Prevalence of malocclusion in children aged 9 to 12 years old in the city of Nova Friburgo, Rio de Janeiro State, Brazil

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Abstract

Introduction: Knowledge of a population's epidemiological situation is important in the planning and provision of dental services. **Objectives:** Assess the prevalence of malocclusion in children aged 9 to 12 years old from public schools in the city of Nova Friburgo, Rio de Janeiro State, Brazil. **Methods:** A randomly selected sample consisting of 407 children (53.1% female) who were evaluated by a trained professional, after parental consent. **Results:** The most prevalent malocclusions were crowding (45.5%), excessive overjet (29.7%), posterior crossbite (19.2%), anterior diastema (16.2%), partially erupted teeth (12.0%) and excessive overbite (10.8%). Class I molar relationship prevailed (76.7%). The presence of diastemas was higher in females and excessive overbite was more prevalent in males, both in mixed dentition. Negative overjet and the presence of partially erupted teeth had a higher prevalence in permanent dentition. **Conclusion:** It was observed that the mere evaluation of malocclusion prevalence does not reveal case severity or treatment need, both of which are important factors in public health planning.

Keywords: Prevalence. Malocclusion. Children. Public Health.

INTRODUCTION

Malocclusions, i.e., dental occlusion problems, are the result of orofacial adaptability to various etiological factors, which result in various implications ranging from aesthetic dissatisfaction to changes in speech, mastication, swallowing, TMJ dysfunction and orofacial pain[23]. Malocclusions feature the third highest prevalence among oral pathologies, second only to tooth decay and periodontal disease, and therefore rank third among worldwide Public Health dental disease priorities[18].

According to the World Health Organization[18], the main oral diseases should be subjected to periodic epidemiological surveys. Knowledge of a population's epidemiological situation is vital for planning and providing prevention and treatment services[20].

Several prevalence studies have been conducted on children in mixed or permanent dentition stages[3,4,7-10,12,13,19,25-28], but few studies in the Brazilian population approach with any degree of clarity the changes occurring between these periods.

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Therefore, the present study aims to assess the prevalence of malocclusion in schoolchildren aged 9 to 12 years old in the city of Nova Friburgo, Rio de Janeiro State, Brazil.

METHODOLOGY

This study was conducted with 407 children aged 9 to 12 years old with no history of previous orthodontic treatment, selected from a total of 6,684 schoolchildren of this age group enrolled in public schools in the city of Nova Friburgo, Rio de Janeiro State, Brazil. A minimum sample of 308 individuals was calculated with an estimated 70% malocclusion prevalence, 5% tolerable error and 95% confidence interval. In order to compensate for a possible clustering effect, the sample was increased by 30% (design effect = 1.3), totaling 400 students. An additional 25% were added to further offset any losses. Thus, 500 children were randomly selected and stratified according to age and school location (7 urban and 3 rural) to ensure that the sources of the population base were adequately represented.

Before the study, approval by the local Ethics Committee was obtained in addition to parental consent and the consent of the children. In rooms reserved inside the schools, a single trained professional assessed the period of dentition, the molar relationship (Angle) and the presence of the following malocclusions: excessive overjet, excessive overbite, negative overjet, crowding, diastemas, anterior and / or posterior open bite, anterior and / or posterior crossbite, ankylosed deciduous teeth, delayed tooth eruption and partially erupted teeth, tipped or impacted.

To determine the presence or absence of these malocclusions, regardless of their severity, the authors adopted the criteria laid down by the Dental Health Component (DHC) of the Index of Orthodontic Treatment Need - IOTN)[5]. In addition, they evaluated the presence of diastema between anterior teeth, a feature overlooked by the DHC. Thus, the occurrence of the malocclusions was determined based on the conditions shown in Chart 1.

The data were collected, entered and analyzed using SPSS 11.0 software (Statistical Package for the Social Sciences, Chicago, EUA). The results were presented in a descriptive fashion using absolute and relative frequencies. To evaluate the difference in distributions according to gender and the dentition period, the chi-square test was used, yielding a 5% significance level.

MALOCCLUSION	CRITERION
Crowding	Drift ≥ 1mm between the contact points of permanent teeth shifted away from the arch line
Excessive overjet	≥ 3.5mm
Anterior and posterior crossbites	Teeth with abnormal buccolingual relationship
Anterior diastemas	Space ≥ 1mm between the contact points of permanent incisors
Partially erupted tooth, tipped or impacted against adjacent teeth	Completely unerupted teeth due to insufficient space in the arch
Excessive overbite	≥ 3.5mm
Anterior and posterior crossbites	≥ 1mm
Delayed tooth eruption (except third molars)	Tooth not yet erupted due to insufficient space (< 4mm between adjacent teeth), presence of supernumerary, retained deciduous tooth or pathology
Negative overjet	All upper incisors in lingual position in relation to lower incisors.
Ankylosed deciduous tooth	Deciduous tooth below the occlusal plane

CHART 1 - Criteria used to determine the presence of malocclusions, according to the DHC of the IOTN (except for anterior diastemas).

RESULTS

Of the 500 children selected for the study, 73 did not return the signed parental consent document, 13 were not present at school on the assessment day and 7 had already started treatment. The age distribution of the remaining 407 children, according to gender and dentition period, can be seen in Tables 1 and 2, respectively. Most children studied in schools located in urban areas (72.2%).

Most children (80.84%) exhibited some type of malocclusion. A Class I molar relationship was found in 76.7% of all children; Class II in 19.2% and Class III in 4.2%. This distribution showed a significant difference only in the type of dentition (p = 0.009; χ^2), although Class I was the most prevalent both in mixed and permanent dentition (Graph 1).

Table 3 shows the prevalence of each malocclusion and the distribution according to gender and dentition period. The presence of anterior diastema was higher in females (p = 0.033) and in mixed dentition (p = 0.004). Excessive overbite was more prevalent in males (p = 0.003) and also in mixed dentition (p = 0.002). Negative overjet and the presence of partially erupted teeth, tipped or impacted against adjacent teeth, had a higher

prevalence in permanent dentition (p = 0.001 and p = 0.002, respectively). The other malocclusions did not produce any significant differences regarding gender or dentition type (p > 0.05).

Among the cases of partially erupted teeth, tipped or impacted against adjacent teeth (n = 49) and delayed tooth eruption (n = 30), the most frequent were maxillary canines (67.3% and 63.3%, respectively), followed by premolars (14.3% and 20%, respectively).
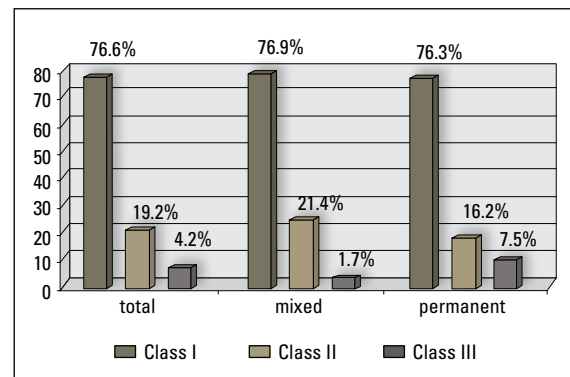
GRAPH 1 - Total molar relationship and in mixed and permanent dentition (p = 0.009; χ^2).

TABLE 1 - Distribution of children's ages according to gender (p > 0.05; χ^2).

GENDER	AGE				TOTAL
	9 years	10 years	11 years	12 years	
male	45	41	52	53	191 (46.9%)
female	56	61	52	47	216 (53.1%)
TOTAL	101 (24.8%)	102 (25.1%)	104 (25.5%)	100 (24.6%)	407 (100%)

TABLE 2 - Distribution children's ages according to dentition period (p < 0.001; χ^2)

DENTITION	AGE				TOTAL
	9 years	10 years	11 years	12 years	
mixed	99	68	52	15	234 (57.5%)
permanent	2	34	52	85	173 (42.5%)
TOTAL	101 (24.8%)	102 (25.1%)	104 (25.5%)	100 (24.6%)	407 (100%)

TABLE 3 - Prevalence (%) of malocclusions and their distribution according to gender and children's dentition periods (* p < 0.05; χ^2).

MALOCCLUSION	TOTAL	GENDER		DENTITION	
		male	female	mixed	permanent
crowding	45.5	20.9	24.6	26.8	18.7
excessive overjet	29.7	14.7	15.0	17.0	12.8
posterior crossbite	19.2	7.7	11.5	10.9	8.3
anterior diastemas	16.2	5.6	10.6*	12.3*	3.9
partially erupted teeth, tipped or impacted against adjacent teeth	12.0	6.1	5.9	4.4	7.6*
excessive overbite	10.8	7.4*	3.4	8.6*	2.2
anterior crossbite	10.1	5.4	4.7	6.4	3.7
anterior open bite	7.8	3.6	4.2	3.9	3.9
delayed tooth eruption	7.4	4.7	2.7	3.2	4.2
posterior open bite	6.1	2.7	3.4	3.4	2.7
anterior and posterior crossbite	4.4	2.0	2.4	2.2	2.2
negative overjet	3.9	1.5	2.5	0.7	3.2*
ankylosed deciduous teeth	1.2	0.5	0.7	1.0	0.2
anterior and posterior open bite	0.5	-	0.5	0.2	0.3

DISCUSSION

In studies of malocclusion prevalence such as this, one should always choose a well-defined sample, subjects with no prior history of orthodontic treatment, and objective data collection[30]. The present study fulfills such criteria entirely.

A reduction in the prevalence of molar Class II, an increase in Class III and negative overjet in mixed to permanent dentition may be regarded as a direct result of the period of mandibular growth spurt[22,30]. A reduction in excessive overbite with the development of teeth is due to the stabilization of the occlusion with the eruption of premolars and second molars[30] and a greater mandibular growth[29]. Excessive overbite was also observed more frequently in boys, as found by other studies[4,6,14,30], despite methodological differences.

Conflicting findings can be found in the literature regarding the prevalence of anterior diastema in relation to gender differences[2,11,14,15,24]. In this study, the higher prevalence in girls may be attributed to sample size, since no accurate explanation could be found. Regarding the type of dentition, most diastemas occurred in mixed dentition, similarly to the findings of other studies[1,30], and some authors consider it normal under the circumstances[17,21]. It can be attributed to the late eruption of permanent canines, which ends the "ugly duckling" stage. As canines find their final position in occlusion they exert increasing mesial pressure on the distal surfaces of the lateral incisors, forcing the latter and the central incisors to change their axial inclination and close the diastema[21].

A higher prevalence of partially erupted teeth, tipped or impacted against adjacent teeth in permanent dentition has been reported by Thilander et al.[30] In the posterior segments, these events are associated with the early loss of deciduous molars and, consequently, loss of space. This condition occurred most frequently in upper canines, followed by lower second premolars. This can be easily explained since these are the last teeth to erupt in each arch and are therefore the most likely to be impaired if space is lacking.

The fact that early treatment is indicated for some of these malocclusions underscores the importance of having children assessed in late mixed dentition and young permanent dentition. The high prevalence of crowding may be partly explained by the frequent occurrence of caries and molar extractions, which favors the migration of first permanent molars, inclinations and rotations[30]. The crossbites showed no difference between dentitions, reinforcing their lack of self-correction and their perpetuation. An early interception of crossbites can prevent asymmetric growth of the mandible and maxilla[29,30]. Early treatment is also recommended in severe cases of excessive overjet to prevent dental trauma and improve lip function and breathing[30].

Studies on the prevalence of malocclusion usually show high incidences, even though many are light (Chart 2). Given the large number found in children suffering from any type of malocclusion it is important to note that the presence of malocclusion does not necessarily entail the need for orthodontic treatment. The same malocclusion can present with different levels of severity and should therefore be given different treatment priorities, especially in public health, where the demand for services far outweighs the available supply. Marques et al.[13] and Pereira[19] also call attention to similar issues. In addition, other factors such as aesthetics and self-perceived need for treatment may influence the interest of patients and their carers in the treatment. In other words, additional criteria should be used in future studies.

In Brazil, the Unified Health System (SUS) does not provide effective assistance to malocclusion patients. Since a significant portion of the population depends exclusively on the public system, many patients with malocclusions are likely not to receive proper assistance. It should be emphasized that epidemiological surveys such as this are extremely important. By highlighting the patients' occlusal and functional changes, the provision of interceptive and corrective treatment to this underserved portion of the population is encouraged.

AUTHOR	COUNTRY	SAMPLE SIZE	AGE (YEARS)	INDIVIDUALS WITH MALOCCLUSION (%)
Mills[14]	United States	1,455	8-18	82.5
Ng'ang'a et al.[16]	Kenya	919	13-15	72.0
Saleh[26]	Lebanon	851	9-15	59.7
Frazão et al.[9]	Brazil	985	5	49.0
			12	71.3
Drummond[7]	South Africa	6,918	12	52.3
Sadakyio et al.[25]	Brazil	243	3-6	71.6
Behbehani et al.[3]	Kuwait	1,299	13-14	86.3
Ciuffolo et al.[6]	Italy	810	11-14	93.0
Jahn[10]	Brazil	4,936	5	44.0
		5,779	12	57.0
Marques et al.[13]	Brazil	333	10-14	62.0
Suliano et al.[28]	Brazil	84	6-12	77.3

CHART 2 - Some studies on the prevalence of malocclusion. Despite differences in evaluation methods, results are always significant.

CONCLUSIONS

There was a high prevalence of malocclusion in the population studied (80.84% of the sample), and the most frequent were: Crowding (45.5%), excessive overjet (29.7%), posterior crossbite (19.2%), anterior diastema (16.2%), partially erupted teeth (12%) and excessive overbite (10.8 %).

Anterior diastemas were found more often in girls and in mixed dentition. Partially erupted teeth, tipped or impacted against adjacent teeth were more frequent in permanent dentition. Excessive overbite was more often observed in boys and in mixed dentition whereas negative overjet showed higher prevalence in permanent dentition.

It was observed that the mere evaluation of malocclusion prevalence – although useful in providing objective information about the malocclusions – does not reveal the severity or treatment need of each case, both of which are important factors in public health planning. For this purpose, in future studies, the authors recommend the use of an orthodontic index.

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