

Impact of malocclusion on oral health-related quality of life of preschool children

Impacto da malocclusão na qualidade de vida relacionada à saúde bucal em pré-escolares

Guilherme Nascimento da ROSA¹
Bruna Cássia Schmit BUZZATI¹
Chaiana PIOVESAN²
Fausto Medeiros MENDES³
Marta Dutra Machado OLIVEIRA¹
Thiago Machado ARDENGHI¹

ABSTRACT

Objective

This study assessed the relationship of dental malocclusion with COHRQoL considering socioeconomic backgrounds and clinical factors.

Methods

A survey was carried out in Santa Maria, Brazil, during the National Children's Vaccination Day. The sample comprised 478 children aged 12 to 59 months. Fifteen trained and calibrated examiners evaluated the presence of anterior malocclusion traits (AMT) - anterior open bite, overjet and sealing lip. COHRQoL was measured through overall scores of the Brazilian version of ECOHIS (Early Childhood Oral Health Impact Scale). The assessment of association used adjusted Poisson regression models.

Results

The unadjusted assessment observed age, untreated dental caries and anterior open bite as the main covariates of the overall ECOHIS score. After the adjustment, the presence of anterior open bite had a negative impact on COHRQoL. There was no association between overjet and sealing lip with COHRQoL.

Conclusion

In conclusion, anterior open bite present a negative impact on COHRQoL.

Indexing terms: Child. Epidemiology. Malocclusion. Quality of life.

RESUMO

Objetivos

Este estudo avaliou o impacto da malocclusão dentária na qualidade de vida relacionada à saúde bucal, considerando fatores socioeconômicos e condições clínicas.

Metodos

Um estudo foi realizado em Santa Maria, Brasi, durante a Campanha Nacional de Multivacinação Infantil. A amostra compreendeu 478 crianças na faixa etária de 12 a 59 meses. Quinze examinadores treinados e calibrados avaliaram a presença de malocclusão na região anterior – mordida aberta anterior, overjet e selamento labial. na qualidade de vida relacionada à saúde bucal foi mensurada por meio de escores totais da versão em português do questionário ECOHIS (Early Childhood Oral Health Impact Scale). Para verificar as possíveis variáveis associadas foram aplicados modelos de regressão de Poisson.

Resultados

O modelo não ajustado revelou associação da idade, cárie dentária não tratada e e mordida aberta anterior aos escores totais do ECOHIS. Após o ajuste, verificou-se que mordida aberta anterior teve um impacto negativo na qualidade de vida relacionada à saúde bucal. Não houve associação entre a presença de overjet e elemento labial à qualidade de vida relacionada à saúde bucal.

Conclusão

Pode-se concluir que que mordida aberta anterior teve um impacto negativo na qualidade de vida relacionada à saúde bucal.

Termos de indexação: Criança. Epidemiologia. Má oclusão. Qualidade de vida.

¹ Universidade Federal de Santa Maria, Faculdade de Odontologia, Departamento de Estomatologia. Av. Roraima, 1000, Cidade Universitária, Camobi, Santa Maria, RS, Brasil. Correspondência para / Correspondence to: TM ARDENGHI. Email: <thiardenghi@hotmail.com>.

² Centro Universitário Franciscano, Faculdade de Odontologia. Santa Maria, RS, Brasil.

³ Universidade de São Paulo, Faculdade de Odontologia, Departamento de Odontopediatria. São Paulo, SP, Brasil.

INTRODUCTION

Dental malocclusion can produce aesthetic alterations in teeth or face, and functional changes involving the mastication, the phonation and occlusion¹⁻³. In Brazil, it has been shown that the prevalence of malocclusion can be considered a public health problem, with 22.01% of children under 5 years old presenting slight occlusal problem and 14.45% had moderate or severe problem⁴.

However, the exclusively use of such normative indicators has been considered inadequate for measuring oral health and orthodontics treatment needs⁵⁻⁶. It has been proposed that any criteria for definition of treatment needs should take into consideration how the health/disease interferes with children's daily activities and quality of life⁷⁻⁸. Nevertheless, assessing the self-report of oral health-related quality of life (OHRQoL) has been widely advocated as an adjunct to clinical examinations documenting the full impact of oral disorders on children's daily performance⁸. For this purpose, OHRQoL instruments have been developed for different age-groups and populations; the Early Childhood Oral Health Impact Scale (ECOHIS)⁷ is one of the instruments. It is a proxy measure of COHRQoL designed to assess the negative impact of oral disorders on quality of life among under-five-year-old children. The ECOHIS was developed in the United States but previous studies confirmed its validity and reliability in Brazil⁸⁻⁹.

There are few studies assessing the negative impact of malocclusion on COHRQoL and daily performance, specially using representative sample and taken into consideration the possible confounder effect of other clinical and socioeconomic variables¹⁰⁻¹¹. The results of such studies may contribute for a public health perspective, mainly to a full evaluation of treatment outcomes and to the definition of groups with higher levels of orthodontics need, thus instructing public health programs. The purpose of this study was to evaluate prevalence of malocclusion and its effect on OHRQoL of preschool children and their parents.

METHODS

Ethical aspects

This study was approved by the Committee for Ethics in Research, of the Federal University of Santa Maria n. 0270.0.243.000-09.

Subjects and study design

A survey was performed to assess the oral health status of 1 to 5 years-old preschool children in the city of Santa Maria, RS, located in the south of Brazil. The city has 263,403 inhabitants, with 27,520 children under 6 years old. This survey was performed during the National Children's Vaccination Day. According to the Ministry of Health, the vaccination program has had consistently uptake rates above 97%.

To assess prevalence malocclusion, the estimated minimum sample size was calculated assuming the following parameters: prevalence of anterior open-bite estimated at 34%¹¹, a standard error of 5%, confidence level of 95% and a design effect of 1.2. To cover non-response, the sample was increased by 10% to 455 mother-child dyads.

A sampling quota was selected from all children attending at health centres in the municipality. For this study, all health centers that possessed a dental chair (15 health centers) were used as sample points. These were the largest health centers in the city, and almost 90% of children visited these centers at the time that this study was undertaken. The sample was stratified according to the number of children in each area. Dental examiners were distributed throughout 15 health centres in Santa Maria During the survey, each fifth child in the queue for vaccination was invited to participate. If parents did not agree to participate, the next child in the queue was selected¹².

Data collection

Data were collected through clinical oral examinations and structured interviews. Children were examined seated on a dental chair using an operating light, a 3-in-1 syringe, plane dental mirror (dental plane mirror n. 5, Golgran, São Paulo, SP, Brazil), WHO periodontal probes (WHO - probe - Golgran, São Paulo, SP, Brazil), wet gauze pads and dental floss.

Clinical examination for recording dental caries, dental trauma and malocclusion were performed. The dental examination for dental trauma included only primary maxillary and mandibular incisors. The criteria for traumatic dental injuries used in the Children's Dental Health Survey in UK were adopted¹³. Prevalence and severity of dental caries were measured by the ICDAS criteria¹⁴. Prevalence of the three most commonly anterior malocclusion traits (AMT) found at preschool were assessed: anterior open bite, overjet, which was measured using a millimeter ruler, was considered as a

risk factor when it presented values higher than 3 mm. Lip coverage was considered adequate when the lips covered the anterior teeth completely in the at-rest position and inadequate if the majority of the crown height was exposed and visible. Fifteen examiners participated in the study; they had previous experience in oral health surveys and had been trained and calibrated by one benchmark examiner. Theoretical activities with discussion on diagnostic criteria of AMT- based on the diagnostic of photographic image- were performed. Then, a total of 10 children were examined twice by the same examiner, with an interval of two weeks between each examination; interexaminer and intraexaminer kappa values ranged from 0.8 to 0.9 and from 0.8 to 1.0, respectively.

Socioeconomic and demographic variables

To obtain socioeconomic data each child's guardian was interviewed using a structured questionnaire. The questionnaire provided information on age, gender, parents' education level, occupation and household income. The educational level compared those fathers and mothers who completed eight years of formal instruction, which in Brazil corresponds to primary school, with those who only completed a lower education (less than eight years of formal education). Household income was measured in terms of the Brazilian minimum wage, a standard for this type of assessment, which corresponded to approximately 280 US dollars during the period of data gathering. Occupational status discriminated the employed and unemployed parents.

Oral Health-related Quality of Life

The COHRQoL was assessed by the Brazilian version of the ECOHIS⁸⁻⁹. It consists of 13 items, including a child impact section (symptoms, function, psychological, self-image/social interaction domains) and a family impact section (parent distress and family function domains). Answers were recorded using a Likert scale with response options coded 0–5 (0 = never; 1 = hardly ever; 2 = occasionally; 3 = often; 4 = very often; 5 = don't know). Mean ECOHIS scores were calculated for each domain and for the whole scale as a simple sum of the response codes, after recoding all "Don't know" responses as missing. For those with up to two missing responses in the child section or one in the family section, a score for the missing items was imputed as an average of the remaining items for that section⁷. Parents with missing responses to more than two child items and one

family item were excluded from the analysis. Total score had a 0-52 range-the higher the score, the greater the impact of oral health problems and related treatment experiences on OHRQoL of preschool children and their families.

Statistical analyses

Data analysis was performed using STATA software (Stata 11.1 for Windows; Stata Corporation, College Station, TX, USA) and taking into account the survey design. For this propose, a weight variable was used in the statistical analysis to adjust for the potential bias in the population estimates. The association between the main predictor variable (malocclusion) and the outcomes (domain-specific and overall ECOHIS scores) was assessed using unadjusted and adjusted Poisson regression analysis. This strategy allowed estimating rate ratios (ratio of geometric means) and their respective 95% confidence interval controlling for potential covariates. We considered only those covariates that presented a p-value ≤ 0.20 in the unadjusted analyses for entry into the multivariate model; they were retained into the final models only if they had a p-value ≤ 0.05 after adjustment.

RESULTS

A total of 478 children, 48.5% boys, were enrolled in the study. Near 5 out of each 10 mothers, and 9 out of each 10 fathers were employed; more than half of families earned less than two Brazilian minimum wages. Prevalence of cavity of caries, dental trauma, overjet (≥ 3 mm), sealing lip and anterior open bite were 30.7, 14.1, 13.5, 10.3 and 26.8 respectively (Table 1).

Total ECOHIS scores ranged from 0 to 41 with an average of 1.9 (standard error = 0.21). Except for the child section -function domain, responses ranged from "never" (minimum) to "very often" (maximum). The highest mean was for child function domain and the lowest for the child self-image/social interaction and family function domains (Table 2).

The unadjusted assessment observed age, untreated dental caries and anterior open bite as the main covariates of the overall ECOHIS score. Analogous observations were performed for domain-specific ECOHIS scores (Table 3). The adjusted analysis showed that children with anterior open bite and cavity of caries had a negative impact on OHRQoL (Table 3).

Table 1. Sociodemographic and clinical characteristi

Variables	n	(%)
<i>Child's gender</i>		
Male	232	48.5
Female	246	51.5
<i>Child's age (months)</i>		
12 - 23	97	20.3
24 - 35	89	18.6
36 - 47	119	24.9
48 - 59	173	36.2
<i>Household income</i>		
≥ 2BMW	174	38.6
< 2BMW	277	61.4
<i>Mother's schooling</i>		
≥ 8 years	268	56.8
< 8 years	204	43.2
<i>Fathes's schooling</i>		
≥ 8 years	247	55.4
< 8 years	199	44.6
<i>Mother's occupation</i>		
Employed	231	49.5
Unemployed	236	50.5
<i>Father's occupation</i>		
Employed	412	90.0
Unemployed	46	10.0
<i>Cavity of Caries</i>		
No	331	69.3
Yes	147	30.7
<i>Dental trauma</i>		
Without	401	85.9
With	66	14.1
<i>Overjet</i>		
≤ 3mm	308	86.5
> 3mm	48	13.5
<i>Lip coverage</i>		
Adequate	417	89.7
Inadequate	48	10.3
<i>Anterior open bite</i>		
No	336	73.2
Yes	123	26.8

* BMW= Brazilian Minimum Wage.

Table 2. Descriptive distribution of total ECOHIS and domains scores. Santa Maria, Brazil (n = 478 mother-child dyads).

<i>ECOHIS domains</i>	Mean (SE)	Possible range	Range
<i>Child section</i>			
1. How often has your child had pain in the teeth, mouth, or jaws? (Symptoms)	0.3 (0.03)	0 - 4	0 - 4
How often has your child...because of dental problems or dental treatments? (Function)	0.5 (0.09)	0 - 16	0 - 15
2. Had difficulty drinking hot or cold beverages			
3. Had difficulty eating some foods			
4. Had difficulty pronouncing any words			
5. Missed preschool, daycare, or school			
How often has your child...because of dental problems or dental treatments? (Psychological)	0.4 (0.05)	0 - 8	0 - 8
6. Had trouble sleeping			
7. Been irritable or frustrated			
How often has your child ... because of dental problems or dental treatments? (Self-image/social interaction)	0.1 (0.05)	0 - 8	0 - 8
8. Avoided smiling or laughing when around other children			
9. Avoided talking with other children			
<i>Family section</i>			
How often have you or another family member ... because of your child's dental problems or dental treatments? (Parent distress)	0.4 (0.09)	0 - 8	0 - 8
10. Been upset			
11. Felt guilty			
How often ... (Family function)	0.1 (0.02)	0 - 4	0 - 4
12. Have you or another family member taken time off from work because of your child's dental problems or dental treatments?			
13. Has your child had dental problems or dental treatments that had a financial impact on your family?			
<i>Total ECOHIS</i>	1.9 (0.21)	0 - 42	0 - 41

ECOHIS early childhood oral health impact scale, ED standard error

Table 3. Univariate and final poisson regression for covariate associated with overall Early Childhood Oral Health Impact Scale.

	With trauma RR Unadj (95%CI)	With trauma RR Adjust (95%CI)	With AOB RR Unadj (95%CI)	With AOB RR Adjust (95%CI)	With Caries RR Unadj (95%CI)	With Caries RR Unadj (95%CI)
ECOHIS (overall scale)	1.64 (0.89-3.02)	*	1.58 (1.04-2.38)	1.52 (1.03-2.22)**	3.26 (2.29-4.65)	2.72 (1.64-4.48)**
<i>Domains</i>						
Symptoms	1.22 (0.70-2.11)	*	1.58 (1.04-2.38)	1.70 (1.08-2.66)**	3.41 (2.17-5.38)	2.72 (1.64-4.48)**
Function	1.90 (0.90-4.02)	*	2.37 (1.43-3.95)	2.24 (1.33-3.76)**	3.70 (2.28-6.01)	2.30 (1.40-3.79)**
Psychological	1.11 (0.49-2.50)	*	1.15 (0.63-2.08)	*	1.97 (1.20-3.24)	2.64 (1.57-4.44)**
Self-image/ Social interaction	3.35 (0.88-12.68)	*	2.03 (0.62-6.61)	*	6.30 (1.86-21.37)	3.60 (1.09-11.90)**
Parental distress	1.49 (0.75-2.95)	*	1.32 (0.77-2.26)	*	3.29 (2.02-5.36)	2.89 (1.74-4.78)**
Family function	3.03 (1.25-7.33)	2.78 (1.18-6.51)**	0.70 (0.23-2.10)	*	4.86 (2.21-10.66)	3.63 (1.61-8.19)**

* Not Fitted in the final model / AOB= Anterior Open Bite / Unadj.= Unadjusted / Adjust.= Adjusted

** Adjusted by child's age, parents' education level, parents' occupation and household income.

DISCUSSION

This study evaluated the impact of oral disorders on OHRQoL of preschool children. At the moment, most of the studies that assessed the impact of malocclusion on OHRQoL of preschoolers used convenience sample of patients who sought dental treatment^{6,15}. Therefore, to our knowledge, this is one of the few study that assessed this issue in a representative sample.

The ECOHIS uses response options from parents to assess the frequency in which oral diseases and treatment affect COHRQoL. Child self-report is considered the standard for measuring perceived health related quality of life; however, there are circumstances when parent proxy-report may be indicated¹⁶, so, it is possible to obtain valid and reliable information from preschool children concerning their OHRQoL using ECOHIS^{7,17}. In this study the ECOHIS responses shows that items like trouble sleeping, pain, difficulty to pronounce any words, difficulty in eating some foods were more frequent related with negative impact in OHRQoL. Parents reported being upset and feeling guilty more frequently because of their child's dental problems or treatments. Another study with a representative sample shows a similar results when analyses dental anxiety and distress domain from parents¹⁸. Regarding the question "missed preschool, daycare or school" there have been many answers "I don't know," probably because the children of our study didn't frequent that places.

This study found that child's age, household income, cavity of dental caries and anterior open bite were correlated with the OHRQoL. However, after the adjustment, only cavity of caries and anterior open bite showed a negative impact in the overall ECOHIS scores. The negative impact of anterior open bite on COHRQoL is the most important result of the current study. It is suggested that the image of satisfaction expressed by parents with regard to their child could explain the association between anterior open bite and the outcome¹⁶. A recent study didn't find such association. However, this study was conducted with a convenience sample, what limited extrapolating the results¹⁸. Therefore, more studies with representative samples are needed.

The role of dentofacial abnormalities in psychosocial well-being and quality of life is well established. Theoretical explanations of the link between malocclusion and OHRQoL are based on the effect of this condition on dissatisfaction with self-image as well as on its impact on adolescents' daily performance. There is evidence that malocclusion can

reduce chewing and speech capability, thus affecting an individual's perceptions of oral health.

Nevertheless, the primary impact of malocclusion on quality of life has been reported as being in the domains of emotional and social well-being, which comprise issues related to esthetic components and self-esteem. A disturbance of normal occlusion may reduce social acceptance and induce low self-esteem and poor quality of life by psychosocial pathways. Unesthetic occlusal traits may induce unfavorable social responses among adolescents, such as nicknames and teasing by schoolmates¹⁹. Others have found that the presence of some occlusal traits is a significant indicator of self-reported bullying among adolescents²⁰. Future studies should be conducted to investigate whether orthodontic treatment in preschool children with malocclusion can improve OHRQoL.

We believe that our findings can be due this disorder (anterior open bite) be more easily noticed by parents than others disorders related with occlusion. The low prevalence of overjet and sealing lip inadequate (13.5% and 10.3%, respectively) may also explain the lack of association between overjet and sealing lip with OHRQoL. Moreover, presence of dental trauma was considered low (14.1%), children with dental trauma did not experience more impacts on their quality of life than children with no traumatic dental injury. It suggests that the lower prevalence of dental trauma and the higher prevalence of crown fracture of enamel only could explain such results.

International studies show that clinical criteria for diagnosis overestimate the problems of malocclusion in relation with the individuals' perception²¹⁻²². This data can be important for planning public health policies for treatment and prevention of this disorder. Quality of life measures, especially ECOHIS for children under 5 years old, have demonstrated to be appropriate to obtain valid and reliable information related with OHRQoL^{7-8,15}.

These study has limitations that could affect the interpretation of the results. First, this study followed a cross-sectional design, which prevents a hypothesis of causality and temporal relations between the outcome and predictor variables. Studies using a longitudinal design could provide a better understanding of the oral disorders influencing the OHRQoL of children. Moreover, a representative sample of preschool children in Brazil was used, obtained by a random selection process at different sample centers around the city. This random process avoided a bias that might occur if, for example, the sample were collected in a clinical setting. Nevertheless, such a

process provides sound conclusions about the research question for all preschool children living in Santa Maria.

CONCLUSIONS

In conclusion, anterior open bite presents a negative impact on OHRQoL of preschool children and their parents.

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