SEVERE MALOCCLUSION NEGATIVELY IMPACTS ADOLESCENTS' QUALITY OF LIFE

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Palavras-chaves: Má Oclusão. Adolescente. Qualidade de Vida. Epidemiologia. Saúde Pública.

RESUMO

Objetivo: Avaliar o impacto da má oclusão severa na qualidade de vida relacionada à saúde bucal de adolescentes (OHRQoL). **Métodos:** Este estudo consistiu em uma amostra de 117 adolescentes entre 11 e 12 anos, que responderam à versão brasileira da forma abreviada do Child Perception Questionnaire (CPQ11-14). Este questionário tem 16 itens distribuídos igualmente em quatro domínios: sintomas bucais (SO), limitações funcionais (LF), bem-estar emocional (BE) e bem-estar social (BS). Escores mais altos indicam um impacto negativo maior na OHRQoL. A má oclusão foi avaliada por meio do Índice Estético Dental. Os adolescentes foram alocados nas seguintes categorias: sem má oclusão/má oclusão leve, má oclusão definitiva e má oclusão severa. Análise descritiva, teste de Kruskal Wallis, teste de Dunn, regressão logística univariada e multivariada foram conduzidas. **Resultados:** Indivíduos com má oclusão severa apresentaram escores significativamente mais elevados do que aqueles sem má oclusão/má oclusão leve para o BE (p=0,001), BS (p=0,027) e para o escore total do CPQ11-14 (p=0,015). Adolescentes com má oclusão severa apresentaram 2,63 vezes mais chance de apresentar um impacto negativo alto na OHRQoL do que aqueles sem má oclusão/má oclusão leve, independentemente das variáveis de confusão (IC=1,07-6,45, p=0,035). **Conclusão:** A má oclusão severa afeta negativamente a OHRQoL dos adolescentes.

Keywords: Malocclusion. Adolescent. Quality of life. Epidemiology. Public health.

ABSTRACT

Aim: To assess the impact of severe malocclusion on adolescents' oral health-related quality of life (OHRQoL). **Methods:** This study consisted of a sample of 117 adolescents between 11 and 12 years, who answered the Brazilian version of the short form of the Child Perception Questionnaire (CPQ_{11-14}). This questionnaire has 16 items distributed equally across four domains: oral symptoms (OS), functional limitations (FL), emotional well-being (EW) and social well-being (SW). Higher scores indicate a greater negative impact on OHRQoL. Malocclusion was evaluated using the Dental Aesthetic Index. Adolescents were assigned to the following categories: no or slight malocclusion, defined malocclusion and severe malocclusion. Descriptive analysis, the Kruskal Wallis test, post hoc test, univariate and multivariate logistic regression were conducted. **Results:** Individuals with severe malocclusion presented significantly higher scores than those with no or slight malocclusion for the EW (p=0.001), SW (p=0.027) and for the overall CPQ_{11-14} score (p=0.015). Adolescents with severe malocclusion showed a 2.63 greater chance of presenting a high negative impact on OHRQoL than those with no or slight malocclusion regardless of the confounding variables (CI=1.07–6.45, p=0.035). **Conclusion:** Severe malocclusion negatively impacts adolescents' OHRQoL.

Submitted: February 14, 2019
Modification: April 4, 2019
Accepted: April 5, 2019

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INTRODUCTION

The term oral health-related quality of life (OHRQoL) has been acknowledged as the functional and psychosocial repercussions of oral outcomes on people's lives. Studies evaluating OHRQoL have become viable through the use of psychometric quality of life instruments that have been developed to reliably assess such impact.[1] In the past, the focus of dental research was on the evaluation of the effect of oral outcomes on the quality of life of adult individuals. Over the last decade, however, there has been the emergence of many instruments for the assessment of OHRQoL among children and adolescents. These instruments allow researchers to examine the impact of a number of oral conditions on young individuals' quality of life.[2]

Oral health outcomes, such as caries and dental trauma may have a quite significant effect on adolescents' OHRQoL. Adolescent individuals affected by severe dental caries and those with dental fractures involving dentin/pulp show a more deteriorated quality of life than adolescents with no caries and those with no dental trauma or only minor fractures.[3,4] For dental caries, in particular, OHRQoL is very much deteriorated due to the emergence of symptoms, oral functioning impairment and psychosocial issues[5]. The repercussions go far beyond the young individual himself/herself. In the face of serious illness, parents/caregivers may feel regretful because their sons'/daughters' oral health condition. The number of parents/caregivers reporting family conflicts and time during which they need to interrupt their work activities due to dental appointment for their sons'/daughters' to solve oral health problems cannot be ignored.[3]

Other oral health issues, such as tooth misalignment and skeletal discrepancies have also been in the spotlight. Severe alterations may be scrutinized as unattractive by young individuals, leading to episodes of embarrassment and distress depending on ones' parameters.[6] Thus, the aim of this study was to assess the impact of severe malocclusion on adolescents' quality of life using an OHRQoL questionnaire, which evaluates oral symptoms, functional limitations, emotional well-being and social well-being[7] The null hypothesis was that severe malocclusion has no impact on young individuals' ORHQoL.

MATERIALS AND METHODS

Study design, participants, setting and eligibility criteria

A total of 120 adolescents between 11 and 12 years referred to orthodontic treatment at the Dental School of the Federal University of Minas Gerais in Belo Horizonte, Brazil were invited to take part in this study. The inclusion criteria were as follows: literate adolescents who were fluent in the Brazilian Portuguese language. Adolescents with syndromes or craniofacial anomalies were excluded from the study. So were those with dental caries, dental trauma or gingival diseases. Dental caries was diagnosed by means of the World Health Organization (WHO) criteria.[8] Dental trauma was diagnosed by means of the Andreasen criteria.[9] Gingival issues were identified using the guidelines of Löe. [10]

Ethical issues

Approval of the Ethics Committee of the Federal University of Minas Gerais was obtained. The right to refuse to participate in the study was guaranteed to adolescents and their guardians. For those who accepted to participant, written consent was obtained prior to data collection.

Variables

This cross-sectional study assessed the impact of malocclusion (independent variable) on adolescents' OHRQoL (dependent variable), controlling for adolescents' sex and age as well as household income (confounding variables).

OHRQoL assessment

Adolescents' OHRQoL was evaluated by means of the short form of the Child Perceptions Questionnaire (CPQ_{11-14}), which was designed in Canada in the English language[7] and was translated into Brazilian Portuguese and cross-culturally adapted for use on the Brazilian population.[11] The CPQ_{11-14} is made up of 16 questions equally distributed across four domains: oral symptoms (four questions), functional limitations (four questions), emotional well-being (four questions) and social well-being (four questions). The four-factor structure of CPQ_{11-14} has been confirmed by confirmatory factor analysis.[12] The 16 questions have five response options following an ordinal scale: never = 0, once/twice = 1, sometimes = 2, often = 3 and every day/almost every day = 4. Therefore, the overall CPQ_{11-14} score ranges from 0 to 64. A higher score is indicative of a greater negative perception on the part of the adolescent regarding the impact of oral outcomes on his/her quality of life. Scores for the four domains are also attainable.

Malocclusion evaluation

Malocclusion was assessed by means of the Dental Aesthetic Index (DAI).[13] The DAI is composed of 10 occlusal characteristics distributed across three pieces: dentition, crowding/spacing and occlusion.

• Dentition: number of missing teeth (incisors, canines and pre-molars)

• Crowding/spacing: crowding in the anterior teeth, spacing in the anterior teeth and diastema between the upper central incisors, greatest irregularity of the anterior teeth on the maxilla and greatest irregularity of the anterior teeth on the mandible

• Occlusion: maxillary overjet, mandibular overjet, anterior open bite and relationship between permanent upper first molar and permanent lower first molar.

The study's participants were examined and scores for each characteristic were provided. The scores were multiplied by a rounded coefficient, summed and the constant 13 was added to obtain the overall DAI score for each participant. Taking into consideration the overall DAI score, participants could be assigned to four malocclusion categories: DAI ≤ 25 (adolescents with no or slight malocclusion), DAI = 26 – 30 (adolescents with defined malocclusion), DAI = 31 – 35 (adolescents with severe malocclusion) and DAI ≥ 36 (adolescents with very severe malocclusion). In this study, individuals with severe malocclusion were placed along with individuals with very severe malocclusion in the severe malocclusion category. Thus, the participants were categorized as follows: adolescents with DAI ≤ 25 (no or slight malocclusion), adolescents with DAI = 26 – 30 (defined malocclusion) and adolescents with DAI ≥ 31 (severe malocclusion).

The dentist, who conducted the exams for malocclusion evaluation was calibrated by an orthodontist. This training was composed of a theoretical and a practical component. During the first, the orthodontist discussed the theoretical basis of the DAI with the dentist. During the second, 15 adolescents were examined by both assessors and the inter-examiner agreement was calculated. Ten day later, the adolescents were re-evaluated by the dentist and the intra-examiner agreement was calculated. Kappa coefficients were 0.84 for inter-examiner agreement and 0.90 for intra-examiner agreement.

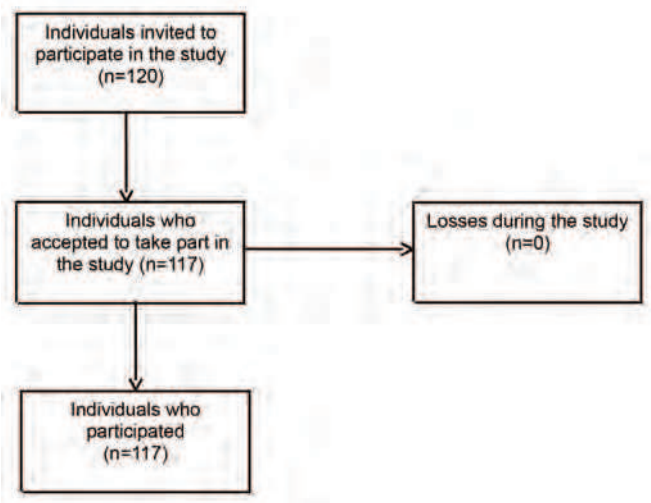
Household income of adolescents' families

The household income of each adolescent's family was measured in terms of the minimum wage in Brazil (MMW), which was equal to US$ 325.00 at the time of the study and was determined as the sum of the income of all family members who accomplished labor activities. Household income was dichotomized, considering the median, as follows: adolescents whose families had a household income lower or equal to three MMWs (≥ 3 MMWs) and adolescents whose families had a household income higher than three MMBs (> 3 MMWs).

Statistical analysis

Data analysis was accomplished using the Statistical Package for the Social Sciences (SPSS for windows, version 22.0. IBM Corporation, North Castle, NY, USA). Descriptive statistics was carried out. Comparisons among the adolescents with different degrees of malocclusion (adolescents with DAI ≤ 25, adolescents with DAI = 26 – 30 and adolescents with DAI ≥ 31) regarding the domains and the overall CPQ_{11-14} score were performed by means of the Kruskal Wallis test (significance level set at $p<0.05$) and multiple comparison post hoc test (significance level set at $p<0.05$). Univariate logistic regression was carried out to evaluate the association of adolescents' overall CPQ_{11-14} score (dependent variable) with adolescents' malocclusion (independent variable), adolescents' sex and age as well as household income (confounding variables). Adolescents' malocclusion and confounding variables with a $p<0.20$ were incorporated into the multivariate logistic regression. For the final model, a $p<0.05$ was considered of statistical significance. For the univariate and the multivariate logistic regression, the participants were divided into two groups (high impact on OHRQOL group and low impact on OHRQoL group). To determine the groups to which the adolescents would belong, the median of the overall CPQ_{11-14} score was calculated. Adolescents with an overall CPQ_{11-14} score higher than the median were assigned to the high impact group. Adolescents with an overall CPQ_{11-14} score lower than the median were assigned to the low impact group.

RESULTS



Out of the 120 individuals initially admitted to this study, three provided missing information. Therefore, 117 adolescents participated in this study (response rate = 97.5%). Figure 1 displays the flowchart of the study. The mean age of adolescents was 11.50 years (±0.50). Table 1 and Table 2 display the results of the comparison among adolescents with different degrees of malocclusion regarding the domains and the overall CPQ_{11-14} scores. Differences were observed in

***Table 1**: Comparison of the overall CPQ11-14 score and domain scores among individuals with different degrees of malocclusion*

	DAI ≤ 25Mean (Median) Min – Max	DAI = 26 – 30Mean (Median) Min – Max	DAI ≥ 31Mean (Median) Min – Max	*p* value*
oral symptoms	3.73 (4.00) 0 – 8	4.15 (4.00) 0 – 11	3.98 (4.00) 0 – 10	0.735
functional limitations	2.58 (2.00) 0 – 11	3.30 (3.00) 0 – 14	3.30 (3.00) 0 – 9	0.367
emotional well-being	1.98 (2.00) 0 – 8	2.45 (2.00) 0 – 13	4.14 (4.00) 0 – 15	**0.001**
social well-being	1.80 (1.00) 0 – 8	2.21 (2.00) 0 – 7	3.55 (2.00) 0 – 17	**0.024**
overall score	10.08 (10,00) 2 – 25	12.12 (11.00) 0 – 45	14.75 (13.00) 4 – 38	**0.020**

*Note: *Kruskal Wallis test. Significance level set at p < 0.05. Bold means statistical significance. DAI ≤ 25: no or slight malocclusion, DAI = 26 – 30: defined malocclusion, DAI ≥ 31: severe malocclusion.*

***Table 2**: Comparison of the overall CPQ_{11-14} score and domain scores between pairs of groups of individuals with different degrees of malocclusion*

	Comparison DAI ≤ 25 x DAI= 26 – 30 *p* value*	Comparison DAI ≤ 25 x DAI ≥ 31 *p* value*	Comparison DAI = 26 – 30 x DAI ≥ 31 *p* value*
oral symptoms	0.999	0.999	0.999
functional limitations	0.715	0.628	0.999
emotional well-being	0.999	**0.001**	0.021
social well-being	0.999	**0.027**	0.169
overall score	0.752	**0.015**	0.398

*Note: *Multiple comparison post hoc test. Significance level set at p < 0.05. Bold means statistical significance. DAI ≤ 25: no or slight malocclusion, DAI = 26 – 30: defined malocclusion, DAI ≥ 31: severe malocclusion.*

***Table 3**: Univariate and multivariate analysis evaluating the association of malocclusion and the overall CPQ_{11-14} score*

	High Impact N (%)	Low Impact N (%)	Univariate Analysis OR (95% CI)	*p* value*	Multivariate Analysis OR (95% CI)	*p* value**
Gender						
Male	21 (38.2)	31 (50.0)	1	0.199	1	0.144
Female	34 (61.8)	31 (50.0)	1.61 (0.77 – 3.38)		1.76 (0.82 – 3.78)	
Age						
11 years	26 (47.3)	32 (51.6)	1	0.639	—	—
12 years	29 (52.7)	30 (48.4)	1.18 (0.57 – 2.46)			
Household Income						
≤ 3 MMWs	41 (74.5)	46 (74.2)	1.1 (0.44 – 2.30)	0.965	—	—
> 3 MMWs	14 (25.5)	16 (25.8)	1			
Orthodontic Need - (DAI)						
≤ 25	14 (25.5)	26 (41.9)	1		1	
26 - 30	16 (29.1)	17 (27.4)	1.39 (0.56 – 3.46)	0.469	1.54 (0.61 – 3.89)	0.359
≤ 31	25 (45.5)	19 (30.6)	2.44 (1.01 – 5.91)	0.047	2.63 (1.07 – 6.45)	**0.035**

*Note: N=number; OR=odds ratio; CI=confidence interval. *Values of p < 0.20 were incorporated into the multivariate analysis; **Statistical significance set at p < 0.05. Bold means statistical significance in the multivariate analysis. DAI ≤ 25: no or slight malocclusion, DAI = 26 – 30: defined malocclusion, DAI ≥ 31: severe malocclusion*

the emotional well-being (p=0.001), social well-being (p=0.024) and in the overall CPQ_{11-14} score (p=0.020) (Table 1). Individuals with severe malocclusion (DAI ≥ 31) presented significantly higher scores than those with no or slight malocclusion (DAI ≤ 25) for the emotional well-being (p=0.001), social well-being (p=0.027) and for the overall CPQ_{11-14} score (p=0.015). Individuals with severe (DAI ≥ 31) also presented significantly higher scores than those with defined malocclusion (DAI = 26 – 31) for the emotional well-being (p=0.021) (Table 2).

Table 3 shows the results of the univariate and the multivariate logistic regression. The confounding variable sex had a p<0.20 in the association with the dependent variable adolescents' overall CPQ_{11-14} score and was incorporated along with the independent variable malocclusion into the multivariate analysis. In the multivariate analysis, adolescents with severe malocclusion (DAI ≥ 31) showed a 2.63 greater chance of presenting a high negative impact on OHRQoL than their peers with no or slight malocclusion (DAI ≤ 25) regardless of the confounding variables (CI=1.07 – 6.45, p=0.035).

The sample power calculation was carried out using the Power and Sample Size Calculation Program (PS, version 3.0, Nashville, TN, USA). The study was conducted with 55 adolescents with high impact on OHRQoL and 62 adolescents with low impact on OHRQoL. The difference regarding the overall CPQ_{11-14} score between groups was 11.06. The pooled standard deviation was 7.73. Taking into account the type I error of 0.05, the null hypothesis has been rejected with a power of 95%.

DISCUSSION

The aim of this study was to assess the impact of severe malocclusion on adolescents' quality of life. The null hypothesis that severe malocclusion has no impact on adolescents' ORHQoL has been rejected. Our findings showed that adolescents with severe malocclusion presented a greater negative impact on their quality of life than adolescents with no or slight malocclusion. The major repercussions of this adverse effect were upon individuals' emotional well-being and the social well-being. No significant impact on the oral symptoms and functional limitations domains was observed. Usually, deterioration of symptoms and functional limetations is associated with dental caries.[4]

Adolescence is a transitional phase during which individuals develop their identity and person's individuality as well as begin to have opinions, values and beliefs. At this stage of life, the individual seeks to interact well with peers in groups of friends and, ultimately, be widely recognized by his/her colleagues. Thus, adolescents are extremely concerned about their appearance and the aesthetics of the body itself.[14] Highly exacerbated dentofacial changes, such as severe malocclusion, have an adverse effect on a young individual's emotional well-being[15] because they can cause discomfort for the affected individual, who feels embarrassed in front of his/her colleagues or even afraid of being harassed for having unattractive facial features. In this regard, very exaggerated discrepancies may impair the acceptance of an adolescent by his/her peers,[16] which, in turn, will jeopardize the establishment of interpersonal relationships, negatively affecting the individual's social well-being repercussions on young individual's psychological state and on his/her emotional well-being may also take place.[17]

For instance, among individuals with excessive maxillary growth and/or mandibular deficiency and among those with exaggerated pro-inclination of upper incisors, some studies have shown that the presence of the occlusal discrepancy may increase the risk of teasing by colleagues. In more severe situations, these provocations may evolve into verbal abuse and even physical aggression, which has been acknowledged in the literature as bullying.[18] An adolescent, who is a victim of bullying tends to isolate himself/herself and to avoid having close ties with individuals at the same age. In some extreme cases, the school performance of the young individual may be impaired and this individual may engage in isolation.[19] These negative changes in the emotional state may perpetuate during adulthood, making this adolescent a low self-esteem individual.[20]

The results of this study are important for the clinical practice of the health care provider and for the organization of public health services as a whole. Aware that dentofacial changes may be associated with psychosocial well-being impairment, the dentist in primary care should be concerned in counseling the young individual and his/her parents/caregivers regarding the negative impact that severe occlusal alterations may have on his/her quality of life[21] and the repercussions of malocclusion on the long-term.[22] The clinician should also emphasize the functional and psychosocial benefits of orthodontic treatment and the importance of the young individual undergoes treatment for the correction of malocclusion as early as in the adolescence.[23] The pediatrician, the family physician or the physician in primary care can also have the benefit of the information presented herein. During the physical examination, an uncomplicated assessment of the adolescent may allow the pediatric provider to identify craniofacial issues. Awareness of the psychosocial impairment that occlusal changes may cause to an adolescent will assist the provider in the anticipatory guidance and health education of the young individual and his/her parents/caregivers. The health care provider should be able to recognize malocclusion and to refer the adolescent to the orthodontist, strengthening his/her (of the provider)

advocacy that interceptive and comprehensive orthodontic treatment should take place as early as possible.[24] The dentist in the oral health service, where orthodontic treatment is provided should be concerned in providing counseling for individuals with more severe malocclusion, because the aesthetic impairment and the deterioration of their emotional and social well-beings and their overall quality of life.[25] Thus, the individual with a severe occlusal discrepancy should be under surveillance during the time he/she is waiting for because severe malocclusion may have not only functional repercussions,[26] but also because it implies in psychosocial damage to the adolescent.[27]

Quality of life research provides a comprehensive and data-guided attempt to assess health care routine procedures upon the non-biological and qualitative elements of the impact of oral outcomes, such as malocclusion on individuals' lives. Interdisciplinary quality of life research builds data and provides valuable insight into issues that are related, not only to that specific individual in the circumstances of oriented policies for clinical management, but that can be generalized to the entire population by means of an epidemiological outlook. When data on epidemiology and assessments of quality of life among the prospective recipients of care guide health care policies, ameliorated pathways to the management of health services may become feasible.[28] Public health strategies based on massive information, adequate rapport between the provider, the adolescent and his/her guardians regarding the adverse consequences of malocclusion over the adolescents' well-being, the anticipated referral of the patient and the adoption of preventive measures, to avoid severe occlusal discrepancies should be a priority in the public health system, rather than the delayed supply of therapy targeting malocclusion at a later moment, when the psychosocial consequences of severe malocclusion over the young individual may have already taken place.[29]

Another barrier to adopt epidemiological data, such as data on quality of life to drive public health regards the institutionalized culture that relies on technology and sophisticated treatment modalities as the most appropriate determinant to deal with health issues. In the case of Dentistry and its allied subspecialties, such as Orthodontics the confidence in technology (complex therapeutic techniques and highly advanced diagnostic resources) needs to be mitigated, as public health services must be in motion towards less costly and uncomplicated health care alternatives, providing appropriate counseling about the negative effects of malocclusion and guaranteeing preventive measures to deal with occlusal and skeletal alterations to as many users as possible and as timely as feasible.[30] In this regard, public health policies should be tailored for the appropriate information of the individual regarding malocclusion itself and the repercussions of this outcome on his/her quality of life, appealing to the adolescent and his/her parents/caregivers that they should take part in the process of clinical decision-making, as malocclusion has adverse implications for the young patient and his/her family. The literature urges that healthcare services encourage communication among the provider, the patient and his/her guardians. If it happens otherwise, with epidemiology[28] and the concept of quality of life[30] failing to orient public health initiatives, health care expenditures will rise and public health services may suffer unprecedented challenges.

For further research, more in-depth studies on malocclusion among adolescents and its association with bullying are suggested, since few publications on this topic have been found in the literature. In addition, the benefits of orthodontic treatment could also be evaluated. So could the likelihood of the provision of this type of treatment in reducing episodes of teasing or even bullying among adolescent individuals.[18] Applied research on the qualitative effect of therapies may also assist in the assessment of the amount of resources spent by healthcare systems at different phases of the condition treated. The components in the development and application of health care knowledge and interventions could be improved by quality of life research, including laboratory research and basic science, clinical research and procedures, training of health care providers and adequate practice of public health.[30]

CONCLUSION

Severe malocclusion negatively impacts adolescents' quality of life. Significant repercussions take place on individuals' emotional and social well-being.

ACKNOWLEDGEMENTS

Support from FAPEMIG, CAPES, CNPq and Pro Reitoria de Pesquisa da Universidade Federal de Minas Gerais (PRPq/UFMG) is sincerely recognized.

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