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The correlation between malocclusions and morphofunctional aspects: analysis of patients aged from 7 to 12 years old

Correlação entre má oclusão e aspectos morfofuncionais: análise de pacientes com idade entre 7 e 12 anos

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ABSTRACT

Objective: To identify the malocclusion prevalence according to Angle's classification, the mean of overjet and overbite and correlate them with the respiration and swallowing types. **Material and Methods**: The dental records of 432 patients from an Educational Institute in the State of São Paulo, Brazil were assessed in order to find the malocclusion classification, the amount of overjet and overbite, and the swallowing (normal/atypical) and respiration (nasal, bucal or mixed) types. The patients were aged between 7 and 12 years old (228 males and 204 females). The data were submitted to parametric statistical tests for quantitative and qualitative analysis (ANOVA, Tukey test and Chi-square) at significance level of 5%. **Results**: Most of the patients had permanent dentition (58.6%), followed by mixed dentition. Angle's Class II malocclusion was the most prevalent (67.2%), followed by Class I and III. Overbite and anterior open bite represented, respectively, 47% and 7.2% of the vertical discrepancies. The average overbite was 3.08mm, while the average overjet was 4.67mm. Approximately 43,1% of the sample presented mouth breathing. Atypical swallowing reached 78.7% of the patients. Statistically significant correlations were observed associating Angle's Class III malocclusion with anterior crossbite and bilateral posterior crossbite; as well as between Angle's Class II with overbite, and Angle's Class I with overbite and atypical swallowing. A correlation was observed between atypical swallowing; the use of pacifiers; and predominant mouth breathing

RESUMO

Objetivo: Identificar as maloclusões de acordo com a classificação de Angle, a sobremordida e sobressaliência médias, e estabeler uma correlação com o tipo de respiração e deglutição. **Material e método**: As documentações de 432 pacientes de um Instituto de Ensino Superior do Estado de São Paulo foram avaliadas para identificar a classificaçãoo da maloclusão, a quantidade de sobremordida e sobressaliência e o tipo de deglutição (típica/atípica) e respiração (nasal, bucal ou mista). Os indivíduos tinham entre 7 e 12 anos (204 do sexo feminino; 228 do masculino). Os dados foram submetidos a testes paramétricos para dados quantitativos e qualitativos (ANOVA, Teste de Tukey e Quiquadrado) com nível de significância de 5%. **Resultados**: A maioria dos indivíduos apresentava dentadura permanente (58,6%), seguido de mista. A maioria era Classe II de Angle (67,2%), seguido de I e III. no sentido vertical, 47% apresentou mordida profunda e 7,2% mordida aberta anterior. A sobremordida média foi de 3,08mm e a sobressaliência, 4,67mm. Observaram-se 43,1% dos indivíduos com respiração bucal; 78,7% com deglutição atípica, 21,3% normal; 23,6% utilizavam chupeta, 7,9% dedo e 13% mamadeira. Houve prevalência estatisticamente significante de Classe III, correlacionada com mordida cruzada anterior e posterior bilateral; de Classe II com mordida profunda; Classe I com mordida profunda e deglutição atípica. Observou-se correlação entre deglutição atípica, sucção de chupeta e respiração

(p<0.001). **Conclusion**: An important correlation was found between the type of malocclusions and the morphofunctional aspects, indicating the need for intervention at proper time.

KEYWORDS

Malocclusion; Epidemiology; Child.

bucal (p<0,001). **Conclusão**: Foi observada importante correlação entre os tipos de maloclusão e os aspectos morfofuncionais, indicando necessidade de intervenção no tempo apropriado.

PALAVRAS-CHAVE

Má oclusão; Epidemiologia; Crianças.

INTRODUCTION

Malocclusions, according to epidemiological data of the World Health Organization (WHO), consist in changes in the oral health of government interest, since it is the third most prevalent oral disease, second only to dental caries and periodontal disease. [1]

Depending on the intensity, duration and frequency, several factors may influence the development of malocclusions, featuring its multifactorial etiology [2] and, much of it presents its first signs of morphological deviations in deciduous dentition. [3] Hereditary aspects and deleterious habits such as finger and pacifier sucking lead the triggering factors of malocclusion in the deciduous and mixed dentition. [1] These habits, often, are associated with early interruption of breastfeeding,[4] since bottle feeding presents a lower frequency of sucking, which reduces the emotional satiety, inducing the child to seek substitutes as the finger and pacifier.

The malocclusions, besides causing aesthetic problems, influence in speech, breathing, posture, chewing and swallowing, [2] so, its diagnosis and treatment should be performed incipiently. The auto-correction index of malocclusion during craniomandibular growth and development is small.[3] Early orthodontic interventions can prevent complex corrective orthodontic treatments or even orthognathic surgery.[1]

Epidemiological surveys should be conducted in different regions, for reporting the status of a miscegenous population, being of great importance for planning and execution of dental services for prevention and treatment, [5] thus, this study aimed to identify the malocclusion prevalence according to Angle's classification, the mean of overjet and overbite and correlate them with the respiration and the swallowing types.

SUBJECTS & METHODS

This retrospective study was approved by the Ethics Committee for Research on Humans of the São Paulo State University (Unesp), Institute of Science and Technology, São José dos Campos. (CAAE: 27591314.6.0000.5508), respecting the ethical and legal principles.

Sample characterization and study location

It is an analytical observational study performed in the Dentistry Course file of the São Paulo State University (Unesp), Institute of Science and Technology, São José dos Campos - Brazil. According to the data from the Brazilian Institute of Geography and Statistics (IBGE) in 2010, the population of the State of São Paulo totaled 41,262,199 inhabitants spread over 645 municipalities and its estimated population in 2014 was 44,035,304 inhabitants. The municipality of São José dos Campos, located in the metropolitan region of São Paulo, has an approximate population of 765,463 inhabitants, and the University, located in its territory, provides dental care to a good part of the city's population.

There were selected the dental records of individuals who underwent treatment in the clinic of orthodontics and pediatric dentistry of that institution from 1986 to 2014, and who met the eligibility criteria. The criteria included age between 7 and 12 years; mixed or permanent dentition, without early teeth losses; presence of some type of malocclusion on clinical examination. Patients could not present syndromes and could present habits like finger sucking, use of pacifier or nursing bottle.

At first, there were pre-selected 687 dental records of patients whose age was in accordance with the provisions for research. Of these, 176 were discarded due to non-compliance with the eligibility criteria, remaining 432 records. The final sample consisted of 228 males and 204 females, with an average age of 10.8 years (SD ± 1.2).

Malocclusions were classified by clinical examination and analysis of models with digital caliper (Mitutoyo™, ABSOLUTE, Aurora, IL., USA) and swallowing and respiration types were evaluated by an speech therapist. The data regarding the classification of malocclusions (Angle classification), presence of deep/open and/or cross bite; amount of overjet and overbite; functional aspects (type of breathing and swallowing); and deleterious habits like pacifier sucking, finger sucking and nursing bottle feeding were logged in a spreadsheet for analysis. The functional analysis of swallowing and breathing was carried out by a speech therapist accompanying the orthodontic service.

Data Analysis

To analyze the data, the V17 SPSS, Minitab 16 and Excel Office 2010 softwares were used. Since the data were quantitative and continuous, it was decided to carry out parametric statistical tests for quantitative and qualitative data, at a 5% significance level. The tests used were: ANOVA for comparison of the averages using the variance; Tukey's test, when necessary to accurately determine where there was a difference; Two Proportions Equality Test to compare the proportion of two given varying responses and/or if its levels are statistically significant; Chi-Square Test, to compare the proportion of two given varying responses and/or if their levels were statistically significant, and Yates Correction Test, when the expected frequency of the classes was very small (less than 5).

RESULTS

Due to the absence of sexual dimorphism statistically significant ($p = 0.102$), all the individuals in this study were evaluated together, for all data.

Mixed dentition was observed in 41.4% of the individuals and permanent dentition in 58.6%. The average overjet was 4.67mm (SD ± 3.5) and the overbite was 3.08mm (SD ± 2.27). Of the individuals, 28% exhibited Angle Class I malocclusion, 67% Class II and 5% Class III; 47% deep bite; 7.2% anterior open bite; 0.2% bilateral posterior open bite; 0.2% unilateral posterior open bite; 13% anterior crossbite; 7.4% bilateral posterior cross bite, and 16.2% unilateral posterior cross bite.

Pacifier sucking was observed in 23.6% of the subjects, nursing bottle feeding in 13% and finger sucking in 7.9%; 78.7% presented atypical swallowing, 38% nasal breathing, 43% oral and 19% mixed.

The data were obtained from the comparison between the three Angle malocclusions and the average of overjet and overbite for every type of dentition (Tables I and II). The comparison of the average amount of overjet and overbite between the types of breathing, in mixed and permanent dentition can be seen in Tables III and IV. The comparison of the average amount of overjet and overbite between the types of swallowing, in the two dentitions, can be seen in Table V.

Table I - Comparison between 3 classes of Angle and the average overjet and overbite for each type of dentition by ANOVA test at 5%

		Overjet			Overbite		
		Average	Standard Deviation	P– value	Average	Standard Deviation	P-value
Mixed	Class I	2.89	2.38		2.35	2.13	
	Class II	5.41	3.46	<0.001*	3.33	2.51	P<0.001*
	Class III	0.10	0.32		0.10	0.32	
Permanent	Class I	3.09	2.66		2.54	1.74	
	Class II	5.96	3.46	<0.001*	3.67	2.14	P<0.001*
	Class III	0.11	0.33		1.17	2.18	

* Statistically significant correlation.

Table II - Tukey's Test at 5% (Post Hoc) for the p-values of the table 1.

		Overjet		Overbite	
		Class I	Class II	Class I	Class II
Mixed	Class II	<0.001*		0.050*	
	Class III	0.032*	<0.001*	0.019*	<0.001*
Permanent	Class II	<0.001*		<0.001*	
	Class III	0.020*	<0.001*	0.129	0.001*

* Statistically significant correlation.

Table III - Comparison of the average amount of overjet and overbite between the types of respiration in mixed and permanent dentition by ANOVA test at 5%

		Overjet			Overbite		
		Average	Standard Deviation	P– value	Average	Standard Deviation	P-value
Mixed	Oral	5.70	3.65		3.11	2.73	
	Mixed	3.24	3.03	<0.001*	2.40	2.07	0.322
	Nasal	3.73	3.00		3.01	2.36	
Permanent	Oral	5.71	3.65		3.22	2.18	
	Mixed	4.31	3.50	<0.001*	3.15	2.35	0.984
	Nasal	4.03	3.22		3.20	1.96	

* Statistically significant correlation.

Table IV - Tuckey's test at 5% (Post Hoc) for p-values in Table 3

		Oral	Mixed
Mixed	Mixed	0.001*	
	Nasal	0.002*	0.753
Permanent	Mixed	0.064	
	Nasal	0.001*	0.896

* Statistically significant correlation.

Table V - Comparison of the average amount of overjet and overbite between the types of swallowing, in mixed and permanent dentition by ANOVA test at 5%

		Overjet			Overbite		
		Average	Standard Deviation	P– value	Average	Standard Deviation	P-value
Mixed	Atypical	5.23	3.42	<0.001*	3.11	2.53	0.127
	Normal	2.42	2.69		2.40	2.27	
Permanent	Atypical	5.14	3.63	<0.001*	3.18	2.10	0.702
	Normal	3.16	2.48		3.31	2.22	

* Statistically significant correlation.

It can be observed some statistically significant correlations between the classification of Angle and transverse and vertical aspects, such as: posterior cross bite in 70% of the Class III individuals ($p < 0.001$); 53% of individuals with Class II deep bite ($p = 0.015$); and 92% of individuals with Class I presented atypical swallowing ($p = 0.031$).

There was no level of relation between the type of breathing and pacifier, nursing bottle and finger sucking habits in any of the types of dentition. But when evaluating the type of swallowing regarding these habits, there was a statistically significant relation between individuals with normal swallowing who did not use pacifiers (87%) and among those with atypical swallowing that used pacifiers (31%), with p-value of 0.014.

When evaluated the type of swallowing with type of breathing, by the Chi-square test, there was a statistically significant correlation ($p < 0.001$) among individuals with atypical swallowing and oral breathing in the mixed (55%) and in the permanent dentition (50%); and it was also observed a statistically significant correlation between normal swallowing and nasal breathing in the two types of dentition (60% and 73%, respectively).

DISCUSSION

Knowing the interactions between occlusal and functional aspects are more prevalent in the population at each age, it is important for the clinician to intervene preventively and effectively. The diagnosis and treatment in an appropriate age, especially during the growth spurt, allows an individualized treatment plan and improves the prognosis of treatments - for Dentistry and Speech, Language and Hearing Sciences.

In the analysis of descriptive data, it was observed a trend of an accentuated overjet average of 4.67mm (SD ± 3.5), similar to another study, [5] much higher than the ideal value of approximately 1.6mm, [6] which may be related to high Class II index in this sample, that, certainly, happened because it was a sample from patients searching for care, which tends to result in more aesthetically compromising characteristics. For overbite, an average of 3.08mm (SD ± 2.27) was found, value considered as ideal, [7] diverging from severe overbite values found in a similar study, [8] probably due to a lower age of the sample and the incomplete eruptive process of individuals with mixed dentition.

Corroborating with some studies, [1,3,5,8-9] it was observed a high rate of malocclusion, being Angle Class II the most prevalent in this group of patients who sought dental care in the Institution, disagreeing with the results of similar articles that highlighted the malocclusion Class I as more prevalent, when evaluated patients from private and school clinics. [1,3,10] This difference of results, probably, also is explained in the origin of the sample, since patients that look for care, usually, have more aesthetically compromising malocclusion standards, such as Class II division 1, observed in this sample.

It was noted a large percentage of subjects with deep bite [1] (47%), unlike the results of similar studies, that obtained a much lower percentage, [3,10] regarding the open bite, it was observed a much lower percentage to that found in other studies, [2,3,10] possibly, this discrepancy occurred under the influence of deleterious habits and the age of the samples (the lower, the greater probability of harmful habits).[2]

Regarding the cross-cutting issues, there was a higher percentage of unilateral posterior cross bite when compared to other studies, [3,10] with lower percentage of bilateral posterior cross bite (7.4%) compared to the unilateral (16.2%), suggesting that, in this sample, there was a higher rate of dental or functional cross bite, with the crossing of a few teeth of one side or a "edge to edge" bite with repetitive rest position to one side.

The overjet presented a statistically significant correlation between Class II and Class III, in permanent dentition and, clinically, the largest overjet values were in Class II, both in mixed and permanent dentition, regarding the overbite, there was a statistically significant correlation with all Classes, regardless the type of dentition and clinically that the highest values were in Class II, both in mixed and permanent dentition.

It can be observed that, in the mixed dentition, there was no statistically significant correlation between Class III and posterior cross bite and Class II and deep bite - correlations already expected due to these characteristics in malocclusions of such Classes. In the permanent dentition, it was observed a statistically significant relation between Class I and atypical swallowing, different result than the expected, which would be the ratio of Class II and Class III with atypical swallowing, but it underscores the importance of evaluating other aspects of occlusion, because a malocclusion in Class I does not mean a normal occlusion.

It was noted that most Class III individuals presented anterior crossbite (56%) and/or bilateral posterior (44%) allowing establishing a relation between Class III and crossbite, result already expected due to the typical disproportional relation between maxilla and mandible in a Class III malocclusion.

None of the sucking habits questioned related to the Angle Classes, unlike the findings of a study that found no relation between malocclusion and nursing bottle feeding. [11]

That difference possibly happened for the age of the samples that presented, predominantly, deciduous dentition. On the other hand, the present data agree with another study, which also did not observe a relation between habit and malocclusion, [1] probably because the frequency, intensity and duration of the habit were not enough to overcome the physiological adaptation limit of the body and cause functional changes.

There was no correlation between breathing and the Angle classification, different from the result obtained in another study that found a relation between Class II and breathing. [11] In evaluating the breathing relation with the questioned deleterious oral habits, no statistically significant correlation was observed. Probably the frequency, intensity and duration of the habit were enough to overcome the physiological adaptation limit of the body and cause functional changes, in addition to devices (finger, pacifier and nursing bottle) not causing obstruction of anatomical structures that prevent the correct function.

When evaluating the relation between swallowing and deleterious oral habits, we only observed a statistically significant relation between atypical swallowing and pacifier in the mixed dentition. This fact has an effect, and not cause, relation, because the open bite caused by harmful habits can lead to inadequate lingual interposition and atypical swallowing. [2]

There was a statistically significant relation between mouth breathing and atypical swallowing, both in mixed and permanent dentition, possibly because people who present breathing changes may have a more posterior positioning of the mandible[2] or other problems, such as hypertrophic adenoids and/or misuse of septum [12] that induces the individual to the mouth wider open, being possible to cause positioning vices and swallowing difficulties, beyond the influence of tone and tongue position.

A statistically significant correlation was observed between the breathing type and the amount of overjet and, through Tukey's Multiple Comparison Test (Post Hoc), in which we observed that individuals with mouth breathing showed the highest overjet values (5.7 mm, approximately), both in mixed and permanent dentition. Parallelism also found between overjet and lower lip eversion, clinical signs observed in mouth breathers, corroborating with a similar study, [13] which suggests that there is not a balance between the muscles of the lips and tongue.

There was no statistically significant relation between the type of breathing and overbite in the two dentitions, agreeing with a similar study that found an opposite relation between oral breathing and overbite signs, [13] however, it was possible to observe that the overbite values in mixed dentition regarding the mixed breathing were lower, which can be answered by the incomplete eruption in the incisors in the mixed dentition.

When evaluating the relation between swallowing and overjet values, there was a statistically significant correlation, for both dentitions, in which the average overjet for atypical swallowing was always greater than that observed in subjects with normal swallowing, for both dentitions. This correlation is expected since the form (position of the upper and lower incisors, possible skeletal variations) and function are not in harmony.

It was observed that, both in mixed and permanent dentition, there was no statistically significant relation between swallowing and overbite, showing that the vertical trespass does not interfere in the swallowing process, however, it can be observed, clinically, that in the mixed dentition, the highest values were in individuals with atypical swallowing and,

in the permanent dentition, it was higher in individuals with normal swallowing.

After analyzing the results, it was possible to establish a mapping of the types of changes most commonly found in patients that seek assistance. More epidemiological studies must be conducted, in order to better characterize the profile of the disease, thus, Dentistry and Speech, Language and Hearing Sciences assistance that provide public health can, effectively, establish preventive actions to minimize malocclusions.

CONCLUSION

There is an important correlation between malocclusions and the morphofunctional aspects of occlusion in subjects from 7 to 12 years old, in need of therapeutic measures in proper time.

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