

Association between malocclusion severity and psychosocial issues among adolescents.

Asociación entre gravedad de maloclusión y problemas psicosociales en adolescentes.

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Abstract: Aim: To evaluate the association between malocclusion severity and psychosocial issues among Brazilian adolescents. Methods: The study sample consisted of 120 adolescents between 11 and 12 years, patients at the *Dental School of the Federal University of Minas Gerais*. Psychosocial issues were assessed by means of two questions, through which the adolescents were asked about whether a classmate had teased or called them names due to the condition of their teeth, or whether the adolescents had felt upset due to their teeth. The higher the response scores the greater the psychosocial impact. Malocclusion was evaluated with the Dental Aesthetic Index, with assignment of individuals to the following sub-groups: mild malocclusion (DAI \leq 25), moderate malocclusion (DAI=26–30), definite malocclusion (DAI=31–35) and severe malocclusion (DAI \geq 36). Results: Adolescents' mean age was 11.50 years. The more severe the malocclusion the greater the frequency of episodes of teasing or name-calling because of the condition of the teeth ($p=0.010$), and the greater the frequency of episodes when the adolescents had felt upset due to their teeth ($p=0.001$). Individuals with severe malocclusion had a higher frequency of episodes during which they were teased or called names due to the condition of their teeth when compared to individuals with mild malocclusion ($p=0.013$). Individuals with severe malocclusion had a higher frequency of episodes in which they felt upset due to their teeth when compared to individuals with mild malocclusion ($p<0.001$), individuals with moderate malocclusion ($p=0.002$), and those with defined malocclusion ($p=0.001$). Conclusion: Severe malocclusion was associated with psychosocial issues among adolescents.

Keywords: Adolescent, malocclusion, psychosocial impact.

Resumen: Objetivo: Evaluar la asociación entre la gravedad de la maloclusión y los problemas psicosociales en adolescentes brasileños. Métodos: La muestra de estudio consistió en 120 adolescentes entre 11 y 12 años, pacientes de la *Escuela de Odontología de la Universidad Federal de Minas Gerais*. Los problemas psicosociales se evaluaron mediante dos preguntas, a través de las cuales se preguntó a los adolescentes si un compañero de clase se había burlado de ellos o les habían insultado debido a la condición de sus dientes, o si los adolescentes se habían sentido molestos debido a sus dientes. Cuanto mayor la puntuación de la respuesta, mayor el impacto psicosocial. La maloclusión se evaluó con el Índice de Estética Dental y se asignó los siguientes subgrupos: maloclusión leve (DAI \leq 25), maloclusión moderada (DAI=26-30), maloclusión definida (DAI=31-35) y maloclusión grave (DAI \geq 36). Resultados: la edad media de los adolescentes fue de 11,50 años. Cuanto más grave la maloclusión, mayor la frecuencia de episodios de burlas o insultos debido a la condición de los dientes ($p=0.010$) y mayor la frecuencia de episodios cuando el adolescente se ha sentido molesto debido a sus dientes ($p=0.001$). Las personas con maloclusión severa tuvieron una mayor frecuencia de episodios durante los cuales fueron objeto de burlas o se les insultó y les dio nombres debido a la condición de sus dientes en comparación con las personas con maloclusión leve ($p=0.013$). Los individuos con maloclusión severa tuvieron una mayor frecuencia de episodios en los que se sintieron molestos debido a sus dientes en comparación con individuos con maloclusión leve ($p<0,001$), individuos con maloclusión moderada ($p=0,002$) y aquellos con maloclusión definida ($p=0.001$). Conclusión: la maloclusión grave se asoció con problemas psicosociales en adolescentes.

Palabras Clave: Adolescente, Maloclusión, Impacto Psicosocial.

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INTRODUCTION.

Malocclusion is a developmental and growth alteration that affects tooth position or the relationship between the maxilla and the mandible. Occlusal changes are usually a result of the interaction of genetic and environmental factors, such as dental trauma, early loss of primary teeth, loss of permanent teeth, and deleterious oral habits (thumb sucking and mouth breathing, for instance). These factors, isolated or otherwise, contribute to the development of malocclusion on the young individual.¹ Depending on the type of genetic factor or the frequency, intensity, and duration of deleterious oral habits, the changes may be exacerbated, resulting in severe or very severe malocclusion.² Malocclusion severity may be assessed by means of epidemiological tools, such as the Index of Orthodontic Treatment Need (IOTN)³ or the Dental Aesthetic index (DAI).⁴

Malocclusion has been shown to be associated with psychosocial issues among adolescents.^{5,6} Usually, these issues are evaluated through questionnaires on self-esteem and quality of life, such as the Rosenberg scale⁷ and the Child Perceptions Questionnaire.⁸

The Child Perceptions Questionnaire, for instance, was originally developed in Canada and was translated, cross-culturally adapted and validated in South American countries, including Brazil⁹ and Peru.¹⁰

Occlusal changes have been associated with low self-esteem among young individuals.¹¹ Adolescents with class II malocclusion and a great projection of maxillary incisors usually feel that their dentofacial appearance is inadequate and this characteristic reverberates on the well-being of the individual during adolescence.¹² Crowding may also be associated with psychosocial issues. A young person with tooth misalignment may have a negative perception regarding their dentofacial condition.¹³ To date, oral health researchers have been concerned in evaluating the association between malocclusion and psychosocial issues. However, few studies have investigated the effects of severe malocclusion on the well-being of adolescents.^{14,15} Thus, the objective of this article was to evaluate the association between the severity of malocclusion and psychosocial issues among Brazilian adolescents. Psychosocial issues were assessed by means of two questions through which the adolescents were asked about whether a classmate had

teased or had called them names due to the condition of their teeth or whether the adolescents had felt upset because of their teeth.

MATERIALS AND METHODS.

The reporting of this study has followed The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.¹⁶

Participants, setting, data collection period and eligibility criteria.

This study involved 120 adolescents, between 11 and 12 years of age, who were referred for orthodontic treatment with fixed appliances to the *Dental School of the Federal University of Minas Gerais* (UFMG) in Belo Horizonte, Brazil, between October 2011 and July of 2013. The inclusion criteria were: fluency in the Brazilian Portuguese language.

Exclusion criteria were: individuals with cognitive disorders, individuals with syndromes, those with a history of dental trauma, dental caries and/or gingival problems and those who had undergone any type of dental treatment in the last three months. Dental trauma, dental caries and gingival problems were evaluated using the Andreasen criteria, the *World Health Organization* (WHO) criteria and the Løe criteria as reported elsewhere.^{17,18}

Ethics

The study was evaluated and approved by the *Committee of Ethics in Research of UFMG* (Protocol: 0421.0.203.000-11). The adolescents signed a free and informed assent form. Parents/caregivers signed an informed consent form. Participation was voluntary. Assurance of anonymity was guaranteed to the participants. No incentive for participation in the survey was offered to any of the adolescents or their parents/caregivers.

Data collection: Assessment of psychosocial issues

The adolescents were asked about whether a colleague had teased or called them names due to the condition of their teeth or whether the adolescents had felt upset because of their teeth. For the evaluation of these outcomes, two questions were selected from the short form of the Child Perceptions Questionnaire (CPQ11-14) questionnaire.¹⁹ This questionnaire was developed in Canada and adapted for use in the Brazilian Portuguese language.²⁰

For the evaluation of teasing and name-calling by classmates, the adolescents answered the following question: "In the last 3 months, how often have other children teased or called you names because of your teeth, lips, mouth or jaw?" For the assessment of whether the adolescents felt upset, they answered the following question: "In the last 3 months, how often have you been upset because of your teeth, lips, jaw or mouth?" Each question had five response options with a specific score system: never (0), once or twice (1), sometimes (2), often (3), every day or almost every day (4). A higher score indicated a higher frequency of episodes in which the adolescents had been teased or called names by their peers and a higher frequency of episodes in which they had felt upset by the condition of their teeth.²⁰

Independent variables:

Malocclusion evaluation

Adolescents' malocclusion was considered the main independent variable of this study. Malocclusion was assessed according to the Dental Aesthetic Index (DAI).⁴ For the use of the index, the assessor received training in two phases. The training was coordinated by a dentist with experience in epidemiological studies.

During the first phase, a theoretical discussion on DAI was carried out. The second phase consisted of the clinical evaluation of 15 adolescents, who did not participate in the main study. The assessor examined adolescents twice with a 10-day interval. For the analysis whether the assessor was able to perform the diagnosis of malocclusion, the Kappa coefficient was calculated. The results ranged from 0.84 (agreement between the assessor and the experienced dentist) to 0.90 (intra-assessor agreement) and were considered satisfactory.

The DAI consists of the evaluation of 10 occlusal characteristics: number of missing teeth, crowding, spacing, midline diastema, greater anterior superior irregularity, greater anterior inferior irregularity, overjet, anterior crossbite, open bite and relationship between the upper and lower first molars.

Each score given to these characteristics is multiplied by a coefficient and the sum of the scores is added to the constant 13. According to the DAI score, adolescents could be assigned to one of the following four groups: adolescents with mild malocclusion with slight

orthodontic treatment need ($DAI \leq 25$), adolescents with moderate malocclusion for whom orthodontic treatment was elective ($DAI = 26-30$), adolescents with definite malocclusion for whom orthodontic treatment was recommended ($DAI = 31-35$) and those with severe malocclusion for whom orthodontic treatment was mandatory ($DAI \geq 36$).⁴

Family monthly income

Family income along with adolescents' sex and age was also evaluated. Family income was calculated as the sum of the monthly wage of all the members of the adolescents' families. The sum of family income was divided by the value of the Brazilian minimum wage (BZMW), which, at the time of the study, was R\$622.00. Adolescents were categorized as individuals whose families had a monthly income of 1 BZMW or less, greater than 1 and less than or equal to 3 BZMWs, greater than 3 and less than or equal to 5 BZMWs, and greater than 5 BZMWs.

Statistical analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences software (SPSS, Inc., version 22.0, Chicago, IL., USA). A descriptive analysis was performed to evaluate the sociodemographic characteristics and adolescents' orthodontic treatment need. The Kolmogorov-Smirnov test showed that the quantitative data had a non-normal distribution. Thus, non-parametric tests were performed.

The Kruskal-Wallis test (statistical significance set at $p < 0.05$) and the post hoc test (statistical significance set at $p < 0.016$) were used to evaluate the association of malocclusion severity (mild, moderate, definite and severe) and the frequency of episodes in which the adolescents had been teased or called names by their peers and the frequency of episodes in which they had felt upset by the condition of their teeth.

RESULTS.

Out of the 120 adolescents invited to participate in this study, 117 accepted (response rate=97.5%). Figure 1 displays a flowchart of the present study. Of the 117 participants, 52 were boys (44.4%) and 65 were girls (55.6%). The mean age of adolescents was 11.50 years (± 0.50). Family monthly income and adolescents' need

for orthodontic treatment are shown in Table 1.

Table 2 shows the median and the mean frequency of episodes in which adolescents with different degrees of malocclusion severity were teased or called names due to the condition of their teeth or had felt upset because of their teeth. The more severe the malocclusion, the greater the frequency of episodes of teasing or name-calling because of the teeth ($p=0.010$) and the greater the frequency of episodes in which the adolescents had felt upset because of their teeth ($p=0.001$).

Table 3 shows the results of comparisons between adolescents with severe malocclusion and adolescents with

mild malocclusion, adolescents with moderate malocclusion, and adolescents with definite malocclusion. Individuals with severe malocclusion suffered a higher frequency of teasing or name-calling episodes due to the condition of their teeth when compared to individuals with mild malocclusion ($p=0.013$).

Individuals with severe malocclusion had a higher frequency of episodes in which they felt upset because their teeth when compared to individuals with mild malocclusion ($p<0.001$), individuals with moderate malocclusion ($p=0.002$), and those with definite malocclusion ($p=0.001$).

Figure 1: Flowchart of this study.

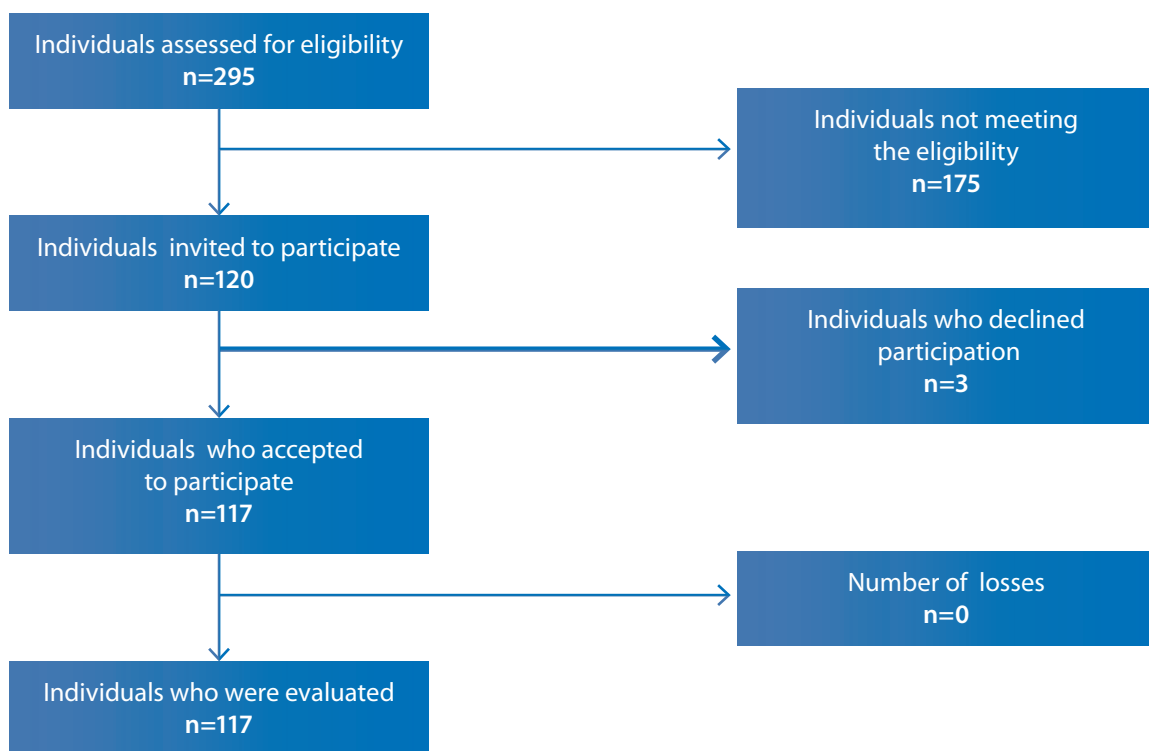


Table 1. Socioeconomic characteristics and adolescents' orthodontic treatment need.

			Number (%)
Family monthly income (BZMW or BZMWs)	≤1	Brazilian Minimum Wage	20 (17.1)
	1 – 3	Brazilian Minimum Wages	67 (57.3)
	3 – 5	Brazilian Minimum Wages	19 (16.2)
	>5	Brazilian Minimum Wages	11 (9.4)
Dental Aesthetic Index (DAI)	≤25		40 (34.2)
	26 – 30		33 (28.2)
	31 – 35		27 (23.1)
	≥36		17 (14.5)

Table 2. Comparison of teasing and feeling upset among adolescents with different degrees of malocclusion.

	DAI≤25	DAI=26 – 30	DAI=31 – 35	DAI≥36	p-value*
	Mean	Mean	Mean	Mean	
	Median (Min – Max)	Median (Min – Max)	Median (Min – Max)	Median (Min – Max)	
Question 1	0.58	0.70	0.74	1.59	0.010
	0.00 (0.00 – 4.00)	0.00 (0.00 – 4.00)	0.00 (0.00 – 4.00)	1.00 (0.00 – 4.00)	
Question 2	0.35	0.55	0.48	1.47	0.001
	0.00 (0.00 – 3.00)	0.00 (0.00 – 2.00)	0.00 (0.00 – 2.00)	1.00 (0.00 – 4.00)	

DAI: Dental Aesthetic Index. *Kruskal-Wallis test. **Statistical Significance:** $p < 0.016$. DAI≤25: Mild malocclusion. DAI=26-30: Moderate malocclusion. DAI=31-35: Definite malocclusion. DAI≥36: Severe malocclusion. **Question 1:** In the last 3 months, how often have other children teased or called you names because of your teeth, lips, mouth or jaw? **Question 2:** In the last 3 months, how often have you been upset because of your teeth, lips, jaw or mouth?

Table 3. Comparison of teasing and feeling upset between adolescents with severe malocclusion and adolescents with mild, moderate and definite malocclusion.

	DAI≤25xDAI≥36	DAI=26-30xDAI≥36	DAI=31-35xDAI≥36
	p-value*	p-value*	p-value*
Question 1	=0.013	=0.046	=0.078
Question 2	<0.001	=0.002	=0.001

DAI: Dental Aesthetic Index. *Kruskal-Wallis test. **Statistical Significance:** $p < 0.016$. DAI≤25: Mild malocclusion. DAI=26-30: Moderate malocclusion. DAI=31-35: Definite malocclusion. DAI≥36: Severe malocclusion. **Question 1:** In the last 3 months, how often have other children teased or called you names because of your teeth, lips, mouth or jaw? **Question 2:** In the last 3 months, how often have you been upset because of your teeth, lips, jaw or mouth?

DISCUSSION.

The findings of the present study demonstrate that severe malocclusion was associated with a higher frequency of episodes of teasing and name-calling due to the condition of the adolescents' teeth, or episodes when the adolescents had felt upset because of their teeth. Similar results have been presented elsewhere.^{21,22} Such episodes may be the result of a more unfavorable dento-facial appearance caused by a very exaggerated occlusal alteration.²³ Adolescents with misaligned teeth and/or problems with an inadequate relationship between the maxilla and the mandible may feel frustrated or unhappy with their unattractive appearance.^{17,18}

During adolescence, more severe occlusal discrepancies can even force the affected individuals to remain in social isolation because such young individuals feel they are unable to be accepted by their peers or they are afraid of any hostility that might take place towards them due to their adverse oral condition.²⁴

Therefore, the distress and disappointments that the adolescent comes up against may be due to verbal

harassment from their classmates. In cases of more extreme provocations, the individual might be a victim of bullying.²⁵ Though not evaluated in the present study; this phenomenon has been commented in the orthodontic literature. Bullying is characterized by attitudes of verbal and even physical violence that occur repeatedly and intentionally against a victim.²⁶

Adolescents, using as justification the unfavorable appearance of a classmate, stigmatize as well as physically and verbally assault the individual. Victims of bullying may experience anxiety, low self-esteem and unsatisfactory school performance, as the school environment is recognized as a source of hostility.²⁷ In the United States, the estimate of young individuals threatened or frigh-tened at school was nearly 20% in 2017. The origin of some of these events may be associated with body and craniofacial characteristics, such as severe malocclusion.²⁸ A comprehensive approach involving health care providers, particularly dentists, families, schools and the community may be useful in addressing this issue.²⁹

The information presented in this study may be useful

to the orthodontist, who is concerned in providing interceptive and corrective orthodontic treatment for children and adolescents. During the counseling of parents/caregivers, the orthodontist may use as justification for the early management of any craniofacial issue, the likely adverse psychosocial repercussions of severe malocclusion.^{30,31}

For instance, early treatment for children and adolescents with Class II malocclusion and incisor protrusion is often recommended under the claim that an improved dental appearance following the correction of the projection of anterior teeth may benefit the children or the adolescents, increasing their self-confidence and enhancing their capability of socialization.³² The clinician should be aware of the psychological effects of severe malocclusion on patients in order to encourage these individuals to take the steps towards early treatment and to have solid information as a basis for providing assertive anticipatory guidance to parents/caregivers.³³

The assessment of malocclusion severity and the need for orthodontic treatment in the public health system is extremely important to assist in the determination of treatment priorities in oral health facilities and in the planning of how financial resources will be spent to adequately meet the existing demand. In countries where orthodontic treatment is provided in the public health system, such as Finland, the resources available do not meet the high demand of patients seeking orthodontic therapy.

Thus, it is necessary to select patients to ensure service to those who have a greater need for treatment.³⁴

Indeed, in cases of high demand for orthodontic treatment, it is necessary to establish parameters that guide public health decision makers to prioritize the provision of treatment to individuals with a greater need.³⁵ In this sense, the results of the present study become relevant. One could conclude that an individual with a more severe occlusal discrepancy may feel more disappointed or unhappy than another with minor occlusal changes, indicating that the former should have preference for treatment in relation to the latter.³⁴

The present study was restricted to the assessment of the association of severe malocclusion with psychosocial

issues. Thus, future research evaluating the association between severe occlusal discrepancies and the occurrence of symptoms and functional limitations should be encouraged.³⁶

Individuals with malocclusion may present dental caries or problems related to the periodontal condition due to inadequate tooth alignment.^{37,38} Dental caries and periodontal issues may be associated with the occurrence of pain, bleeding, bad breath or food stuck in or between the teeth.^{39,40}

It would also be relevant to evaluate whether particular occlusal characteristics are associated with challenges faced by the individuals in performing oral functions. Last, but not least, additional studies should include in their objectives, assessments of the psychosocial repercussions and the extent of the impact of the treatment of severe malocclusion on adolescents.^{41,42} Evaluations of the relationship between orthodontic outcomes and bullying should also be taken into account.²⁶

CONCLUSION.

Severe malocclusion was associated with a higher frequency of episodes in which the Brazilian adolescents were teased or called names due to the condition of their teeth or episodes when the adolescents had felt upset because of their teeth.

Conflict of interests: The authors declare no conflict of interest.

Ethics approval: This study was approved by the Ethics Committee of the *Universidade Federal de Minas Gerais* (Protocol number: 0421.0.203.000-11).

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