Yes	73	(54.1%)	62	45.9%	135 (100.0%)	
Fluorosis	Normal	54	(51.9%)	50	48.1%	104 (100.0%)	= 0.017*
	Questionable	42	(67.7%)	20	32.3%	62 (100.0%)	
	Very mild	16	(80.0%)	4	20.0%	20 (100.0%)	
	Mild	7	(87.5%)	1	12.5%	8 (100.0%)	
Tooth 26							
Gingival bleeding	No	23	76.7%	7	23.3%	30 (100%)	=0.002*
	Yes	75	45.7%	89	45.1%	164 (100%)	
Malocclusion	No	46	78%	13	22%	59 (100%)	= 0.001*
	Yes	73	54.1%	62	45.9%	135 (100%)	
Fluorosis	Normal	43	41.3%	61	58.7%	104 (100%)	= 0.032*
	Questionable	40	64.5%	22	35.5%	62 (100%)	
	Very mild	10	50.0%	10	5.0%	20 (100%)	
	Mild	5	62.5%	3	37.5%	8 (100%)	
Tooth 36							
Gingival bleeding	No	26	86.7%	4	13.3%	30 (100.0%)	<0.001*
	Yes	71	43.3%	93	56.7%	164 (100.0%)	
Malocclusion	No	33	55.9%	26	44.1%	59 (100.0%)	= 0.175
	Yes	64	47.4%	71	52.6%	135 (100.0%)	
Fluorosis	Normal	47	45.2%	57	54.8%	104 (100.0%)	=0.238
	Questionable	32	51.6%	30	48.4%	62 (100.0%)	
	Very mild	14	70.0%	6	30.0%	20 (100.0%)	
	Mild	4	50.0%	4	50.0%	8 (100.0%)	
Tooth 46							
Gingival bleeding	No	26	86.7%	4	13.3%	30 (100.0%)	Tooth 46 <0.001*
	Yes	87	53.0%	77	47.0%	164 (100.0%)	
Malocclusion	No	76	56.3%	59	43.7%	59 (100.0%)	=0.001*
	Yes	37	62.7%	22	45.9%	135 (100.0%)	
Fluorosis	Normal	53	51.0%	51	49.0%	104 (100.0%)	=0.025*
	Questionable	38	61.3%	24	38.7%	62 (100.0%)	
	Very mild	14	70.0%	6	30.0%	20 (100.0%)	
	Mild	8	100%	0	37.5%	8 (100.0%)	

* chi-squared test

permanent teeth to erupt and, due to their anatomy, which includes pits and fissures, these teeth have increased odds of developing carious lesions[4]. In the present study, the lower molars had a greater frequency of caries, whereas the upper molars were, for the most part, sound. The permanent molars are the teeth most affected by caries[22]. While the location of the tooth (lower or upper) has no influence on the risk to dental caries, a number of factors may be related to the development of this disease in general, such as dietary habits[23], caries experience in the deciduous tooth[24] and parents/guardians' schooling[25].

Tooth loss was found in the sample in both the upper and lower arches. According to Gonzalez and Manrrique (2001), the loss of permanent first molars can lead to a reduction in local function, the continuous eruption of the antagonist teeth and tooth deviations[26]. Considering the consequences of the absence of such teeth to the stomatognathic system, oral health promotion programs and campaigns aimed at the prevention of oral health problems should be established for the population as a whole and schoolchildren in particular. When performed early, interventions tend to minimize the impact of treatment and costs[27].

No significant association was found between dental fluorosis and sex. However, the prevalence of fluorosis was relatively low, which may have been due the fact that the participants lived in a rural environment, where some communities without access to a fluoridated water supply make use of artesian wells, mines, rivers, ponds, etc. Fluorosis has been related to a reduction in caries[28-29]. However, a significant association was found between these conditions

in three of the four teeth evaluated in the present study. Changes in diet have been suggested as an explanation for the increase in the prevalence of caries in groups that also have contact with fluoride ions[30]. Therefore, a greater frequency of visits to the dentist and supervision with regard to sugar intake and brushing should be warrant[21].

A statistically significant association was found between gingival bleeding and caries activity. A previous study reports that the prevalence of gum disease is high among individuals aged seven to 14 years and is directly related to deficient oral hygiene[31]. In a systematic review of studies addressing periodontal disease, Gjermo et al. (2000) report that gingivitis is the most common periodontal condition among children and adolescents, especially among males and individuals belonging to lower socioeconomic strata[32]. The findings of the present study are in agreement with these statements, except with regard to sex, for which no significant association was found.

The prevalence of malocclusion in the present study was high, likely due to the absence of public promotion measures regarding this aspect of oral health. According to Dimberg et al. (2011), the early treatment of malocclusion may be unnecessary if spontaneous correction occurs during the transition from the primary to the mixed dentition[33]. However, the present study involved the mixed dentition and the findings demonstrate treatment needs in this subgroup of the population. Thus, basic epidemiological surveys are fundamental to the assessment of the current situation regarding malocclusion and the drafting of treatment plans for groups at risk.

Prevention programs should be directed at the population in both rural and urban environments. The findings of a longitudinal study demonstrate that children without caries in the primary dentition tend to remain caries free during the mixed dentition phase[34]. Strategies aimed at health promotion should be adopted on a large scale to minimize the prevalence of oral diseases. Moreover, for cases in which such conditions have already developed, early detection and treatment can ensure a future generation of healthy adults from the dental standpoint.

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