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Impact of a dental care program on the quality of life of children with and without caries

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Abstract: The aim of the present study was to evaluate the long-term effects of the caries treatment provided by a dental care program on changes in schoolchildren's OHRQoL. A one-year follow-up was conducted with a sample of 372 children aged 8 to 10 years which were clinically examined and divided into two matched groups according to their caries experience: dental treatment group (DTG) and group without caries (GWC). Both groups were assessed three times (at baseline, at 4 weeks, and at 1 year) using the Child Perceptions Questionnaire (CPQ_{8-10}). The normality test was performed for the statistical analyses; the Friedman test was used for the dependent variables (longitudinal assessment repeated three times for the same group); and the Mann-Whitney test was used for the independent variables (test and control groups in each time period). There was improvement in all domains and in overall CPQ_{8-10} ($p < 0.0001$) in the DTG over time, but no significant changes ($p > 0.05$) were observed at baseline for overall CPQ_{8-10} and for the emotional well-being domain in the GWC. The comparison between groups demonstrated that OHRQoL was persistently better for the GWC ($p < 0.05$) over time. In conclusion, dental caries treatment has a long-term positive impact on schoolchildren's OHRQoL, highlighting the importance of health policies that promote access to dental care for this population.

Keywords: Oral Health; Child; Quality of Life.

Introduction

Over the past two decades, there has been a growing interest of health professionals and researchers in the sociodental approach for improvement of the quality of oral care, which focuses more on the subjective well-being of individuals and is guided by Oral Health-Related Quality of Life (OHRQoL) measures.[1,2] The subjective assessments of the psychosocial impacts of oral disorders complement clinical indicators and provide a more comprehensive oral health diagnosis of individuals and populations.[3,4]

Children and adolescents worldwide suffer from diverse oral problems, but dental caries remains the most prevalent oral disease, which is mediated by psychosocial determinants and has severe consequences for OHRQoL, happiness, and school performance.[5,6,7,8,9] Even though studies with this population have investigated the impact of OHRQoL related to orthodontic treatment, oral rehabilitation under general anesthesia,

atraumatic restorative treatment, traumatic dental injury, and other treatments,[10,11,12,13,14,15,16,17,18] few have evaluated the longitudinal impact of dental caries treatment on children's OHRQoL by considering subjective aspects.[14,15,16,17,18] Most studies comparing OHRQoL scores between children with and without dental caries have a cross-sectional design, which refrains them from determining the causal relationship between an intervention and an outcome.[6,7,13,18] Besides, studies monitoring the OHRQoL after restorative treatment for caries are limited to a 6-month follow-up period, and other studies assessing the impact of interventions for a longer time are thus needed.[14,15,16,17]

Therefore, the aim of the present study was to evaluate the long-term effects of the caries treatment provided by a dental care program on changes in schoolchildren's OHRQoL. The findings presented in this prospective cohort study refer to data on a 1 year follow-up from a larger project that investigated the impact of dental treatment on children with and without dental caries.[16]

Methodology

Ethical issues

The project was approved by the Research Ethics Committee (protocol no. 111/2010) of Piracicaba Dental School, University of Campinas. The written informed consent for the children to participate in the study was obtained from their parents/guardians.

Study population

This prospective cohort was carried out with the initial population study of 1,215 schoolchildren aged 6 to 10 years from 10 schools participating in the "Always Smiling Project" conducted by Piracicaba Dental School– University of Campinas, Brazil – and other partners. The project targeted preventive and curative actions related to the dental health of children from low-income families and from areas of greater social exclusion.[16,19]

At the beginning of the study, all schoolchildren were clinically examined for the presence of decayed, missing, and filled teeth (DMFT and dmft indexes) related to dental caries in permanent and primary teeth. Four calibrated examiners performed the examinations under natural light, outside the classrooms, using WHO probe and mirrors, in accordance with the recommendations of the World Health Organization (WHO) for epidemiological studies.[20] Before the examinations, calibration exercises comprising practical and theoretical activities were carried out. Intra-rater reliability was assessed and an 85% rate was considered to have good agreement.

After examining all the children aged 8 to 10 years, the researchers detected 186 schoolchildren who required dental treatment from three randomly selected schools, and all of these children participated in the study. For comparison, another 186 caries-free schoolchildren (DMFT and dmft equal to zero) were selected randomly, matched by gender and age in each school, totaling 372 children.

A total of 372 schoolchildren aged 8 to 10 years from three schools included in the "Always Smiling Project" were then invited to participate in this study. The sample size (n = 372) has, according to our *a posteriori* calculations, a power above 0.80 for a 5% significance level to detect a 10% difference between groups and between times.

Two groups were therefore formed at baseline: dental treatment group (DTG), consisting of 186 children aged 8 to 10 years in need of curative dental treatment, and group without caries (GWC), composed of 186 schoolchildren with similar characteristics to those of the DTG but without curative dental needs. The groups were matched by using children from the same schools.

OHRQoL assessments were performed in both groups at baseline, at 4 weeks after dental treatment, and at 1 year after baseline. All treatments were performed in accordance with the protocols of Piracicaba Dental School, University of Campinas, Brazil.

Assessment of OHRQoL

The Child Oral Health Quality of Life (COHQoL) questionnaire is widely used with children and contains questions about oral symptoms, functional limitations, emotional well-being, social well-being, overall oral health, and extent to which oral health status affects overall well-being.[21] Originally drafted in Canada, the CPQ_{8-10} has been translated and validated

for use in other countries, including Brazil.[22] The questionnaire was self-administered in the school environment and it was used to evaluate the OHRQoL of the two groups. [23]

The CPQ_{8-10} consists of 25 questions organized into four health domains: oral symptoms (OS) (n = 5), functional limitations (FL) (n = 5), emotional well-being (EWB) (n = 5), and social well-being (SWB) (n = 10). Each item is scored on a 5-point Likert scale to rate the impact of oral health status on a given aspect of quality of life (described by the item). The questions ask about the frequency of events in the previous 4 weeks in relation to children's oral/orofacial condition. The response options are: "never" = 0, "once/twice" = 1, "sometimes" = 2, "often" = 3, and "everyday/almost everyday" = 4. The instrument also contains global ratings for children's oral health and the extent to which the oral/orofacial condition affects their overall well-being. They are worded as follows: "When you think about your teeth or mouth, would you say that they are…" and "How much do your teeth, or mouth, bother you in your everyday life?" A 4-point response format, ranging from "very good" = 0 to "poor" = 3 and from "not at all" = 0 to "a lot" = 3, respectively, is offered for these ratings.

To assess changes in schoolchildren's OHRQoL over time, the CPQ_{8-10} was applied at baseline, in the school environment, to the group of children without curative dental needs and to that with curative dental needs. The questionnaire was re-administered to all schoolchildren without curative dental needs and to those who had completed their curative treatment at 4 weeks and at 1 year, also in the school environment.

In addition to the 25 items of the CPQ_{8-10}, global questions were assessed at baseline and follow-up to evaluate changes in OHRQoL. At baseline, the CPQ_{8-10} asks global questions about subjective aspects of oral health (very good, good, fair, and poor). At follow-up, according to the methodology of Jokovic et al.,[21] the questions in the OHRQoL domains were the same, but the global ratings were replaced with global transition judgment (GTJ), which indicates improvements, no change, or worsening in the OHRQoL of participants over time.

Statistical analyses

A guided data analysis was performed using the SAS software, which indicated that the data do not meet the assumptions of parametric analysis (additivity model, normal distribution of errors, and homogeneity of variances) or with some adaptation. Nonparametric tests were then used. The scores for overall CPQ_{8-10} and its domains were obtained by adding the answers to the questions on the Likert scale. The higher the score of CPQ_{8-10}, the worse the OHRQoL. The Friedman test was used for dependent variables (longitudinal assessment in the three time periods for the same group) and the Mann-Whitney test was used for independent variables (test and control groups in each period). Finally, the magnitude of the change was calculated by subtracting the initial score by the final one and dividing that value by the initial score, and the result was presented as percentage. A 5% significance level was considered in all analyses.

Results

The initial sample at baseline and at 4 weeks was composed of 372 schoolchildren. The mean dmft and DMFT indexes at baseline for the 186 children in the DTG group were 1.9 ± 2.1 and 0.6 ± 1.7, respectively.

At 1 year, 180 students (48.38%), divided into GWC (n = 110) and DTG (n = 70), answered the CPQ_{8-10}. The reason why children were lost to follow-up was that many participants changed schools or cities and/or that parents did not allow their children to participate in the study at one year from baseline.

Table shows that lower CPQ_{8-10} scores, indicating better quality of life, occurred at 4 weeks after dental treatment in the DTG. From 4 weeks to 1 year, there was a slight increase in CPQ_{8-10} scores in this group, indicating slight worsening in OHRQoL, which was statistically significant only for the OS domain. However, in this domain, the values did not show a statistically significant difference at baseline and at 1 year. When comparing the results at 4 weeks and at 1 year, there was no significant difference in the assessed CPQ_{8-10} domains, except for OS. This can be observed through the increase in mean OS scores from 5.77 (4 weeks) to 7.83 (1 year), which justifies the statistically significant difference.

By longitudinally evaluating the changes in the OHRQoL of schoolchildren without caries (GWC), there was no statistically significant difference in the mean overall CPQ_{8-10} values and the values obtained for the EWB domain (Table). On the other hand, the OS, FL, and SWB domains showed statistically significant differences over time ($p < 0.05$).

Conversely, the GWC showed a slight and not statistically significant reduction in overall CPQ_{8-10} at 4 weeks and at 1 year, a tendency also observed for the EWB domain, indicating better OHRQoL over time. However, there was a statistically significant decrease in the OS, FL, and SWB scores at 4 weeks and at 1 year, indicating improvement in schoolchildren's OHRQoL.

By comparing the overall CPQ_{8-10} and the domains between the groups in each time period (Table), note that there was a statistically significant difference in all domains and in the mean overall CPQ_{8-10} scores between the treated and untreated groups ($p < 0.0001$) at baseline. At 4 weeks, there was a statistically significant difference between the treated and untreated (caries-free) groups in the OS and SWB domains, in addition to a difference in overall CPQ_{8-10} scores ($p < 0.05$). At 1 year, there was a statistically significant difference in all domains and in overall CPQ between the treated and untreated groups ($p < 0.05$).

Table also presents the calculation of the magnitude of change in OHRQoL for both groups, showing a range from 17.8% to 61.1% in the DTG and 3.5% to 50.6% in the GWC.

Figure shows the overall CPQ_{8-10} scores over time between the two groups. The DTG had greater improvement in their OHRQoL over time while that did not happen to the GWC.

Table. Mean, standard deviation, median and range of all domains and in overall CPQ_{8-10} scores at baseline, at 4 weeks, and at 1 year.

Variables	Baseline			4 weeks			1 year			MC	p#
	Mean (SD)	Median	Range	Mean (SD)	Median	Range	Mean (SD)	Median	Range	%	
Dental Treatment Group - DTG (n = 70)											
CPQ8-10 (overall score)	41.33 (12.59)*	40.0[a]	12–100	20.24 (10.66)**	17.0[b]	0–48	21.97 (11.63)**	20.0[b]	0–69	46.8	p < 0.0001
Domains											
Oral Symptoms	9.53 (4.01)*	10.0[a]	2–20	5.77 (3.68)**	5.0[b]	0–16	7.83 (3.06)**	8.0[a]	0–16	17.8	p = 0.0004
Functional limitation	9.06 (2.3)*	9.0[a]	4–20	3.64 (2.35)	4.0[b]	0–13	3.69 (2.89)**	3.0[b]	0–15	59.2	p < 0.0001
Emotional well-being	9.11 (4.14)*	8.0[a]	1–20	2.90 (2.45)	3.0[b]	0–9	5.16 (3.47)**	5.0[b]	0–20	43.3	p < 0.0001
Social well-being	13.63 (5.16)*	12.0[a]	0–40	7.93 (6.27)**	6.0[b]	0–30	5.3 (4.4)**	3.5[b]	0–28	61.1	p < 0.0001
Group without caries -GWC (n = 110)											
CPQ8-10 (overall score)	16.34 (6.79)	15.5	0–45	15.67 (6.98)	15.0	0–48	15.77 (10.08)	12.00	0–78	3.5	0.7493
Domains											
Oral Symptoms	3.91 (2.84)	4.0[a]	0–13	3.72 (2.84)	3.0[a]	0–13	5.89 (3.16)	5.0[b]	0–14	50.6	< 0.0001
Functional limitation	3.52 (2.38)	4.0[a]	0–10	3.31 (2.38)	3.0[ab]	0–10	2.64 (2.57)	1.00[b]	0–15	23.6	0.0216
Emotional well-being	3.88 (5.54)	2.0	0–17	3.87 (3.57)	2.0	0–20	3.61 (3.06)	2.00	0–17	6.9	0.9193
Social well-being	5.03 (3.46)	5.0[a]	0–19	4.77 (3.46)	5.0[a]	0–19	3.64 (3.57)	2.00[b]	0–32	27.6	0.0044

MC: magnitude of the change; #p-values were obtained from the Friedman test: Same letters indicate no significant difference; different letters indicate significant difference.
According to the Mann-Whitney test, comparison of the dental treatment group and group without caries in each time period: *$p < 0.0001$, **$p < 0.05$.

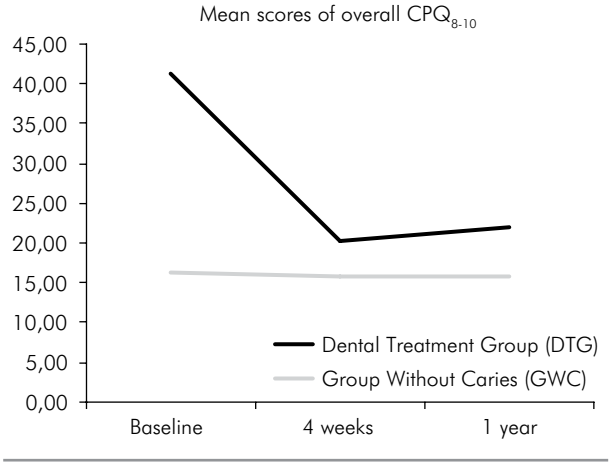

Figure. Mean scores of overall CPQ for both groups

Discussion

This study demonstrates the influence of dental caries on schoolchildren's OHRQoL and how the disease brings negative consequences to children's lives, thereby corroborating the literature findings.[6,7,8,12,13,14,21,24]

Moreover, our results bring new evidence of the long-term effects of caries treatment on the OHRQoL of schoolchildren aged 8 to 10 years. Although other studies have demonstrated improvements in children's OHRQoL after dental treatment, they generally have focused on outcomes in younger children using the Early Childhood Oral Health Impact Scale (ECOHIS), Child-Oral Impacts on Daily Performances (Child-OIDP), the Parental-Caregivers Perception Questionnaire (P-CPQ),[17,25,26,27] and research in which treatment was proposed for early childhood caries under general anesthesia.[12,28,29]

In relation to CPQ instruments, Turton et al.[30] evaluate the responsiveness of the Khmer version of the CPQ_{11-14} in 140 children aged 8 to 14 years who received basic dental care from a local nongovernmental organization over a 6-month period. Therefore, to our knowledge, the present study is the first longitudinal study that compares the OHRQoL of children aged 8 to 10 years after caries treatment using the CPQ_{8-10} over a 1 year period.

Children who have access to oral care to treat their dental caries quickly and significantly improve their OHRQoL in a short period of time, as indicated in the present study 4 weeks after the end of treatment. This was also observed in studies which evaluated changes in the OHRQoL of children after a short-term dental caries treatment[12,15,17,29] and corroborates the importance of the promotion of equal access to dental care and quality of treatment outcomes to reduce inequalities in oral health.[31]

The 1-year follow-up in the DTG demonstrated that the scores of all CPQ_{8-10} domains continued to improve and were statistically different from those at baseline, except for the OS domain. This result can be due to the fact that, at this age, children have mixed dentition (age 8 to 12 years), which can make them experience problems related to natural processes, such as exfoliation of deciduous teeth, dental eruption, or interdental spaces because of an unerupted permanent teeth.[32,33] By looking at the median OS scores, we observe that the values for the questions 'how often have you had sore spots in your mouth in the past 4 weeks' and 'how often has food gotten stuck in your teeth in the past 4 weeks' did not change at baseline and at 1 year (data not shown). Thus, those children could be experiencing food stuck between their teeth, a factor that could have an impact on their oral health symptoms.[34] No significant changes were observed in the mean overall CPQ_{8-10} scores and domains from 4 weeks to 1 year, indicating that improvement in children's OHRQoL was sustained over time. This was also observed in the study of Yawary,[28] in which authors assessed OHRQoL in children at 2 weeks and 3 months after comprehensive oral rehabilitation under general anesthesia and verified that OHRQoL did not change significantly between those time periods after treatment.

On the other hand, there were no differences in the overall CPQ_{8-10} scores in the GWC at 4 weeks and at 1 year. However, the scores of the OS, FL, and SWB domains were statistically different at 1 year in relation to baseline. A possible explanation to these results is that the OHRQoL of schoolchildren who did not need curative dental treatment remained at good levels given the absence of active dental caries.

When comparing both groups (Figure) the difference between the mean scores of the overall CPQ_{8-10} values over time becomes evident, expanding the evidence from cross-sectional studies that children with dental caries continue to present lower OHRQoL than children who have never have experienced oral health problems related to dental caries.[32,33,35] For Sheiham,[36] children with severe dental caries showed worse OHRQoL,

probably because of pain, discomfort, acute and chronic infections, difficulty in eating and sleeping, and school absenteeism with consequent decrease in their ability to learn. However, in the present study, even children who have had a relatively low caries experience also showed significant gains in OHRQoL when they had access to dental treatment.

At 1 year, there was a statistically significant difference in all domains and in overall CPQ_{8-10} between the treated and untreated groups ($p < 0.05$). These persistent results over 1 year may be related to regular participation in preventive and educational activities proposed by the "Always Smiling Project"[19], which provided both groups with a better OHRQoL. These results highlight the importance of oral health programs for improving access to dental services among schoolchildren from economically underprivileged families, as those in the present study, in order to tackle health inequalities in oral health and to improve children's OHRQoL.[32,37] According to Watt,[37] there is a need to mitigate the consequences of oral diseases that arise from differences in socioeconomic and health parameters and, therefore, actions should be taken to ensure that *"accessible, appropriate and effective dental treatment is available to marginalized groups in society whose quality of life is most likely to be adversely affected by oral diseases,"*[37] While Universal Health Coverage in Brazil has brought important advances to its population's oral health, it is known that the psychosocial environment in which children live, including the beliefs and values assigned to oral health by their parents, the coincidence of their work schedule with their children's dental appointments, among others, are barriers that can restrict children's access to dental care and caries treatment.[19,37,39] Therefore, health programs, as is the case of Always Smiling Project, which is planned to overcome those barriers, can be an important way to improve the oral health needs and OHRQoL of disadvantaged children.

Some specific limitations were observed in this study. The data were collected from convenience samples of children from schools located in neighborhoods with large social exclusion, so the schoolchildren's socioeconomic status were similar. Moreover, all of children participate in a dental program and fewer than 50% were reexamined at 1 year. All these aspects could interfere with the external validity of the results of the present study. Therefore, further studies with children from public and private schools and a greater level of participation in follow-up should bring more representative evidence about the OHRQoL of children in relation to dental caries treatment.

Conclusion

The results indicate that the treatment of dental caries has a long-term positive impact on schoolchildren's OHRQoL, highlighting the importance of health policies that promote access to dental care for this population.

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