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ORIGINAL ARTICLE

A population-based study on the impact of orofacial dysfunction on oral health-related quality of life among Brazilian schoolchildren

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ABSTRACT

Objective: The aim of the present study was to assess the impact of orofacial dysfunction on oral health-related quality of life (OHRQoL) among Brazilian schoolchildren.

Material and methods: A population-based study was conducted with 531 children aged eight to 10 years at schools in the city of Campo Magro, Brazil. The Brazilian version of the Child Perceptions Questionnaire ($CPQ_{8–10}$) was the outcome variable used to measure the impact on OHRQoL. The main independent variable was orofacial function, which was diagnosed using the Nordic Orofacial Test-Screening (NOT-S). Descriptive, bivariate and multiple Poisson regression analyses were performed using a multilevel approach, with the significance level set to 5%.

Results: The mean (±SD) total $CPQ_{8–10}$ score was 13.95 ± 0.5. The multilevel Poisson regression model revealed that the mean CPQ8-10 score was higher among girls (RR: 1.38, 95% CI: 1.17–1.63; $p < 0.001$) than boys and that children from families with a higher income had lower $CPQ_{8–10}$ scores (RR: 0.67, 95% CI: 0.51–0.88; $p = 0.004$) than those from families with a lower income. Children who sought dental care due to pain or factors other than prevention (RR: 1.41; 95% CI: 1.18–1.68), those with orofacial dysfunction (RR: 1.62; 95% CI: 1.30–2.02) and those with a history of traumatic dental injury (RR: 1.39; 95% CI: 1.15–1.69) also experienced a greater impact on OHRQoL.

Conclusions: Schoolchildren with orofacial dysfunction experience a greater negative impact on OHRQoL.

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Child; Nordic orofacial test screening; orofacial dysfunction; oral health-related quality of life; quality of life

Introduction

The functioning of stomatognathic system includes activities such as breathing, chewing and swallowing [1,2]. Due to changes during craniofacial growth and development, orofacial function can be negatively influenced by the presence of parafunctional habits, nasal obstruction, muscle tone of the tongue as well as the lips, cheeks and masticatory muscles [3,4], which can lead to orofacial dysfunction.

Characterized by changes in the normal pattern of stomatognathic functions and muscle balance, orofacial dysfunction is found in some genetic and congenital disorders and can also be the result of an injury, nerve disorder, problems with the masticatory system [3] or the practice of harmful oral habits [2].

Health indicators are tools that offer a numerical representation of differences between people and communities with regard to health-related quality of life [5]. Measuring health is an attempt to translate an abstract concept into concrete language. Questionnaires are created to conduct such assessments and are generally composed of items intended to measure how aspects of daily life are affected by health conditions [6,7].

The Nordic Orofacial Test-Screening (NOT-S) is an assessment tool that addresses aspects of orofacial dysfunction that was first tested in Sweden and subsequently translated to other 15 languages [8]. The NOT-S consists of a structured interview and clinical examination [3].

Orofacial problems are part of everyday life for many individuals and can compromise vital functions, such as breathing and nutrition as well as other functions necessary for the purposes of social interaction and communication. Thus, orofacial dysfunction can affect well-being [3,9,10]. Given the lack of studies addressing this issue in the literature, the aim of the present study was to evaluate the impact of orofacial dysfunction on the quality of life of Brazilian schoolchildren aged eight to 10 years.

Materials and methods

This study received approval from the Human Research Ethics Committee of the Federal University of Paraná, Brazil. Only children and parents/guardians who agreed to participate by signing a statement of informed consent were included in the study.

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Study design and sample characteristics

A cross-sectional study was conducted with children aged eight to 10 years attending municipal schools in urban (seven units) and rural (two units) areas in the city of Campo Magro, Brazil, from March to December 2013. According to the records of the Municipal Department of Education, Campo Magro had a total of 1023 children in this age group enrolled at municipal schools in 2013. None of the nine schools in the city are private institutions. Each school provided the list of students in the target age group (1023 children). To ensure the representativeness of the sample, lots were drawn maintaining the proportion with the number of students enrolled in each school. For those who expressed interest, the researcher sent a letter to the parents explaining the purpose, characteristics, importance and methods of the study and requesting written consent for the participation of the children.

The sample size was calculated using a formula for the comparison of means between two groups of individuals (mean $CPQ_{8–10}$ score between children with and without orofacial dysfunction), adopting a 5% significance level and a power of 85% for a two-tailed hypothesis test. A standard deviation (SD) of 17.7 on the total CPQ scores for Brazilian public schoolchildren aged eight to 10 years as reference [11] and a difference of five points to be detected on the total $CPQ_{8–10}$ scale [5% of the possible range of the scale (0–100 points)] were considered, which determined a minimum sample of 452 children. To increase the precision, a correction factor of 1.2 was applied due to the cluster effect [12]. The minimal sample size needed to satisfy the requirements was therefore estimated to be 543 children, to which 20% was added ($n = 651$) to compensate for potential dropouts.

A total of 531 children with similar distribution in relation to sex (46% boys and 54% girls) and representative of schoolchildren aged eight to 10 years living in Campo Magro, Brazil, participated in the present study.

The inclusion criteria were male or female gender, age eight to 10 years, presence at school on the day of data collection and authorization from a parent/guardian. The exclusion criterion was a history of orthodontic treatment.

Training exercise and pilot study

Sixty-five children were examined for malocclusion and traumatic dental injury (TDI) by two examiners who had previously undergone a training and calibration exercise. Cohen's Kappa values for interexaminer agreement ranged from 0.84 to 0.99. All children were re-examined after two weeks for the determination of intraexaminer agreement, for which Cohen's Kappa values ranged from 0.85 to 1.00.

A pilot study was conducted at the paediatric dentistry clinic of the Federal University of Parana (Brazil) to test the methods and comprehension of the questionnaires. The children in the pilot study were not included in the main sample. The results demonstrated that there was no need to change the proposed methodology.

Orofacial function assessment (clinical and non-clinical oral examination)

Orofacial functions were evaluated using the Nordic Orofacial Test-Screening (NOT-S) [3], which has been validated and cross-culturally adapted to Brazilian Portuguese [13]. The NOT-S has 12 domains in the form of a structured interview (six domains) and a clinical examination (six domains). The interview section addresses (1) sensory function, (2) breathing, (3) habits, (4) chewing and swallowing, (5) drooling and (6) dryness of the mouth. The clinical examination section involves an assessment of (1) the face at rest, (2) nasal breathing, (3) facial expression, (4) masticatory muscle and jaw function, (5) oral motor function and (6) speech. Each domain contains one to five items.

The interview responses are categorized as 'yes', 'no' or 'item not rated'. For each 'yes' answer, the item is assigned a value of 1, whereas each 'no' answer is scored zero. Domains that have at least one item with a 'yes' answer receive a score of 1. For the clinical evaluation, the child performs actions requested by the examiner, who compares the action with photographic standards contained in an illustrated manual provided by the Mun-H-Center website (www.mun-h-center.se) [8], classifying the function performed as either 'impaired' or 'not affected'. The domain receives a value of 1 if at least one action is classified as 'impaired'. Thus, the total score of the NOT-S ranges from 0 to 12 (total of six points on the interview section and six on the clinical examination), with higher scores denoting a greater the number of affected domains. A child was classified as having an orofacial disorder if he/she had at least one 'yes' answer or if a function was classified as 'impaired', indicating dysfunction in at least one domain [3]. Children with a cold or influenza were evaluated after the symptoms had disappeared.

Dental examination

Dental examinations were performed at school in a private room during daytime hours. A mouth mirror (PRISMA®, São Paulo, SP, Brazil) and periodontal probe (WHO-621, Trinity, Campo Mourão, PA, Brazil) were used for the visual dental examination. The examiners used appropriate equipment to protect against individual cross infection and all instruments were sterilized.

Malocclusion classification

The criteria for the diagnosis of occlusal factors were based on the recommendations of the World Health Organization [9]. Overjet, open bite and crossbite were evaluated.

Traumatic dental injury classification

The Andreasen classification [14] was used to record evidence of TDI on the maxillary and mandibular incisors: non-complicated fracture (enamel and enamel–dentin fracture), complicated fracture (enamel–dentin fracture with

pulp exposure), tooth dislocation (lateral luxation, intrusion and extrusion), avulsion, discoloration and restoration of a fractured tooth. After the clinical examination, children were allocated to two groups: those without TDI and those with TDI.

Non-clinical data

OHRQoL measure

The outcome variable was impact on the schoolchildren's OHRQoL measured using the Brazilian version of the Child Perceptions Questionnaire ($CPQ_{8–10}$) [15]. The $CPQ_{8–10}$ is part of the Child Oral Health Quality of Life questionnaires, which constitute a set of five questionnaires that measure the negative effects of orofacial conditions on the social, emotional and functional well-being of children aged six to seven, eight to 10 and 11 to 14 years as well as the perceptions of parents/caregivers and the impact on family life [16].

The $CPQ_{8–10}$ is made up of 25 items distributed among four subscales: oral symptoms (five items), functional limitations (five items), emotional well-being (five items) and social well-being (10 items). The items address the frequency of events in the previous four weeks. A five-point rating scale is used with the following options: never =0; once/twice =1; sometimes =2; often =3; and every day/almost every day =4. $CPQ_{8–10}$ scores are calculated by summing all item scores, with the total score ranging from 0 (no impact of oral condition on OHRQoL) to 100 (maximum impact of oral condition on OHRQoL). There are also two questions on patient identification (gender and age) and two global indicators asking the children for a global rating of their oral health and the extent to which their orofacial condition affects their overall well-being.

Demographic/socio-economic questionnaire

A questionnaire was sent to the parents/guardians addressing demographic data (child: birth date, gender and address; mother's employment status) socio-economic data (parent's/caregivers' schooling, monthly gross household income and number of residents in the home). Three questions were related to the child's access to dental care. Gross household income was categorized based on the monthly minimum wage in Brazil (roughly equal to US $258.33) and parents'/guardians' schooling was categorized in years of study.

Statistical analysis

The Stata 12 program was used for the data analysis. Descriptive analyses were performed to characterize the sample. Bivariate analysis was performed to test associations between OHRQoL (total $CPQ_{8–10}$ score) and the independent variables related to the individual level. The Mann–Whitney test, Spearman's correlation test and Kruskal–Wallis test were used to test associations between the impact on OHRQoL and the independent variables.

Table 1. Descriptive distribution of overall and domain-specific $CPQ_{8–10}$; Campo Magro, Brazil, 2013.

Variables	No. of item	Mean (SD)	Possible range	Observed range
CPQ8–10 (overall scale)	25	13.95 (13.12)	0–100	0–76
Subscales				
Oral symptoms	5	5.15 (3.64)	0–20	0–19
Functional limitation	5	2.84 (3.52)	0–20	0–18
Emotional well-being	5	3.51 (4.47)	0–20	0–20
Social well-being	10	2.45 (4.50)	0–40	0–28

The data were analysed using adjusted Poisson regression with a multilevel approach, since the children (first level) were nested in schools (second level). This strategy allowed estimating the effects of individual variables on CPQ scores by computing rate ratios, which are ratios of arithmetic means between compared groups adjusted for the contextual effect (school). Independent variables with a p value <0.20 in the bivariate analysis were incorporated into the multiple model. The stepwise backward method was used to select the variables for the final model, with only those that remained significant ($p < 0.05$) after adjustment maintained in the model. The adjustment quality of the model was analysed using Deviance (-2loglikelihood)

Results

The mean (±SD) total $CPQ_{8–10}$ score was 13.95 ± 13.12. Domain-specific scores demonstrated considerably large variations. The highest mean score was for 'oral symptoms' (5.15 ± 3.64) and the lowest mean score was for 'social well-being' (2.45 ± 4.5) (Table 1).

A total of 467 (87.9%) children had oral disorders, 216 (41.1%) reported having difficulty regarding access to dental care and 257 (50.0%) declared that they had sought dental care due to pain or factors other than prevention. Regarding socio-demographic factors, the majority of children lived with both parents (73.1%), had parents/guardians with more than eight years of schooling (51.1%) and had mothers who worked outside the home (70.1%) (Table 2).

OHRQoL was significantly associated ($p<0.05$) with sex, clinical data (the presence of TDI and orofacial dysfunction, difficulty regarding access to dental care and seeking dental treatment for reasons of pain) and a low socioeconomic status (lower family income and lower parent's/guardian's schooling) (Table 2).

The Poisson regression model with a multilevel approach adjusted for the contextual effect (school) (Table 3) revealed that the mean $CPQ_{8–10}$ score was 1.38-fold (95% CI: 1.17–1.63; $p<0.001$) higher among the girls than boys and that children from families with a higher income had lower $CPQ_{8–10}$ scores (RR: 0.67, 95% CI: 0.51–0.88; $p=0.004$) than those from families with a lower income. Children who sought dental care due to pain or factors other than prevention (RR: 1.41; 95% CI: 1.18–1.68), those with orofacial dysfunction (RR: 1.62; 95% CI: 1.30–2.02) and those with a history of TDI (RR: 1.39; 95% CI: 1.15–1.69) also experienced a greater impact on OHRQoL.

Table 2. Bivariate analysis for associations between OHRQoL and independent variables related to the individual level; Campo Magro, Brazil, 2013.

Independent variables	*n* (%)	Mean (SD)	*p* value
Child characteristics			
Gender			
Male	244 (46.0)	12.2 (10.9)	**0.029**[a]
Female	287 (54.0)	15.6 (14.8)	
Parents'/guardians' characteristics			
Family income	–	–	**<0.001**[b]
Mother's job			
Work out	336 (70.1)	13.5 (12.2)	0.515[a]
Work at home	143 (29.9)	14.3 (15.1)	
Marital status			
Married/living common law	386 (73.1)	13.5 (13.0)	0.061[a]
Single/separated/widowed	142 (26.9)	15.4 (14.0)	
Parent's/caregiver's schooling			
>8 years of study (high school/college)	269 (51.1)	12.0 (12.2)	**<0.001**[a]
≤8 years of study (elementary school)	257 (48.9)	16.1 (14.2)	
Child's clinical status			
TDI			**0.002**[a]
Absence	414 (78.0)	12.9 (12.2)	
Presence	117 (22.0)	18.1 (16.0)	
Overjet			
<0 mm	8 (1.5)	19.8 (18.1)	0.416[c]
0–3 mm	295 (55.6)	13.2 (12.2)	
>3 mm	228 (42.9)	14.9 (14.3)	
NOT-S			
Without orofacial disorders	64 (12.1)	9.0 (8.2)	**<0.001**[a]
With orofacial disorders	467 (87.9)	14.7 (13.7)	
Lip sealment			
Presence	401 (75.5)	14.0 (13.6)	0.438[a]
Absence	130 (24.5)	14.1 (12.3)	
Anterior open bite			
Absence	497 (93.6)	14.0 (13.1)	0.726[a]
Presence	34 (6.4)	14.0 (15.9)	
Posterior crossbite			
Absence	446 (84.0)	14.0 (13.4)	0.727[a]
Presence	85 (16.0)	14.3 (12.9)	
Access to dental care			
Difficulty in accessing dental care			
No	310 (58.9)	12.1 (11.9)	**<0.001**[a]
Yes	216 (41.1)	16.7 (14.7)	
Reasons for seeking dental care			
Preventive	247 (49.0)	10.6 (11.3)	**<0.001**[a]
Treatment for pain/others	257 (51.0)	17.5 (14.4)	
Last visit of the children to the dentist			
Less than one year	329 (62.3)	13.3 (13.1)	0.051[a]
More than one year	199 (37.7)	15.2 (13.4)	

[a]Mann–Whitney test.
[b]Spearman's correlation test ($r_s = -0.219$).
[c]Kruskal–Wallis test.
Results in bold type are significant at 5% level.

Table 3. Poisson regression model on a multilevel approach explaining independent variables in children with impact on OHRQoL adjusted by schools; Campo Magro, Brazil, 2013.

Independent variables	*p* value	**Robust RR[a][95% CI]**
Gender		
Male	**<0.001**	1
Female		**1.38[1.17,1.63]**
Family income	**0.004**	**0.67[0.51,0.88]**
TDI		
Absence	**0.001**	1
Presence		**1.39[1.15,1.69]**
NOT-S		
Without orofacial disorders	**<0.001**	1
With orofacial disorders		**1.62[1.30,2.02]**
Reasons for seeking dental care		
Preventive	**<0.001**	1
Treatment for pain/Others		**1.41[1.18,1.68]**

[a]Poisson regression adjusted.
Results in bold type are significant at 5% level.

Discussion

This study provides evidence supporting the negative impact of orofacial dysfunction on OHRQoL among Brazilian schoolchildren even when controlled for the other variables of interest and adjusted for the contextual effect (school). This finding is in agreement with data described by Leme et al. [10], who evaluated the relationship among oral habits, oral function and oral health-related quality of life (OHRQoL) in 328 children using the NOT-S to assess orofacial function and the $CPQ_{8–10}$ and $CPQ_{11–14}$ to measure OHRQoL in the groups of children aged eight to 10 and 11 to 14 years, respectively. The authors found a statistically significant association between orofacial dysfunction and a poorer OHRQoL in the sample. Moreover, a cross-sectional study conducted with young adults related both orofacial dysfunction (evaluated using the NOT-S) and salivary cortisol levels to ORHQoL (evaluated using the OHIP-49) and also found an association between orofacial dysfunction and OHRQoL [17].

The multiple Poisson regression analysis demonstrated that $CPQ_{8–10}$ scores were 38% higher among girls that boys. The female gender often has greater aesthetic concerns in comparison to males and this may explain why girls are more likely experience a negative impact on satisfaction with their appearance [10,18,19].

Schoolchildren from families with a higher income had lower CPQ8-10 scores (denoting less impact on OHRQoL) than those from families with a lower income. Findings from previous studies have demonstrated that socio-economic status influences the association between different clinical conditions and OHRQoL [20–22]. A lower income may reflect a lower degree of schooling on the part of parents/guardians, which can influence the health behaviours of children and their perceptions regarding oral health [20,23]. Indeed, a negative impact on children's OHRQoL was significantly associated with a lower parent's/guardian's schooling in the present investigation.

Underprivileged families living in conditions of greater vulnerability have less access to better health information, fewer possibilities of making healthy choices and are more likely to seek curative dental treatment [24,25]. These data are in agreement with the present findings, since children in the sample reported difficulty in having access to dental care and only sought dental care due to pain or factors other than prevention. Such individuals were more likely to experience a negative impact on OHRQoL.

Socio-economic inequalities exert a considerable influence on access to dental treatment, resulting in individuals with dental problems who may have difficulty chewing, embarrassment with regard to smiling and pain experience [20,26]. The present study identified a significant negative impact on OHRQoL associated with a history of TDI (RR: 1.39; 95% CI: 1.15–1.69) and orofacial dysfunction (RR: 1.62; 95% CI: 1.30–2.02). The higher total $CPQ_{8–10}$ score for these clinical conditions may be explained by dissatisfaction with one's body image. Psychological well-being could play a mediating role in OHRQoL. In a study conducted in New Zealand with the aim of determining the contribution of socio-demographic, psychosocial and clinical characteristics to OHRQoL in children

[27], the authors found that self-esteem, general well-being and social perception of body image accounted for half of the variance in the CPQ_{11-14} score. Concern regarding one's face and body is expressed at an increasingly early age. Children at about eight years have criteria similar to those of adults regarding the self-perception of body image [28]. To evaluate their appearance, children compare themselves to others of their own age and the judgment of peers exerts an influence on the development of self-esteem [29].

Cross-sectional studies have limitations inherent to the design. Since data on exposure and outcome are collected simultaneously, such information does not provide evidence of the temporal relationship between the two variables. Another limitation regards the fact that the findings related to the items 'snoring' and 'parafunctional habits' were derived from the perceptions of parents/caregivers who answered these NOT-S items. Moreover, the NOT-S is a screening instrument and is therefore not able to assess the severity of oral dysfunction. Thus, the observed impact could have been greater if an assessment tool with greater discriminatory power had been used.

The findings of the present study demonstrate an association between orofacial dysfunction and impact on quality of life. This information could assist in the allocation of public resources and the establishment of strategies aimed prevention and education, as orofacial dysfunction has a multifactor aetiology and several aspects associated with the aggravation of this condition also affect occlusal factors.

Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

Notes on contribution

Fernanda Sardenberg, PhD, MSc, BDS, is a Pediatric dentistry professor. Her experience is in Pediatric dentistry and Epidemiology, working mainly on the following topics: quality of life and malocclusion.

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