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ORIGINAL ARTICLE

What Factors are Associated with Health-Related Quality of Life in Mixed Dentition Children?

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ABSTRACT

Objective: To associate the OHRQoL and HRQoL in mixed dentition children with the influence on age range, socioeconomic and clinical variables. **Material and Methods:** A cross-sectional study was carried out with 1,240 children between 6 and 12 years of age. HRQoL was assessed by the Quality of Life Assessment Scale, considered an outcome variable. OHRQoL was determined using specific questionnaires related to the age group: Oral Health Impact Scale in Early Childhood, Child Perceptions Questionnaire for 8 to 10 years, and 11 to 12 years. Dental caries and malocclusion were diagnosed. The socioeconomic class was evaluated. A multiple negative binomial regression analysis was used to test the relationship between HRQoL, OHRQoL scores and socioeconomic and clinical variables. Correlation analyses were performed between the total HRQoL and OHRQoL, with a significance level of 5%. **Results:** The HRQoL is inversely related to the impact of OHRQoL ($p<0.05$), modulated by the age group. There was a significant weak negative correlation between the HRQoL scores and the impact of OHRQoL ($p<0.05$). **Conclusion:** The OHRQoL impacts the HRQoL, modulated by the age group and with minor influence from socioeconomic and clinical variables.

Keywords: Malocclusion; Mixed Dentition; Quality of Life; Oral Health.

Introduction

The oral health-related quality of life (OHRQoL) aims to explain the effect of oral outcomes on individuals' daily lives [1,2]. In this sense, the quality of life measures should be individual-centered and applied to understand patients' perceptions and values affected by diseases or those undergoing treatment [3,4]. It is essential to realize the health-disease process, where the cultural aspects, values, objectives, expectations, standards, and concerns of each individual must be considered in the broad part of general health [5]. Evaluating the quality of life measures represents a paradigm shift, leading to an individual-centered approach to oral health care [6].

Generic measures can capture the different quality of life elements since they include domains that are not specific to the disease condition [6] and can also represent different knowledge domains for a bothered understanding of oral health's impact on the quality of life conditions [7]. On the other hand, the specific instruments are geared towards particular health conditions that can detect special situations, such as the impact of oral diseases on children and adolescent's quality of life [8-10]. Quality of life measures has been widely used as a patient-reported outcome to assess the impact of health conditions on children's daily lives, providing information about the broad consequences of oral health that normative clinical indicators cannot capture [10,11].

The literature highlights the possible impact on dental caries and malocclusions in the OHRQoL study [2,9,10]. However, the health-related quality of life (HRQoL) assessment must be associated with OHRQoL, comparing the results to achieve more elaborate levels of understanding of the individual's health [6,8]. There are no reports in the literature on the association of these measures in the transitional stage of children's development. Mixed dentition is a long childhood period, before adolescence, with a wide range of variations [12]. At this moment, children develop self-perceptions regarding life, esthetics, and self-esteem [13]. Evidence highlights the importance of introducing a measure of the impact of health quality of life in assessing OHRQoL and the need to study the instruments for populations with other socioeconomic conditions and dental conditions [8].

The hypothesis was that OHRQoL influences the HRQoL. Therefore, this study aimed to associate the OHRQoL and HRQoL in mixed dentition children and the influence on age range, socioeconomic and clinical variables.

Material and Methods

The present study conforms to guidelines from the Strengthening the Reporting of observational studies in epidemiology (STROBE Statement).

Ethical Requirements

This study was approved by the Research Ethics Committee (CAAE #87570618.4.0000.5385). All the participants and parents/guardians were informed about the aim of the study. The latter signed an informed consent form authorizing the participation of their child. The children also signed a consent form.

Study Design and Eligibility Criteria

A population-based observational cross-sectional study was carried out with children in Araguaína, northern Brazil. Araguaína (Tocantins) has an estimated 142,925 inhabitants and a human development index (HDI) of 0.752 [14]. A representative sample of children aged 6 to 12 was selected exclusively in mixed

dentition enrolled in public schools. Initially, 19 schools were selected by stratified random sampling according to the schoolchildren's population in the neighborhoods. Then, all volunteers in the target age group of the selected schools were invited to participate. Data collection was carried out between August 2018 and April 2019. The minimum sample of 1,125 individuals was calculated in the EpiInfo (Centers for Disease Control and Prevention, Atlanta, U.S.A.) software, considering a test power of 80%, a significance level of 5%, and minimum odds ratio of 1.5 [12,13].

The study included only children in the mixed dentition stage. Mixed dentition was determined exclusively through clinical oral examination based on dental age [12,15]. Therefore, children with systemic diseases, such as cerebral palsy or Down syndrome, were excluded from the study in the primary or permanent dentition stage, with current or previous orthodontic or clinical dental treatment. The final sample included 1,240 children (644 girls and 596 boys) aged between 6 and 12.

Data collection consisted of validated questionnaires and a dental examination. Socioeconomic status was determined by the information provided by the Municipality of Araguaína (Tocantins, Brazil). The data were dichotomized into high, medium, and low socioeconomic status.

Data Collection

Clinical examinations were carried out at the school under natural light by a single trained and calibrated examiner. Before starting the experimental phase, full training of 16 hours was carried out, consisting of four hours of theoretical and 12 hours of practical classes. Another four hours were allocated to the calibration process to obtain an estimate of the diagnostic extent. The inter-examiner Kappa coefficient was greater than 0.91 and 0.93 to evaluate dental caries and malocclusion, respectively.

Dental caries was diagnosed with the DMFT index and dmft (permanent, decayed, missing, filled teeth and decayed primary teeth, extracted by decay and filled), according to the criteria of the World Health Organization [16]. The results of dental caries were dichotomized and classified as: no caries experience (scores = 0) and with caries experience (scores> 1) [17].

The evaluation of malocclusion in mixed dentition was performed based on Grabowski et al. [18]. Intermaxillary relations were analyzed in the anteroposterior regions in the sagittal, transverse, and vertical planes. The anteroposterior relationship was determined by the upper canine position between the lower canine and the lower deciduous first molar, configuring a Class I. The abnormal positioning was defined in Class II, Class III, and asymmetry. Overjet was defined from a distance between the lower incisor's buccal surface and the upper incisal edge. Overjet was considered normal when the distance was between 0 to 2 mm, increased> 2 mm, and decreased <0 mm, thus presenting an anterior crossbite. The anterior vertical relationship (overbite) was defined as normal when the upper incisors covered up to 2 mm from the lower incisors, values> 2 mm defined as a deep overbite, and <0 mm anterior open bite. The posterior transverse relationship was classified as normal when the upper arch had transverse dimensions compatible with the lower one, so that the presence of posterior crossbite, of a single or multiple elements, unilateral or bilateral or a scissor bite was considered the presence of posterior crossbite [18]. Children were diagnosed with malocclusion when they had at least one change in the above conditions [19].

HRQoL Measure

The assessment of the health-related quality of life (HRQoL) was determined by the Quality of Life Assessment Scale (AUQUEI) [20], and considered an outcome variable. AUQUEI presents 26 questions

related to child satisfaction concerning family, social activities, health, bodily functions, and separation from the family, separated into four domains: autonomy, leisure, functions, and family. The scale uses images of 4 faces expressing different emotional states, and the possibilities for responses are: very unhappy = 0; unhappy = 1; happy = 2 and very happy = 3. The sum of the scores can vary between 0 to 78, and the lower the value, the worse the HRQoL [8].

OHRQoL Measures

The quality of life related to oral health (OHRQoL) was conducted with specific instruments for each age. Children aged 6 to 7 years old used the Early Childhood Oral Health Impact Scale (ECOHIS) questionnaire; for those aged 8 to 10 years, the Child Perceptions Questionnaire (CPQ_{8-10}) and, between 11 to 12, the (CPQ_{11-14}). The specific instrument was used in its Brazilian version in an interview format. Children were also informed that the questions were related to the frequency of events in the last three months. The results allowed the categorization in the absence or presence of impact on OHRQoL. Parents/caregivers were previously contacted and asked to attend a meeting at the school and be informed about the study.

ECOHIS was the instrument applied to children between 6 and 7 years old [21,22] and consists of 13 questions, divided into two sections: a child impact section with four domains (child symptoms, function, psychology, and self-image/social interaction domains) and a family impact section with two domains (parental distress and family function). Parents/caregivers answer the questions using a rating scale from 0 to 5, where 0 = never, 1 = hardly ever, 2 = occasionally, 3 = often, 4 = very often, and 5 = do not know. Total scores are calculated as the sum of the response codes, and the "do not know" answers are counted but excluded from the total ECOHIS score. Higher scores represent a greater impact on OHRQoL [10,23].

CPQ_{8-10} was the instrument applied to children between 8 to 10 years old [24,25]. The CPQ_{8-10} has 25 questions, divided into four domains: oral symptoms - five questions; functional limitations - five issues; emotional well-being - five issues and social well-being - ten issues. The answers follow the 5-point Likert scale: never = 0; once or twice = 1; sometimes = 2; often = 3 and every day or almost every day = 4. The score can vary from 0 to 100. The median calculation was obtained by adding the answers. Higher scores represent a greater impact on OHRQoL [12].

CPQ_{11-14} was the instrument applied to children between 11 and 12 years old [21,26,27]. The summarized version of the CPQ11-14 presents eight questions divided into four domains: oral symptoms - two questions; functional limitations - two questions; emotional well-being - two questions; and social well-being - two questions. The 5-point Likert scale is used, with the following answer options: never = 0; once or twice = 1; sometimes = 2; several times = 3; every day or almost every day = 4. The final results range from 0 to 32. The median was calculated using the total sum. Higher scores represent a greater impact on OHRQoL [28].

Data Analysis

Multiple negative binomial regression analysis was used to test the relationship between HRQoL and OHRQoL scores, sex, age range, socioeconomic class, caries experience, and malocclusion. The fit of the models was assessed using the Akaike Information Criterion (AICC). Pearson's correlation analyzes were performed between the total scores of HRQoL and OHRQoL and how they are related in the presence of malocclusion. The R Program (R Foundation for Statistical Computing, Vienna, Austria) made de analyses, with a significance level of 5%.

Results

A total of 1,240 children were enrolled in the study and distributed into age groups: 411 (33.10%) between 6 and 7 years, 676 (54.50%) between 8 and 10, and 153 (12.30%) between 11 and 12 years old. The prevalence of caries experience was 60.01%, and malocclusion was 46.90% (Table 1).

Table 1. Characteristics of the sample.

Variables	Category	N (%)
Sex	Girls	644 (51.9)
	Boys	596 (48.1)
Age Range	6 – 7 Years	411 (33.1)
	8 –10 Years	676 (54.6)
	11-12 Years	153 (12.3)
Carie Experience	Without	495 (39.9)
	With	745 (60.1)
Malocclusion	Absence	658 (53.1)
	Presence	582 (46.9)

Table 2 presents the multiple negative binomial regression models for the HRQoL total score. Six models were tested: model 1 (intercept), model 2 (sex, age, and socioeconomic status), model 3 (caries experience and malocclusion), model 4 (sex, age, caries experience, malocclusion, and OHRQoL), model 5 (sex, age, socioeconomic status, caries experience, malocclusion, and OHRQoL) and model 6 (OHRQoL and age). The best fit was observed in model 6 (lowest AICC). The results showed that the HRQoL is inversely related to the children's age range and the impact of OHRQoL ($p<0.05$).

Table 3 shows the Pearson correlation analysis between the total scores for HRQoL and OHRQoL and the relation of malocclusion. There was a weak significant negative correlation between the scores of HRQoL and OHRQoL ($p<0.05$). HRQoL decreases with increasing OHRQoL impact ($p<0.05$).

Discussion

This study evaluated the association between OHRQoL and HRQoL and the influence of the age group, socioeconomic and clinical variables. Based on our results, data support that OHRQoL impacts HRQoL, and the measures are modulated by age, with minor influences of clinical variables. To our knowledge, this is the first study that compared different OHRQoL instruments and HRQoL in a broad age group of children between 6 and 12 years old.

In this study, negative binomial regression showed that Model 6 explained the association better. OHRQoL impacts the general HRQoL, and the older the age range group, the greater the impact on HRQoL. There may be several reasons for this situation, especially because generic measures can capture the different elements of quality of life, including domains that are not specific to the condition of the disease [6]. Also, the age-modulating factor seems clear. The ability to identify problems related to oral health accompanies the child's growth and development [29]. In this sample, younger children may lack self-awareness about their mouth and face. According to the literature, the older the children, the greater the ability to identify and understand problems related to oral health and its impacts, which may present criteria similar to those of adults [30]. This fact can justify our findings.

Table 2. Multiple negative binomial regression models for the HRQoL score.

Variables	Category	Model 1 (empty)	Model 2		Model 3		Model 4		Model 5		Model 6	
			Estimate (EP)	p-value	Estimate (EP)	p-value	Estimate (EP)	p-value	Estimate (EP)	p-value	Estimate (EP)	p-value
Sex (ref=male)	Female		-0.0069 (0.0090)	0.4400			-0.0068 (0.0089)	0.4480	-0.0068 (0.0089)	0.4415		
Age (ref=6 to 7 years)			-0.0114 (0.0027)	<0.0001			-0.0086 (0.0027)	0.0016	-0.0085 (0.0027)	0.0021	-0.0087 (0.0027)	0.0015
Socioeconomic status (ref= medium)	Low		-0.0090 (0.0097)	0.3510					-0.0080 (0.0096)	0.4089		
Carie experience					-0.0003 (0.0017)	0.8387	-0.0018 (0.0017)	0.2876	-0.0020 (0.0017)	0.2545		
Malocclusion (ref=absence)	Presence				-0.0020 (0.0091)	0.8274	-0.0040 (0.0090)	0.6605	-0.0036 (0.0090)	0.6878		
OHRQoL (ref= without)							-0.0016 (0.0003)	<0.0001	-0.0019 (0.0004)	<0.0001	-0.0015 (0.0003)	<0.0001
AIC_C		8773.4396	8759.5564		8777.3812		8741.9516		8743.2955		8737.8931	

EP = Standard Error; AICC (Akaike Information Criterion).

Table 3. Pearson's correlation analysis between the total scores of the HRQoL and OHRQoL.

Variables	Categories	r (p-value)
General Sample		-0.15 (<0.0001)
Age	6 - 7 Years	-0.07 (0.1569)
	8 - 10 Years	-0.18 (<0.0001)
	11-12 Years	-0.35 (<0.0001)
Malocclusion	Absence	-0.17 (<0.0001)
	Presence	-0.14 (0.0009)
Anteroposterior relationship	Class I	-0.14 (<0.0001)
	Class II	-0.16 (0.0436)
	Class III	-0.31 (0.0100)
	Asymmetric	-0.12 (0.3531)
Overjet	Normal (0/2 mm)	-0.16 (<0.0001)
	Increased (>2mm)	-0.13 (p=0.0200)
	Decreased (<0 mm)	0.06 (p=0.6982)
Overbite	Normal (0/2 mm)	-0.14 (p<0.0001)
	Increased (>2mm)	-0.23 (p=0.0021)
	Decreased (<0 mm)	-0.06 (p=0.6491)
Transverse Relationship	Normal	-0.15 (p<0.0001)
	Unilateral Crossbite	-0.12 (p=0.3996)
	Bilateral Crossbite	-0.36 (p=0.3767)
	Scissor Bite	-

r= Correlation Coeficient.

Although the literature highlights the influence of oral health on the daily activities of children and adolescents, in the studied sample, there was no association with HRQoL. A possible explanation is the age range. In our study, age clearly modulated the results. The differences between the objectives of the questionnaires, domains and questions can difficult the adequately measure the subjective perceptions related to the experience of caries and malocclusion. Therefore, choosing a generic quality of life tool to assess the impact of a specific disease on HRQoL must be chosen with caution.

The convergent validity between the AUQUEI image domains and the CPQ_{11-14} instrument was evaluated in adolescents [8]. The study showed that generic and specific quality of life instruments showed a weak association and significantly influenced socioeconomic and clinical variables [8]. In our study, the correlation ranged from 0.25 to −0.36. Considering that there is a negative correlation with values of −1 and a positive correlation with +1, correlations closer to zero are considered weaker. The findings confirm the weak correlation between the instruments, even in a different age group.

In Paula et al. [8] a statistically significant but weak correlation was observed between the instruments, corroborating the hypothesis that the instruments measure different domains of quality of life using different constructions. The OHRQoL showed an association with the lowest scores of the HRQoL. The instrument (AUQUEI) domains are scored individually according to values on a Likert scale, and the total scores range from 0 to 78. Thus, the lower the score, the worse the quality of life. On the other hand, the OHRQoL instruments used (ECOHIS and CPQ) indicate that the higher the scores, the worse the quality of life.

The present study results must be considered within some limitations, such as the choice of specific OHRQoL instruments for each age group. We also did not evaluate the presence of general diseases or health problems that could have influenced the results of HRQoL.

Finally, the HRQoL is essential data in clinical evaluation, being an ally for the treatment and public health policies [3]. Thus, our results reinforce the importance of including subjective assessments in dental practice about the impact of oral health and its consequence on individuals' quality of life. The present study collaborates with the current literature since few studies have been carried out.

Conclusion

Oral health-related quality of life impacts health-related quality of life and is modulated by age group. The socioeconomic and clinical variables did not influence the association.

Authors' Contributions

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All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

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Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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