

Impact of dental treatment on the oral health-related quality of life of Brazilian schoolchildren

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Declaration of Interests: The authors certify that they have no commercial or associative interest that represents a conflict of interest in connection with the manuscript.

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<https://doi.org/10.1590/1807-3107bor-2021.vol35.0125>

Abstract: This before-after experimental study evaluated the impact of dental treatment on the oral health-related quality of life (OHRQoL) in children aged 6–8 years from Paranoá, DF, considering the presence or absence of cavitated dentin carious lesions pre- and post-treatment. The responsiveness and sensitivity of the questionnaires were also investigated. Caries was detected by using the Caries Assessment Spectrum and Treatment (CAST) instrument, while the impact of oral health on the children's health-related quality of life was assessed using the Brazilian version of the Child Perceptions Questionnaire (CPQ₈₋₁₀), which was completed by the children and the Brazilian version of the Early Childhood Oral Health Impact Scale (B-ECOHIS), which was completed by their parents. Sociodemographic characteristics were also assessed. After the examinations, the children were categorized into two groups according to the presence (treatment/n = 34) or absence (control/n = 34) of cavitated dentin carious lesions. Restorative/curative care was provided to the treatment group, while the control group received preventive measures. OHRQoL was assessed at baseline and at four weeks post-treatment. No significant sociodemographic differences were observed between the groups. In the treatment group, the children and their families reported a greater impact of oral health on their OHRQoL in both questionnaires ($p < 0.05$). However, there was a significant reduction in the impact of oral health, with differences between the pre-treatment and post-treatment phases ($p = 0.001$). Good sensitivity and responsiveness were observed for both questionnaires. Dental treatment was found to reduce the negative impact of dental caries on OHRQoL in 6–8-year-old children, which was detected by both questionnaires (B-ECOHIS and CPQ₈₋₁₀).

Keywords: Quality of Life; Dental Caries; Child; Pain; Sensitivity and Specificity.

Introduction

Dental caries is one of the world's most common chronic childhood diseases and the fourth most expensive to treat.¹ The first clinical manifestations of this multifactorial disease are asymptomatic visible alterations in the enamel, which can be treated through non-invasive and painless measures.² However, parents often do not notice such signs in their children's teeth. Consequently,

Submitted: May 22, 2020
Accepted for publication: April 29, 2021
Last revision: May 20, 2021



the lesions tend to progress to more advanced stages, which can lead to tooth loss.³ Epidemiological data have shown that most cavitated lesions in the dentin of primary teeth remain untreated,⁴ although dental treatment has proven to be an important strategy for minimizing or eliminating the consequences of untreated caries, which in more severe stages can negatively impact the daily life of children and their families.⁵

Therefore, there has been increasing interest in associating the quality of life data with the objective analysis of oral health,⁶ usually by determining the number of teeth affected by dental caries in both adults and children. With respect to children's oral health,⁷ several studies have shown a relationship between dental caries and lower quality of life in different age groups.^{8,9,10} Therefore, it is mandatory to assess the impact of dental treatment in reducing the negative effects of poor oral health status on children's quality of life.

Several versions of the oral health-related quality of life (OHRQoL) questionnaires have been developed to measure the functional and psychological impact of oral disorders on children under 8 years of age, based on information provided by the children or their caregivers about their daily lives.⁶⁻¹² Many of these questionnaires have been tested for validity and reliability, but not for responsiveness and sensitivity, which are essential characteristics that demonstrate an instrument's ability to validly determine change over time.¹³⁻¹⁷ It should also be pointed out that none of these questionnaires have been validated for use in children aged 6 to 7 years.

Thus, the purposes of this study were to evaluate the impact of dental treatment on the OHRQoL of children with and without cavitated dentin carious lesions, by pre- and post-treatment intra- and intergroup analysis, and to test the responsiveness and sensitivity of the questionnaires applied. We hypothesized that the management of cavitated dentin lesions can reduce the negative impact of such conditions on the children's OHRQoL.

Methodology

Ethical aspects

This project was approved by the Ethics Committee of the Faculty of Health Sciences of the

University of Brasilia (CAAE registration number 51310415.0.0000.0030). An informed consent form was sent to the parents to explain the study and the voluntary nature of participation. Assent forms were also collected from the children.

Study phases and sample selection

This before-after experimental study was divided into two phases (Figure). Phase 1 occurred prior to dental treatment and included sending the consent form, a sociodemographic questionnaire, and the Brazilian version of the Early Childhood Oral Health Impact Scale (B-ECOHIS) questionnaire¹⁸ for the parents to answer; administering the Brazilian version of the Child Perceptions Questionnaire (CPQ₈₋₁₀) to the children (pre-treatment quality of life survey); and determining the children's oral health using the Caries Assessment Spectrum and Treatment (CAST)¹⁹ instrument. Phase 2 involved providing dental treatment to children with one or more cavitated dentin carious lesions (treatment group), preventive measures for those with none (control group), and re-applying the OHRQoL questionnaires to both parents and children 30 days post-treatment (post-treatment quality of life survey).

The inclusion criteria for Phase 1 were children aged 6 to 8 years enrolled in the second grade in the six public schools of Paranoá, DF. Paranoá is an administrative region of the Federal District, with a human development index of 0.785. According to official data, about 90% of the population are not covered by private health insurance, and less than 5% have a higher education level. Children who refused to be examined or parents who, due to some difficulty, were judged by their children being unable to answer the quality of life questionnaire, were excluded. In total, 374 children were included in this study.

For Phase 2, a sample size calculation was carried out based on the difference in toothache prevalence between the treatment and control groups. For a 40% difference, an alpha of 0.05, a statistical power of 80%, and 32 children randomly selected from among the six schools were required for each group.

Phase 1

The B-ECOHIS,¹⁸ sociodemographic questionnaire, and consent form were sent to the parents

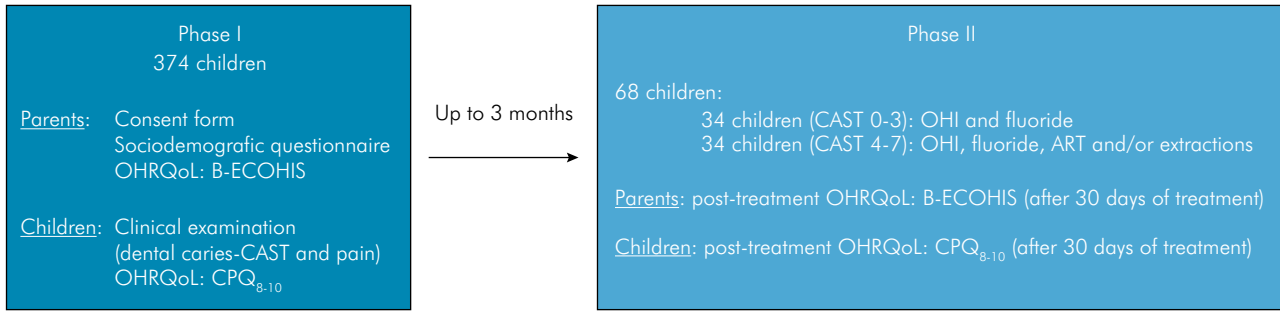


Figure. Flow chart for Phase I and Phase II, with sample size and evaluated variables.

(self-administered). The B-ECOHIS was completed by the parent or guardian, and it consisted of 13 items in two sections, the child impact section and the family impact section. These sections were divided into domains: four in the child impact section (symptom, function, psychological, and self-image/social interaction), and two in the family impact section (parent distress and family function).²⁰ The sociodemographic questionnaire consisted of 21 questions covering the family's sociodemographic aspects and questions about the child's oral health.

The second step of this phase was a clinical examination of the participating children for toothache (reported by the child), and the assessment of dental caries using the CAST¹⁹ instrument. This instrument, which distinguishes all stages of dental caries, features 10 codes that assess dental caries from enamel carious lesions to tooth loss.¹⁴ Codes 1 and 2 refer to dental treatments; code 3 registers enamel carious lesions; codes 4 and 5 are related to dentin lesions without obvious cavitation and with cavitation, respectively; codes 6 and 7 are related to pulp exposure and fistula/abscess; and code 8 indicates tooth loss due to dental caries. Moreover, the CAST instrument categorizes individuals in stages according to dental caries severity as follows: healthy (CAST codes 0, 1, and 2), pre-morbidity (CAST code 3), morbidity (CAST codes 4 and 5), severe morbidity (CAST codes 6 and 7), and mortality (CAST code 8).

Examinations of the 374 children were performed by two examiners under natural light supplemented with artificial light (a portable lamp). The equipment included a portable stretcher, clinical mirrors (Golgran, São Paulo, SP, Brazil), gauze (for tooth drying), and a WHO probe, which was used according to

WHO recommendations.²¹ The examiners had been previously trained and calibrated by an experienced epidemiologist, and the calibration procedures are described in detail elsewhere.²² The inter- and intra-examiner kappa values for the CAST instrument ranged from 0.89 to 0.93. The prevalence rates of dentin carious lesions in these groups were 40.6% and 49.2%, respectively, when including enamel lesions. Additionally, the prevalence of dental pain was 2.8%.²²

After the examination, the children's quality of life data were collected using the Brazilian version of the CPQ₈₋₁₀ questionnaire, which was administered as an interview¹¹ by trained personnel, which facilitated the comprehension of the questionnaire by the study population (6–8-year-old children). This questionnaire consisted of 29 questions on four subscales: oral symptoms, functional limitations, emotional well-being, and social well-being. It was applied in a separate setting from that of the clinical examination to avoid interference in the responses.^{16,23}

Phase 2

The CAST codes were analyzed, and the children were divided into two groups: children presenting with CAST codes 0, 1, 2, and 3 were considered healthy, while those with CAST codes 4, 5, 6, and 7 were considered to have a disease. Through a randomization process (randomize.org), the first 34 children without (CAST codes 0 to 3) and with caries (CAST codes 4 to 7), totaling 68 of the 374 children evaluated in phase 1 were then selected to comprise the control and treatment groups, respectively.

Treatments were carried out at the school premises. For CAST codes 4 and 5, that is carious

lesions in the dentin that did not involve the pulp, painful symptoms and/or fistula were treated using the atraumatic restorative treatment.²⁴ For CAST codes 6 and 7, the need for extraction was confirmed by radiography, which was performed at the school premises with a portable X-ray machine (70k periapical Rx, Dabi Atlante, Ribeirão Preto, Brazil). Extraction was performed only after obtaining the parents or guardians' consent at the school premises. There were also children who required endodontic treatment. These cases were referred to the pediatric dentistry clinic of the University Hospital of Brasilia due to the impossibility of performing such treatment under the provisory conditions at the school. Although both groups received oral health instructions and education on the application of fluoride varnish, this was the only treatment provided to the control group.

Statistical analysis

The collected data were analyzed using SPSS for Windows (version 20.0; SPSS Inc., Chicago, USA). Initially, descriptive statistics and proportions analysis (Pearson chi-square test or Fisher's exact test) were performed to assess the homogeneity of the groups (control vs. treatment) in relation to the sociodemographic characteristics. The normality of quantitative variables from the quality of life questionnaires was determined using the Shapiro-Wilk test. Non-parametric tests were used to determine the significance of differences within and between groups, regarding the questionnaire scores. The Wilcoxon signed-rank test (Phase 1 vs. Phase 2) and the Mann-Whitney U-test for independent groups (control vs. treatment) were also used.

The sensitivity of the B-ECOHIS and the Brazilian version of the CPQ₈₋₁₀ were assessed by determining changes in scores over time.^{14,15} Pre- and post-treatment scores were compared using the Wilcoxon signed-rank test. Effect size estimation indicated the magnitude of statistical variation.²⁵ To test the change in responsiveness of both questionnaires, the standardized response mean (SRM) was computed²⁶, with the values evaluated as follows: ≤ 0.2 , small effect; 0.3–0.7, moderate effect; and ≥ 0.8 , large effect.²⁵ The minimally important difference (MID), which

can be conceptualized as the smallest difference in score that the patients perceived as beneficial, was also estimated¹⁵. Internal consistency was analyzed using Cronbach's alpha.

Results

Sample characterization and sociodemographic data

In total, 68 children (34 in the treatment group and 34 in the control group) were included in this study. The majority were female (51.5%), 7 years old (76.5%), and those with mothers as head of the household (52.9%). The parents or guardians generally had over 8 years of education (52.5%), and 58.8% of this population had a monthly income varying between R\$678 and R\$1356 (US\$123.3 and US\$246.50).

In Phase 1, the sample was homogeneous in terms of sociodemographic and economic characteristics. Table 1 shows the characterization of the two groups.

Assessment of the children's conditions in Phase 1 and Phase 2

Table 2 shows the sample distribution regarding toothache, caries, and maximum CAST scores in Phases 1 and 2. In the treatment group, there was an expressive reduction in the prevalence of these conditions, with differences between the two phases.

Evaluation of the quality of life questionnaires in Phase 1 and Phase 2

The B-ECOHIS showed good internal consistency at baseline (Cronbach's alpha = 0.881). Table 3 shows the total scores and scores for each B-ECOHIS domain in the different phases. There was a significant difference ($p < 0.05$) between the control and treatment groups in phase 1. The perceived impact of oral health was significantly higher among the parents of children with CAST codes 5, 6, and 7. According to the B-ECOHIS scores, in phase 1, the parents of children with cavitated dentin lesions reported a greater impact on the overall score ($p = 0.001$) and on the following domains: symptom ($p = 0.001$), function ($p = 0.001$), psychological ($p = 0.001$), self-image/social interaction ($p = 0.010$), parental distress ($p = 0.001$), and family function ($p = 0.001$).

Table 1. Sample characterization according to the study groups (control and treatment).

Variables	Control group	Treatment group	Total	p-value
	n (%)	n (%)	n (%)	
Sex				0.225 ^a
Male	14 (41.2)	19 (55.9)	33 (48.5)	
Female	20 (58.8)	15 (44.1)	35 (51.5)	
Age				0.332 ^b
6 years	0 (0.0)	3 (8.8)	3 (4.4)	
7 years	28 (82.4)	24 (70.6)	52 (76.5)	
8 years	6 (17.6)	7 (20.6)	13 (19.1)	
Lived with				0.783 ^b
Father	13 (38.2)	9 (26.5)	22 (32.4)	
Mother	16 (47.1)	20 (58.8)	36 (52.9)	
Grandparent	4 (11.8)	4 (11.8)	8 (11.8)	
Other	1 (2.9)	1 (2.9)	2 (2.9)	
Guardian's education				0.705 ^a
≤ 8 years	15 (50.0)	14 (45.2)	29 (47.5)	
> 8 years	15 (50.0)	17 (54.8)	32 (52.5)	
Monthly family income				1.000 ^a
< 1 x minimum monthly wage	9 (26.5)	9 (26.5)	18 (26.5)	
1–2 x minimum monthly wage	20 (58.8)	20 (58.8)	40 (58.8)	
≥ 3 x minimum monthly wage	5 (14.7)	5 (14.7)	10 (14.7)	
Parent believes that the child needs dental treatment				0.053 ^a
No	5 (14.7)	0 (0.0)	5 (7.5)	
Yes	29 (85.3)	33 (100.0)	62 (92.5)	
The child has been to the dentist at least once in his or her life				0.231 ^a
No	14 (41.2)	9 (27.3)	23 (34.3)	
Yes	20 (58.8)	24 (72.7)	44 (65.7)	
Toothache in the last three months				< 0.001 ^b
No	31 (91.2)	14 (41.2)	45 (66.2)	
Yes	3 (8.8)	20 (58.8)	23 (33.8)	

^aPearson chi-square test; ^bFisher's exact test.

Significant intragroup differences ($p < 0.001$) were observed in the treatment group between phase 1 and phase 2. The mean total pre-treatment B-ECOHIS score was 14.94 ± 8.84 in Phase 1 (pre-treatment) and 1.41 ± 1.83 in phase 2 (post-treatment), with approximately 90% reduction in total score. There was a significant difference in the reduction of the mean and median total B-ECOHIS scores between Phase 1 and Phase 2 ($p < 0.001$), indicating that, according to their parents, the children's OHRQoL improved. For each B-ECOHIS domain, the mean and median baseline values were significantly higher than those found in Phase 2 ($p < 0.001$), indicating an improvement in all aspects of oral health post-treatment (Table 3).

The Brazilian version of the CPQ₈₋₁₀ also showed good internal consistency in Phase 1 (Cronbach's alpha = 0.890). Table 4 shows the total and individual subscale scores for the CPQ₈₋₁₀ in Phase 1 and Phase 2. There was a statistically significant difference ($p < 0.05$) between the control and treatment groups in phase 1. The perceived impact of oral health on the children's quality of life was significantly higher in the treatment group according to the CPQ₈₋₁₀ scores. In Phase 1, this group reported a greater impact on the overall score ($p = 0.004$) and on the following subscales: oral symptoms ($p = 0.005$), emotional well-being ($p = 0.004$), and social well-being ($p = 0.004$). In Phase 2, this group reported a greater impact on the

Table 2. Distribution of children according to the occurrence of toothache, dentin caries and maximum CAST score at Phase 1 and Phase 2.

Variables	Control group	Treatment group	Total
	n (%)	n (%)	n (%)
Toothache (phase 1)			
Absent	31 (91.2)	24 (70.6)	55 (80.9)
Present	3 (8.8)	10 (29.4)	13 (19.1)
Toothache (phase 2)			
Absent	32 (94.1)	33 (97.1)	65 (95.6)
Present	2 (5.9)	1 (2.9)	3 (4.4)
Dentin caries (phase 1)			
Absent	34 (100)	0 (0.0)	34 (50)
Present	0 (0.0)	34 (100)	34 (50)
Dentin caries (phase 2)			
Absent	34 (100.0)	34 (100)	68 (100)
Present	0 (0.0)	0 (0.0)	0 (0.0)
Maximum CAST score (phase 1)			
Healthy	28 (82.4)	0 (0.0)	28 (41.2)
Restauration	2 (5.9)	0 (0.0)	2 (2.9)
Enamel	4 (11.8)	0 (0.0)	4 (5.9)
Dentin (clear cavitation in the dentin)	0 (0.0)	4 (11.8)	4 (5.9)
Pulp	0 (0.0)	13 (38.2)	13 (19.1)
Abscess/fistula	0 (0.0)	1 (2.9)	1 (1.5)
Lost	0 (0.0)	16 (47)	16 (23.6)
Maximum CAST score (phase 2)			
Healthy	28 (82.4)	0 (0.0)	28 (41.2)
Restauration	2 (5.9)	5 (14.7)	7 (10.3)
Enamel	4 (11.8)	0 (0.0)	4 (5.9)
Lost	0 (0.0)	29 (85.3)	29 (42.6)

overall score ($p = 0.016$) and on functional limitations subscale ($p = 0.001$).

Significant intragroup differences ($p < 0.001$) were also observed in the treatment group between phase 1 and phase 2. The mean total CPQ₈₋₁₀ score was 20.79 ± 14.92 in Phase 1 and 5.35 ± 7.98 in Phase 2, with a reduction of approximately 74%. ($p < 0.001$), indicating an improvement in their OHRQoL. For each CPQ₈₋₁₀ subscale, the mean/median Phase 1 values were also significantly higher than the Phase 2 values ($p < 0.001$), indicating post-treatment improvement in all aspects of oral health (Table 4).

Questionnaire sensitivity and responsiveness

The change in the mean total B-ECOHIS score for the treatment group was 13.53 ± 8.05 , which was calculated by subtracting the baseline scores from

the follow-up scores. A positive change indicated an improved OHRQoL. The highest mean change among the subscales was observed in the functional domain (3.76 ± 3.34). In addition, there was a large effect size for the magnitude of change in total B-ECOHIS score (1.53), as well as for the symptom (1.65), function (1.10), psychological (1.11), parent distress (1.61), and family function domains (0.89). A moderate effect size was found in the self-image/social interaction domain (0.74) (Table 5). The SRM values were high for total B-ECOHIS score (1.68), as well as for the symptoms (1.64), function (1.13), psychological (1.18), parent distress (1.64), and family function domains (0.92). A moderate SRM value was observed in the self-image/social interaction domain (0.75). The MID for the total B-ECOHIS score was 0.92, whereas among the six subscales, the parent distress domain had the

Table 3. Measures of central tendency and variability in B-ECOHIS and subscale scores according to group and point in time [control and treatment groups in Phases 1 and 2].

Variable	Point in time					
	Phase 1			Phase 2		
	Mean (SD)	Median	IQR	Mean (SD)	Median	IQR
Control group						
B-ECOHIS						
Overall score	4.35 (5.01)	2.00	1.50–6.25	2.18 (2.62)	1.50	0.00–3.25
Child Section (subscale)						
1. Symptom domain	0.59 (0.96)	0.00	0.00–1.00	0.29 (0.63) ^b	0.00	0.00–0.00
2. Function domain	1.35 (1.67)	0.50	0.00–2.25	0.94 (1.58) ^b	0.00	0.00–2.00
3. Psychological domain	0.44 (0.99)	0.00	0.00–0.00	0.18 (0.76)	0.00	0.00–0.00
4. Self-image/social interaction domain	0.38 (0.89)	0.00	0.00–0.00	0.12 (0.48)	0.00	0.00–0.00
Family Section (subscale)						
5. Parent distress domain	1.03 (1.88)	0.00	0.00–2.00	0.41 (1.08)	0.00	0.00–0.00
6. Family function domain	0.56 (1.50)	0.00	0.00–0.25	0.24 (0.61)	0.00	0.00–0.00
Treatment group						
B-ECOHIS						
Overall score	14.94 (8.84) ^a	14.00	6.75–21.25	1.41 (1.83) ^c	1.00	0.00–2.00
Child section (subscale)						
1. Symptom domain	1.85 (1.10) ^a	2.00	1.00–2.00	0.03 (0.17) ^c	0.00	0.00–0.00
2. Function domain	3.94 (3.41) ^a	3.50	1.50–6.25	0.18 (0.58) ^c	0.00	0.00–0.00
3. Psychological domain	2.26 (1.85) ^a	2.00	0.00–4.00	0.21 (0.54) ^c	0.00	0.00–0.00
4. Self-image/social interaction domain	1.32 (1.74) ^a	0.00	0.00–2.00	0.03 (0.17) ^c	0.00	0.00–0.00
Family section (subscale)						
5. Parent distress domain	3.82 (1.88) ^a	4.00	2.00–5.00	0.79 (1.37) ^c	0.00	0.00–1.00
6. Family function domain	1.74 (1.76) ^a	2.00	0.00–2.25	0.18 (0.63) ^c	0.00	0.00–0.00

SD: standard deviation; IQR: interquartile range (25th–75th percentile). ^aSignificant difference between control and treatment groups at phase 1 (Mann–Whitney U-test, $p < 0.05$); ^bSignificant difference between control and treatment groups at phase 2 (Mann–Whitney U-test, $p < 0.05$); ^cSignificant difference between Phase 1 and Phase 2 in the treatment group (Wilcoxon signed-rank test, $p < 0.001$); *No significant difference was found between Phase 1 and Phase 2 in the control group (Wilcoxon signed-rank test, $p > 0.001$).

highest value (0.69). All these values were lower than the change in mean score (Table 5).

Table 6 shows the sensitivity and responsiveness of the CPQ₈₋₁₀ to treatment. The mean total change in the CPQ₈₋₁₀ score was 15.44 ± 13.28 for the treatment group. The greatest mean change for any subscale was observed in oral symptoms (4.65 ± 4.14). In addition, there was a large effect size for the magnitude of change in the total CPQ₈₋₁₀ score (1.03), as well as for the oral symptoms (1.11), functional limitations (0.91), and well-being subscales (0.85). There was a moderate effect size for the social well-being subscale (0.65). SRM values were high for the total CPQ₈₋₁₀ score (1.16), as well as for oral symptoms (1.12), functional limitations (1.10), and emotional well-being subscales (0.83). There was a moderate value for the social

well-being subscale (0.76). The MID for total CPQ₈₋₁₀ score was 3.99. Of the four subscales, the highest MID value was observed in the emotional well-being subscale (1.47). All these values were lower than the change in mean scores (Table 6).

Discussion

The results of this investigation showed a clear and positive impact of dental treatment on the OHRQoL of children aged 6–8 years, who were affected by untreated dental caries at the cavitation level. Their OHRQoL improved significantly after treatment, which was perceived not only by the child, but also by a family member. The scores of both questionnaires, CPQ₈₋₁₀ and B-ECOHIS, reduced

Table 4. Measures of central tendency and variability in CPQ₈₋₁₀ and subscale scores according to group and point in time [control and treatment groups in Phases 1 and 2].

Variable	Point in time					
	Phase 1			Phase 2		
	Mean (SD)	Median	IQR	Mean (SD)	Median	IQR
Control group						
CPQ ₈₋₁₀						
Overall score	12.21 (12.83)	7.50	2.00–19.00	8.85 (8.75) ^b	6.00	3.75–12.25
Subscale						
1. Oral symptoms	4.00 (3.73)	2.50	1.75–6.00	2.94 (2.95)	2.00	0.75–4.25
2. Functional limitations	3.21 (3.92)	2.00	0.00–5.25	2.88 (2.77) ^b	2.00	0.00–4.00
3. Emotional well-being	2.29 (3.23)	1.00	0.00–2.50	1.74 (3.02)	0.00	0.00–2.00
4. Social well-being	2.71 (4.15)	0.50	0.00–4.00	1.29 (2.11)	0.00	0.00–2.00
Treatment group						
CPQ ₈₋₁₀						
Overall score	20.79 (14.92) ^a	16.50	9.00–32.50	5.35 (7.98) ^c	2.00	0.75–7.00
Subscale						
1. Oral symptoms	6.68 (4.18) ^a	6.00	4.00–9.00	2.03 (2.67) ^c	2.00	0.00–2.00
2. Functional limitations	4.44 (3.66)	4.00	1.00–6.50	1.12 (2.28) ^c	0.00	0.00–2.00
3. Emotional well-being	4.94 (4.40) ^a	4.00	1.00–9.00	1.21 (2.93) ^c	0.00	0.00–1.00
4. Social well-being	4.74 (5.76) ^a	3.00	0.75–6.50	1.00 (1.86) ^c	0.00	0.00–2.00

SD: standard deviation; IQR: interquartile range (25th-75th percentile). ^aSignificant difference between control and treatment groups at phase 1 (Mann–Whitney U-test, $p < 0.05$); ^bSignificant difference between control and treatment groups in phase 2 (Mann–Whitney U-test, $p < 0.05$); ^cSignificant difference between Phase 1 and Phase 2 surveys in the treatment group (Wilcoxon signed-rank test, $p < 0.001$); *No significant difference was found between Phase 1 and Phase 2 for the control group (Wilcoxon signed-rank test, $p > 0.001$).

Table 5. Sensitivity and responsiveness of the B-ECOHIS to caries treatment.

Group	Mean score change (SD)	Cohen's d ^a	SRM ^b	MID ^c
Control group				
B-ECOHIS				
Overall score	2.18 (5.09)	0.44	0.43	-
Child section (subscale)				
1. Symptom domain	0.29 (0.84)	0.30	0.35	-
2. Function domain	0.41 (1.23)	0.25	0.33	-
3. Psychological domain	0.26 (0.86)	0.26	0.30	-
4. Self-image/social interaction domain	0.26 (0.79)	0.29	0.33	-
Family section (subscale)				
5. Parent distress domain	0.62 (1.88)	0.33	0.33	-
6. Family function domain	0.32 (1.59)	0.21	0.20	-
Treatment group				
B-ECOHIS				
Overall score	13.53 (8.05)	1.53	1.68	0.92
Child section (subscale)				
1. Symptom domain	1.82 (1.11)	1.65	1.64	0.09
2. Function domain	3.76 (3.34)	1.10	1.13	0.29
3. Psychological domain	2.06 (1.74)	1.11	1.18	0.27
4. Self-image/social interaction domain	1.29 (1.73)	0.74	0.75	0.09
Family section (subscale)				
5. Parent distress domain	3.03 (1.85)	1.61	1.64	0.69
6. Family function domain	1.56 (1.69)	0.89	0.92	0.32

SD: standard deviation; ^aeffect size; ^bSRM: standardized response mean; ^cMID: minimally important difference.

Table 6. Sensitivity and responsiveness of the CPQ₈₋₁₀ to caries treatment.

Group	Mean score change (SD)	Cohen's d ^a	SRM ^b	MID ^c
Control group				
CPQ ₈₋₁₀				
Overall score	3.35 (8.76)	0.26	0.38	-
Subscale				
1. Oral symptoms	1.06 (3.14)	0.28	0.34	-
2. Functional limitations	0.32 (2.17)	0.08	0.15	-
3. Emotional well-being	0.56 (2.36)	0.17	0.24	-
4. Social well-being	1.41 (4.36)	0.34	0.32	-
Treatment group				
CPQ ₈₋₁₀				
Overall score	15.44 (13.28)	1.03	1.16	3.99
Subscale				
1. Oral symptoms	4.65 (4.14)	1.11	1.12	1.34
2. Functional limitations	3.32 (3.03)	0.91	1.10	1.14
3. Emotional well-being	3.74 (4.53)	0.85	0.83	1.47
4. Social well-being	3.74 (4.94)	0.65	0.76	0.93

SD: standard deviation; ^aeffect size; ^bSRM: standardized response mean; ^cMID: minimally important difference.

dramatically from phase 1 to phase 2. Moreover, the domains and subscales of each questionnaire reflected these reductions.

This age group (6 to 8 years old) was selected due to the lack of published studies on this topic among children in this age group.^{8,27} The gap in the literature can be explained by the absence of a specific instrument to assess children's perception of OHRQoL in this age group,⁸ based on concerns that children under 8 years of age could not satisfactorily respond to questions because of their communication and cognitive limitations. However, it has been demonstrated that children already have the capacity to self-evaluate, form abstract thoughts, and make judgments at 6 years of age.²⁸ In addition, the interview format applied by the trained personnel in a quiet environment allowed a better comprehension of the questions by the study population. Our results showed that the perception of the children and that of their parents matched, with respect to the children's OHRQoL, which allowed us to infer that the children were able to correctly express their feelings.

In addition, evaluating parental perceptions is important, since a child's dental problem can lead to lost sleep and workdays, cause additional expenses, and feelings of guilt in the parents.^{5,29}

Martins-Junior et al.¹⁰ showed the effectiveness of the B-ECOHIS in assessing the impact of early childhood caries (ECC) on the OHRQoL of preschool children and their families. In our study, the parents' scores for guilt and distress in the B-ECOHIS "family section" remained higher in the treatment group than in the control group, even after treatment, indicating that despite improved oral health, some OHRQoL aspects are difficult to change. In a recent study,³⁰ parents feeling upset and guilt were the most frequently reported domains at baseline, and even after treatment, some parents still felt guilty. The authors believe that families with better financial conditions that did not use preventive therapy or treatment at the initial stages felt more anguished. Therefore, improving parents' knowledge of oral health in order to seek early treatment and prioritize preventive care rather than treatment is of utmost importance.²⁹

The effect size (ES) and standardized response mean (SRM) for both questionnaires were considered large when comparing Phase 1 (before treatment) and Phase 2 (post-treatment) in the treatment group. A similar overall score for B-ECOHIS and effect size was reported by Vollú et al.³⁰ when evaluating the OHRQoL 30 days after dental treatment in 16 preschool children with ECC. Abanto et al.³¹

also confirmed that dental treatment improved the OHRQoL in children aged 3–5 years, with both ES and SRM considered large. On the other hand, only subtle changes were observed in the control group, as was the case in previous studies.^{24,32} This reinforces the concept that dental caries at the morbidity and severe morbidity stages negatively impact OHRQoL. It also demonstrates that the improvement of OHRQoL depends significantly on oral health prior to treatment.³³

Our results also showed that the presence of cavitated carious lesions significantly increased the total B-EOCHIS and CPQ₈₋₁₀ scores, that is untreated caries negatively impacted children's quality of life. This impact is more clearly perceived at more severe stages of the disease, such as caries involving the pulp, fistulas, abscesses, pain, or residual roots.⁸ Therefore, the use of caries detection instruments, such as CAST,¹⁹ in which dentin carious lesions are registered at different levels—shadow in dentin without an obvious cavitation, cavitation, pulp exposure, and fistula/abscess—are recommended. Based on the stratification of individuals by CAST codes into healthy, pre-morbidity, severe morbidity, and mortality stages, one can speculate about the impact of oral health/dental treatment on a child's quality of life. Vollú et al.³⁰ observed that children who underwent extractions or required a space maintainer during the treatment phase presented higher B-ECOCHIS scores than those who did not experience any of those treatment options. If children at an early age already have problems concerning their OHRQoL, we should really consider the promotion of oral health through educational programs, to control this preventable disease.⁸

Regarding the characterization of our sample, the socio-demographic characteristics of both groups were similar, consisting mostly of low-income families. Such findings were expected, since the region in which the study was carried out is one of the poorest areas of Brazil's Federal District.³⁴ Although there were healthy children identified by the CAST instrument who were enrolled in the control group, the children in the treatment group presented with precarious oral health conditions that can be, in part, explained by

the social vulnerability of the families. The literature shows that children from families whose income is no more than two times the minimum monthly wage are more likely to have oral problems and, consequently, poorer OHRQoL.^{35,36,37}

Our study also tested the sensitivity and responsiveness of the B-ECOCHIS and CPQ₈₋₁₀, and the results were satisfactory. Measures of effect size and mean score difference demonstrated that the instruments were valid for evaluating changes in the quality of life of children aged 6 to 8 years after dental treatment. This means that such questionnaires can be used in future clinical trials involving children in this age group. We also tested the internal consistency of the instruments, and in both cases, the Cronbach's alpha coefficient values were close to 1, indicating good consistency.

Our results provide original evidence for the impact of dental treatment on the OHRQoL of schoolchildren aged 6 to 8 years, and the validity of using both CPQ₈₋₁₀ and B-ECOCHIS as instruments to assess this impact. The limitations of our study include the short-term evaluation (only 30 days) and the use of CPQ₈₋₁₀ in a different age population. The CPQ₈₋₁₀ was applied in an interview format to allow a better comprehension in the children, changing its original concept (self-application). In addition, no previous test was performed on the children to evaluate their understanding. Longer evaluation periods should be included in future studies to evaluate the long-term effects on their OHRQoL and on their families.

Conclusions

It can be concluded that cavitated dentin carious lesions worsened the OHRQoL of 6–8 years old children, and this impact can be overcome by dental treatment. Moreover, CPQ₈₋₁₀ and B-ECOCHIS can be used as safe tools to evaluate OHRQoL in this age population.

Acknowledgements

This study received a research grant from the Brazilian Federal District Research Support Foundation (FAPDF).

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