



Impact of Dental Rehabilitation on Oral Health-related Quality-of-life in Healthy Children and Those with Special Health Care Needs

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ABSTRACT

Aim: The aim of this study is to compare the effect of dental rehabilitation on oral health-related quality-of-life (OHRQoL) in children with special health care needs (CSHCN) and healthy children.

Materials and methods: The prospective study's sample consisted of 213 parents of caries-affected children, who were aged 6 years or younger and were scheduled for dental rehabilitation under general anesthesia (DRGA). The parent-child dyads were recruited from three public hospitals in Jeddah between October 2014 and May 2016. They comprised healthy children (n = 133) and CSHCN (n = 80). Parents self-completed the early childhood oral health impact scale (ECOHIS) before and 1 month after DRGA. The parents also rated the overall oral health status of their children by answering a global question before and after DRGA.

Results: At baseline, the CSHCN had significantly worse OHRQoL in most of the scale domains at 25.9 [standard deviation (SD) 11.3] and 19.9 (SD 10.3) respectively. The OHRQoL significantly improved in both groups postoperatively ($p = 0.005$, Wilcoxon rank-sum test). The effect size of the improvement in the CSHCN group (+1.8) was greater than that in the healthy group (+1.5) in all domains, except for the family impact and parental distress sections.

Conclusion: The DRGA markedly improves OHRQoL in children aged 6 years or younger, and the improvement is even greater in CSHCN.

Clinical significance: The substantial improvement in OHRQoL after DRGA highlights the importance of oral health care in young children, which should receive higher priority than it has been done to date.

Keywords: Children with special health care needs, Dental caries, Early childhood oral health impact scale, General anesthesia, Oral health-related quality-of-life.

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Conflict of interest: None

INTRODUCTION

Dental caries remains a highly prevalent childhood disease worldwide with a negative impact on the well-being of the child and the family.¹⁻³ Untreated caries can cause pain, infection, and dysfunction and may compromise social interaction, all of which can impede normal growth and development.^{4,5} Despite the deleterious effects of caries, its treatment is generally accounted as low priority in the health care services.⁶

Treating young children with early childhood caries is challenging for dentists and parents. Dental rehabilitation under general anesthesia facilitates efficient, comprehensive, and high-quality preventive and restorative dental treatment in a single appointment, while requiring minimal cooperation on the part of the child. The DRGA is indicated for children who are young, uncooperative, or

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have extensive treatment requirements and for CSHCN.⁷ Failure of several attempts at treatment on the dental chair is the most common reason for resorting to the DRGA option.⁸

When evaluating the impact of dental treatment, its effect on the quality-of-life may be as important as the clinical outcome.^{4,9} Patients' satisfaction and subjective emotional experience and social and physical functioning are now important determinants of treatment outcomes and should be assessed by an instrument that measures OHRQoL.¹⁰ The ECOHIS is one of the most commonly used scales to measure OHRQoL in young children.⁴ Several studies have assessed the quality of DRGA in children,¹¹⁻¹³ but those that have investigated the impact of this treatment on OHRQoL have generally been done in children who were otherwise healthy.^{6,14-19}

The CSHCN are defined as "children with any physical, developmental, mental, sensory, behavioral, cognitive, or emotional impairment or limiting condition that requires medical management, health care intervention, and/or use of specialized services or programs."²⁰ With recent advances in medical technology, early diagnosis, and preventive and management options, there has been an increase in the number of surviving CSHCN.^{21,22} As the numbers of surviving CSHCN have increased, so have the challenges in managing them medically and dentally. It has been reported that dentistry is the most unmet health care need in this group of children.²³ Inadequate availability and utilization of dental services for CSHCN are a chronic public health care problem.²²

A few studies have assessed OHRQoL in children with a variety of medical conditions.²⁴⁻²⁷ However, information on the effect of dental treatment on the quality-of-life in CSHCN is limited.²⁸ This study assessed the magnitude of change in OHRQoL in CSHCN following dental rehabilitation. This study also compared the change in OHRQoL between healthy children and CSHCN. Improvement in OHRQoL after DRGA would highlight the importance of dental care in children, especially CSHCN.

MATERIALS AND METHODS

Study Sample

The protocol for this longitudinal study was approved by the Ethics Committee at the Faculty of Dentistry, King Abdulaziz University. Between October 2014 and May 2016, a consecutive sample of children aged 18 to 72 months who were scheduled for DRGA to treat early childhood caries and who had a parent who can read and write the Arabic language was identified as being eligible for participation. The parent-child dyads were recruited from three public hospitals in Jeddah (King Abdulaziz University Hospital [KAUH], the National

Guard Hospital [NGH], and King Fahd Hospital [KFH]), all of which provide free-of-charge DRGA for pediatric patients.²⁹ The initial sample comprised 213 parent-child dyads that were categorized into a healthy group (n = 133) and a CSHCN group regardless of the nature or severity of their health problems (n = 80).

The Scale

The ECOHIS is a scale designed by Pahel et al³⁰ to measure OHRQoL in young children. It includes 13 items and is divided into a child impact section (CIS) and a family impact section (FIS). The CIS covers four domains [symptoms (1 item), functioning (4 items), psychological effects (2 items), and self-image and social interaction (2 items)]. The FIS covers two domains, parental distress (2 items) and family functioning (2 items). The current study used the Arabic version of the ECOHIS, which has been validated previously and had its responsiveness demonstrated.^{31,32} Parents were asked to report on a 6-point scale on how often the child or family has experienced each item (0, never; 1, hardly ever; 2, occasionally; 3, often; 4, very often; and 5, do not know). The score was calculated by summing the scores of each section and domain separately. The total score was obtained by summing the responses to all the scale items. Lower scores indicated better OHRQoL.

Parents were asked a global question in Arabic, "How would you rate the overall oral health of your child?" both preoperatively and postoperatively to assess each parent's perception of the child's overall oral health. This question was answered on a 5-point scale (1, excellent; 2, very good; 3, good; 4, fair; and 5, poor).

Data Collection

In the week before DRGA, each parent answered questions about the child's medical history and sociodemographic status. Each parent also independently self-completed the ECOHIS to establish the child's pretreatment OHRQoL status and was encouraged to reflect on the child's oral health since birth. All parents agreed to participate and provided their written informed consent.

On the day of DRGA, a comprehensive dental examination was performed and a decayed, missed, or filled teeth score (DMFT) was calculated according to the World Health Organization (WHO) criteria.³³ The DRGA consisted of examinations with the aid of radiographs, preventive treatment (fluoride and pits and fissure sealants), restorative treatment (simple adhesive restorations or pulp therapy/stainless steel crowns), and/or extraction.

One month after DRGA, the parents were asked to independently complete the postoperative questionnaire at the follow-up appointment. A call was made to parents

who did not attend the follow-up appointment in order to obtain their responses unaided over the telephone.

Statistical Analysis

“Do not know” responses were coded as missing and, along with missing values, were dealt with as suggested in the ECOHIS development study.³⁰ If a caregiver had up to two missing values in the CIS or one missing value in the FIS, these values were imputed using the mean value of the rest of the items for each section. Participants with more missing values than those indicated were excluded from the study.

Categorical sociodemographic variables were presented as frequencies and percentages and continuous variables as the mean and SD. Continuous and categorical variables were compared between healthy children and CSHCN using the t-test and the Chi-squared test respectively. The magnitude of change in OHRQoL after DRGA was calculated by subtracting the mean postoperative score from the mean preoperative score for each of the scale domains. Improvement or deterioration in OHRQoL was measured by positive or negative changes respectively. The mean baseline scores for the different domains were compared between the healthy children and CSHCN using the Wilcoxon rank-sum test. For both groups of children, the mean values at baseline and follow-up were compared using the Wilcoxon signed-rank test. An effect size (ES) was computed for each of the questionnaire domains to assess the magnitude of the change in the ECOHIS score and determine its clinical significance. The ES was computed as follows^{34,35}:

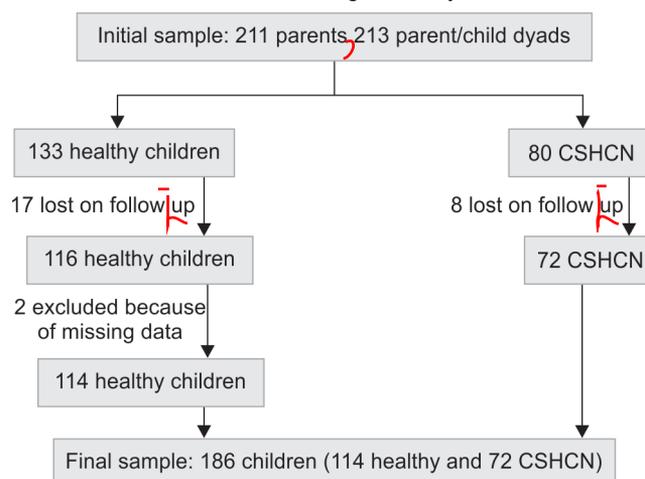
$$ES = \frac{\text{Mean baseline score} - \text{mean follow-up score}}{\text{SD of mean baseline score}}$$

An ES <0.2 represents a small change, while ES values of 0.2 to 0.7 and >0.7 denote moderate and large changes respectively.^{19,36} For each of the ECOHIS items, the number of respondents who reported a negative impact (“often” and “very often”) for each of the ECOHIS items was compared between the healthy children and CSHCN preoperatively and postoperatively using McNemar’s test; $p \leq 0.05$ was considered to be statistically significant. The statistical analyses were conducted using Stata version 12.1 software (StataCorp LP, College Station, Texas, USA).

RESULTS

Eighty CSHCN and 133 healthy children were enrolled, but 25 (13.3%) were lost to follow-up, leaving 72 CSHCN and 116 healthy children. Two healthy children were further excluded from consecutive analyses for having more than

Flow Chart 1: Disposition of the participating parents and children during the study



two missing values in the CIS (Flow Chart 1). The final sample included 186 children aged 18 to 72 months.

As presented in Table 1, the healthy and CSHCN were comparable with regard to age and sex. Approximately half of the healthy children were recruited from KAUH, and 43% of the CSHCN were recruited from KFH. The fathers of the CSHCN were less well educated than those of the healthy children. There was no marked difference in the level of maternal education between both groups. The DMFT scores were 13.2 (SD 3.5) and 14.1 (SD 3.9) for the healthy children and CSHCN respectively. About 61% of the CSHCN had a systemic disease, 19% had an intellectual disability, 11% had malignancy, and 6% had a craniofacial abnormality.

The CSHCN had significantly worse baseline OHRQoL than the healthy children in all domains, except for the parental distress items and the FIS overall (Table 2).

Table 3 summarizes the changes in scores for the healthy children and CSHCN after DRGA. Scores in all the domains of the ECOHIS showed significant postoperative improvement in OHRQoL in both groups. The ES, which was large in all domains for both healthy children and CSHCN, expresses the extent of improvement except in child self-image and social interaction for CSHCN, where it was of moderate magnitude. The ES for improvement in the CSHCN group was greater than that in the healthy group in most domains. However, the change in parental distress in the FIS was slightly greater for healthy children than for CSHCN.

The pre- and postoperative impacts of the ECOHIS scores with the highest occurrence (often and very often) in healthy and CSHCN are summarized in Table 4. At baseline for healthy children, “pain” was the most frequent impact in the CIS and “parents being upset” was the most common impact in the FIS; at follow-up, “difficulty eating” and “parental guilt” were the most

Table 1: Sociodemographic characteristics of the participating children

Characteristic	Healthy children n = 114 (%)	CSHCN n = 72 (%)	p-value
Age (years)			
1–3	29 (25.4)	16 (22.2)	0.618 [#]
4–6	85 (74.6)	56 (77.8)	
Age, mean (SD)	4.4 (1.2)	4.5 (1.2)	0.502 [*]
Gender			
Female	66 (57.9)	32 (44.4)	0.074 [#]
Male	48 (42.1)	40 (55.6)	
Recruitment site[§]			
KAU	56 (49.1)	27 (37.5)	0.002 [#]
NGH	36 (31.6)	14 (19.4)	
KFH	22 (19.3)	31 (43.1)	
Father's education			
Less than high school	8 (7.0)	13 (18.1)	0.039 [#]
High school	43 (37.7)	29 (40.3)	
Higher than high school	63 (55.3)	30 (41.7)	
Mother's education			
Less than high school	41 (36.0)	22 (30.6)	0.733 [#]
High school	38 (33.3)	27 (37.5)	
Higher than high school	35 (30.7)	23 (31.9)	
Father's occupation			
Employee	69 (60.5)	47 (65.3)	0.018 [^]
Teacher/university faculty	17 (14.9)	3 (4.2)	
Soldier/police			
Other	23 (20.2)	22 (30.6)	
Unemployed	5 (4.4)	0 (0)	
Mother's occupation			
Employee	17 (14.9)	15 (20.8)	0.663 [^]
Teacher/university faculty	17 (14.9)	12 (16.7)	
Other	3 (2.6)	1 (1.4)	
Unemployed	77 (67.5)	44 (61.1)	
Income			
Low	8 (7.2)	13 (18.3)	<0.001 [#]
Moderate	79 (71.2)	47 (66.2)	
High	24 (21.6)	11 (15.5)	
DMFT, mean (SD)	13.2 (3.5)	14.1 (3.9)	0.117 [*]

*Two-sample t-test; ^Fisher's exact test; #Chi-squared test; §KAU: King Abdulaziz University Hospital; NGH: National Guard Hospital; KFH: King Fahd Hospital

Table 2: Comparison of mean ECOHIS baseline scores between healthy children and CSHCN

ECOHIS scale	Healthy children mean (SD) n = 114	CSHCN mean (SD) n = 72	p-value*
CIS	13.1 (8.0)	18.6 (8.7)	<0.001
Child symptoms	2.5 (1.1)	2.7 (1.1)	<0.001
Child function	6.3 (3.9)	8.8 (3.8)	<0.001
Child psychology	2.5 (2.2)	3.9 (2.5)	<0.001
Child self-image and social interaction	1.8 (2.0)	3.2 (2.4)	<0.001
FIS	6.8 (3.4)	7.4 (3.8)	0.421
Parental distress	4.4 (2.1)	4.1 (2.3)	0.283
Family function	2.4 (1.9)	3.3 (2.1)	0.004
Total ECOHIS score	19.9 (10.3)	25.9 (11.3)	<0.001

*Wilcoxon rank-sum test

Table 3: Scores before and after DRGA* for healthy children and CSHCN

ECOHIS scale	Healthy children (n = 114)			CSHCN (n = 72)		
	Pretreatment mean (SD)	Posttreatment mean (SD)	p-value [#]	Pretreatment mean (SD)	Posttreatment mean (SD)	p-value [^]
Child impact section	13.1 (8.0)	2.8 (3.3)	<0.001	1.3 (8.6)	10.3 (8.6)	<0.001
Child symptoms	2.5 (1.1)	0.4 (0.8)	<0.001	2.1 (1.4)	2.1 (1.4)	<0.001
Child function	6.3 (3.9)	1.5 (2.1)	<0.001	4.8 (4.1)	4.8 (4.1)	<0.001
Child psychology	2.5 (2.2)	0.3 (0.8)	<0.001	2.3 (2.3)	2.3 (2.3)	<0.001
Child self-image and social interaction	1.8 (2.0)	0.6 (1.3)	<0.001	1.2 (2.5)	1.2 (2.5)	<0.001
FIS	6.8 (3.4)	1.5 (2.4)	<0.001	5.3 (4.1)	5.3 (4.1)	<0.001
Parental distress	4.4 (2.1)	0.7 (1.5)	<0.001	3.7 (2.5)	3.7 (2.5)	<0.001
Family function	2.4 (1.9)	0.8 (1.4)	<0.001	1.6 (2.4)	1.6 (2.4)	<0.001
Total ECOHIS score	19.9 (10.3)	4.3 (4.8)	<0.001	15.6 (11.5)	15.6 (11.5)	<0.001

ES: Early Childhood Oral Health *Dental Rehabilitation under general anesthesia #p-value for the difference in mean score before and after DRGA treatment in healthy children (Wilcoxon signed-rank test); ^p-value for the difference in mean score before and after DRGA treatment in CSHCN (Wilcoxon signed-rank test); *p-value for signed rank test); ^p-value for the difference in the mean score change with DRGA between healthy children and CSHCN (Wilcoxon rank sum test)



Table 4: Distribution of the ECOHIS responses in the healthy children and CSHCN

ECOHIS item	Prevalence of impact reported [^] in healthy children (n = 114)			Prevalence of impact reported [^] in CSHCN (n = 72)		
	Pretreatment	Posttreatment	p-value*	Pretreatment	Posttreatment	p-value*
I. Child impact section						
i. Symptoms						
Q1 pain	65	3	<0.001	47	0	<0.001
ii. Function						
Q2 difficulty drinking hot or cold beverages	41	0	<0.001	41	2	<0.001
Q3 difficulty eating	45	5	<0.001	37	6	<0.001
Q4 pronunciation difficulty	19	3	<0.001	26	10	<0.001
Q5 missed school or daycare	20	2	<0.001	23	0	<0.001
iii. Psychology						
Q6 trouble sleeping	20	0	<0.001	28	2	<0.001
Q7 irritability or frustration	21	3	<0.001	26	5	<0.001
iv. Self-image and social interaction						
Q8 avoid smiling or laughing	14	3	0.007	19	1	<0.001
Q9 avoid talking	12	2	0.003	17	1	<0.001
II. FIS						
i. Parental distress						
Q10 been upset	57	4	<0.001	28	6	<0.001
Q11 felt guilty about child's oral health	53	8	<0.001	25	5	<0.001
ii. Family function						
Q12 taken time off work	18	7	0.022	17	3	<0.001
Q13 financial impact	11	4	0.052	20	3	<0.001

*McNemar's test; [^]Responses "often" and "very often" represent the presence of impact

common impacts in the CIS and FIS respectively. In CSHCN, the baseline data showed "pain" to be the most frequent impact in the CIS and "being upset" to be the most common impact reported in the FIS; at follow-up, "pronunciation difficulty" was the most commonly reported impact in the CIS and "parental upset and guilt" was the most common impact in the FIS. The frequencies of the post-operative impact for all the scale items were significantly lower than those reported preoperatively in both groups, except for "financial impact" in the healthy children, for which the difference in frequency between before and after DRGA was not significant (11 vs 4; $p = 0.052$).

DISCUSSION

Many CSHCN are at greater risk of oral problems that arise from the pathophysiology of their diseases or their management. Dental care for these patients requires advanced knowledge and clinical skills, patience, and flexibility beyond what is considered routine. Nevertheless, there are barriers to dental treatment for CSHCN, and research has been undertaken worldwide to identify them.²¹ There is a global need that there is no discrimination with regard to medical and dental treatment needs based on the general health status.^{21,37}

The DRGA is a safe and effective alternative method for dental care in some children, including those with behavioral, intellectual, and/or medical disabilities who

cannot undergo dental treatment in the conventional setting.²⁹ The literature contains a number of recent studies investigating the change in children's OHRQoL after DRGA using a variety of OHRQoL-assessing instruments.^{6,10,14-17,28,38-41} Despite the difference in instruments used, these studies have consistently reported an improvement in OHRQoL after DRGA. In the present study, we investigated whether there was a difference in the way DRGA affected OHRQoL in CSHCN when compared with healthy children using the Arabic version of the ECOHIS, which has been validated and tested for its responsiveness.^{31,32}

Different cultures arguably perceive oral symptoms and problems differently in terms of how bothersome they are. The extent to which oral disease in a child disrupts the functioning of the family can vary widely. In the study populations reported in the literature, the pretreatment OHRQoL scores before treatment were variable; however, they were generally poor. In the present study, the pretreatment mean total score was 19.9 ± 10.3 for the healthy children, which is higher than that in studies performed in Lithuania (17.25 ± 5.6)⁴⁰ and China (18.5 ± 7.2),⁶ but lower than in studies from Turkey (20.6 ± 8.1), Iran (20.38 ± 5.55), and Australia (27.85 ± 9.55).^{17,42,43} In the present study, CSHCN showed significantly worse pretreatment OHRQoL in most domains when compared with healthy children, which highlights

an unmet need for preventive dental treatment in these children. However, there was no statistically significant difference in FIS scores between the two groups, including the parental distress item. This can be attributed to the high number of responses of “often” and “very often” to the “felt guilty” question in both groups. The majority of mothers (69.3% in the healthy group and 68.1% in CSHCN group) had not been educated beyond high school. Therefore, it is possible that poor parental education was a major contributor to the development of caries in these young children. This is more indicative of the parents being less well informed than having poor parenting skills.⁴⁴

All children in this study received DRGA, which was associated with a remarkable improvement in OHRQoL in both groups on the ECOHIS. However, the ES was greater among the CSHCN. This is a significant finding, given that the demands of parenting a CSHCN can inflict considerable stress on parents, who need to deal with more child health issues than other parents. More attention needs to be focused on the tremendous relief that dental treatment gives these children and their families. Only parental distress showed a greater degree of improvement in healthy children, perhaps because scores on this item were unusually high for parents of healthy children in the pretreatment. Another explanation is that parents of CSHCN might have other causes of stress that were not relieved by the dental treatment alone.

It is also important to investigate changes in each group for the CIS and FIS individually. In a report by Farsi et al, postoperative morbidity was a common finding in children who received dental treatment under general anesthesia, with difficulty eating being the most common complaint.⁷ In the current study, the postoperative problem most often reported in the CIS for healthy children was “difficulty eating.” A plausible explanation for this is that extraction of unrestorable teeth could affect incising and chewing food. In CSHCN, the greatest postoperative impact was “pronunciation difficulty,” which could also be attributed to the extraction of anterior teeth. Further, the postoperative evaluation was performed 1 month after treatment, at which point the children may have not yet adapted to the loss of teeth.

Postoperatively, parental distress in the FIS had the highest impact in both groups of children. This can again be attributed to the frequently reported “guilt” felt by parents of young children with caries. After appropriate education on oral health, the parents may have regretted not being more active in preventing the disease that now required their children to be subjected to DRGA.

Our study has some limitations, including the short follow-up duration and lack of a negative control group. The inclusion of an untreated control group would have

been ideal, but was not possible for ethical reasons. Furthermore, preschool children cannot recall everyday events accurately, and their perceptions of health and disease may be inaccurate. Therefore, parental reporting is relied on in research. Considering the current study’s strengths, first, unlike most studies investigating the effect of DRGA in preschool children, CSHCN were not excluded and were compared with their healthy counterparts.^{6,14,40,42} Second, our sample size was larger than that of similar studies.^{6,14} Third, a rigorous methodology was used, for example, the questionnaire was answered by the same parent preoperatively and postoperatively to ensure consistency in perception and reporting.

CONCLUSION

The DRGA markedly improved OHRQoL in children aged 6 years or younger, and the improvement was even greater in CSHCN.

CLINICAL SIGNIFICANCE

In this study, DRGA was associated with marked improvement in OHRQoL in young children, and this improvement may be of a greater magnitude in CSHCN. Raising awareness among health care providers and the public concerning how a child’s oral health affects his/her overall wellbeing should receive higher priority than it has done to date. Future studies could investigate the long-term effects of DRGA on OHRQoL and whether OHRQoL outcomes differ according to the intervention strategy used.

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