Assessing Changes in Oral Health-Related Quality of Life Following Dental Rehabilitation under General Anesthesia

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Objective: *To determine whether dental treatment under general anesthesia (GA) improved oral health-related quality of life (OHRQoL) in pre-school children, to evaluate the sensitivity and responsiveness of the Turkish version of the Early Childhood Oral Health Impact Scale (ECOHIS) and to examine parental satisfaction with the care received.* ***Study design:*** *The parents/caregivers of 120 pre-school children receiving dental treatment under GA, were asked to complete the ECOHIS before and after treatment. Participants were also asked a global transition judgement concerning change in their child's condition after treatment. Global transition judgement and distribution changes in ECOHIS scores were used to assess the sensitivity and responsiveness.* ***Results:*** *98 children completed the follow-up survey. Between pre- and post-treatment ECOHIS scores, significant reduction was observed ($p<0.001$). The effect sizes were moderate and large (0.36 to 1.63). Global transition rating groups were compatible with statistical differences between pre- and post-treatment scores, supporting the responsiveness of the ECOHIS. 91% of parents regarded the experience to be positive.* ***Conclusions:*** *Children's OHRQoL showed significant improvement after treatment. The majority of parents reported a high degree of satisfaction. Also, Turkish version of the ECOHIS was sensitive to dental treatment under GA for pre-school children and responsive to treatment-associated changes.*

Keywords: *Preschool children, Dental treatment, General Anesthesia, Quality of Life*

INTRODUCTION

One of the most common health problems in children is dental caries.[1] Children who experience early childhood caries tend to experience caries later in both primary and premanent dentition.[2] Dental caries may have an impact on children's oral health status throughout their lives.[3] For the treatment of young children with many carious lesions, prolonged or multiple visits are needed, which may cause a problem with behaviour management.[4] While most of the children are able to be treated in the conventional care setting, some children are too young or fail to respond to the usual behaviour management techniques.[4-6] In these situations, dental treatment under general anesthesia (GA) has to be considered.[7] However for most parents, GA is seen as a dramatic departure from the traditional office-based approach for children's dental treatment. Because GA carries a risk for morbidity and mortality, this approach can be emotionally challenging for parents who choose this option.[8] Whereas previous studies have shown that dental treatment under GA has many beneficial effects such as: reducing toothache-related behaviours and providing better quality of life,[8,9] improvements involving less pain experience, abilities to eat and sleep and positive social impact.[3,4,7,8,10]

In recent years, there has been a considerable interest in assessing oral health-related quality of life (OHRQoL) among children. Adults generally make decisions about their children's health. Therefore, assessing parent's perceptions about how oral health problems and dental treatment influence their children's quality of life is important.[11] Different OHRQoL questionnaires for children have been developed and used in clinical studies recently.[4,6,7,9,11-13] Among them, the Early Childhood Oral Health Impact Scale (ECOHIS) have been used for children of pre-school age and younger.[1,11] Previous studies have shown the ability of ECOHIS to distinguish children with different oral health status and have supported the use of this questionnaire in the evaluation of interventions related to oral health problems.[11,14,15]

The purposes of this study were; (1) to determine whether dental treatment under GA improved oral health-related quality of life (OHRQoL) for pre-school children and their families using the ECOHIS, (2) to evaluate the sensitivity and responsiveness of the Turkish version of the ECOHIS and (3) to examine parental satisfaction with the dental rehabilitation that their child received under general anesthesia (GA).

MATERIALS AND METHOD

Ethical approval was obtained from Kırıkkale University Clinical Research Ethics Committee. Pre-school children (younger than 7 yr of age) referring to Kırıkkale University, Faculty of Dentistry Clinic

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Table 1. Treatments provided under general anaesthetia

Treatment item*	Total number	Mean number (± SD)**	Range
Compomer/anterior:			
one surface	98	1,9 ± 1,2	1-7
two surfaces	95	2,0 ± 1,1	1-5
three surfaces	120	2,8 ± 1,7	1-10
Compomer/posterior:			
one surface	190	2,4 ± 1,3	1-6
two surfaces	166	2,1 ± 1,2	1-7
three surfaces	138	2,2 ± 1,4	1-8
Composite/anterior:	-	-	-
Composite/posterior:			
one surface	1	1 ±0,0	1-1
two surfaces	2	1 ±0,0	1-1
three surfaces	-	-	-
Pulpotomy	81	1,6±0,9	1-5
Pulpectomy	44	1,7± 1,0	1-4
Extraction	244	2,9± 2,1	1-14
Fissure sealant	24	2,6± 1,0	2-4

*All children received fluoride treatment.

**Among those who received this treatment. [3]

of Pediatric Dentistry who were recommended comprehensive dental treatment under general anesthesia upon dental examination as they are either uncooperative or very young- were recruited for the study. Children with complex medical problems such as Down syndrome, heart disease, mental retardation and cerebral palsy were excluded.

A power analysis was undertaken (SPSS Inc., Chicago, IL, USA). A sample size of 96 would be required to provide %90 statistical power in identifying a statistical difference before and after treatment. Considering the loss to follow-up, it was decided to set a baseline sample of 120 participants.

The family/caregivers of healthy pre-school children were invited to participate the study in consecutive order until 120 children have been reached over a 16-month period. The study was undertaken with the understanding and written consent of each participant. The family/caregivers were asked to complete self-administered questionnaires before and after the treatment. The first questionnaire was completed before treatment or while the child was undergoing treatment. The follow-up questionnaire was completed 4 weeks afterward at the child's postoperative review appointment. No questionnaires were administered by telephone interview.

As the target study population is pre-school children, the ECOHIS questionnaire was used. ECOHIS includes two main sub-scales consisting 13 items: child impact section (CIS) and family impact section (FIS). In the child impact section, there are four domains: child symptoms, child function, child psychology, child self-image and social interaction. In the family impact section, there are two domains: parental distress and family function.

In addition, before treatment the parents/caregivers were also asked whether they provide help with their child's brushing of their teeth or not. Then the parents/caregivers received advice regarding help with their child's brushing. At the post-operative appointment, awareness of parents/caregivers about helping to brush was measured. The post-treatment questionnaire also included questions related to parental satisfaction with the care provided under general anesthesia and participants were also asked a global transition judgement concerning change between post- and pre-treatment completion of the ECOHIS. The question was 'How has your child's condition changed since dental treatment?'. The categorical response options were: 'no change', 'got better' and 'got worse'.

In the child and family impact sections, each item was rated on a 5-point Likert scale: never '0', hardly ever '1', sometimes '2', often '3', every day or almost every day '4'. Total ECOHIS scores can range from 0 to 52, and respectively the CIS and FIS scores can range from 0 to 36 and 0 to 16. A high score displays greater oral health problems and worse OHRQoL.[1]

Comparison of the pre-treatment and post-treatment scores were made by using Wilcoxon signed-rank test. Change scores were computed by subtracting post-treatment scores from pre-treatment scores. A positive change score displays an improvement and a negative change score displays a deterioration in OHRQoL. The magnitude of change was determined by the calculation of effect sizes. Effect-size statistics were calculated by dividing the mean of change scores by the standard deviation of the pre-treatment scores, in order to give a dimensionless measure of effect suggested by Cohen.[16] Effect-size statistics of <0.2 indicate a small clinically meaningful magnitude of change, 0.2–0.7 a moderate change and >0.7 a large change [6]. Also to compare change of ECOHIS scores with the global transition judgment, group of participants were determined: 'no change', 'better' and 'worse'. The statistical significance of the within-group change in scores were evaluated and the effect size statistics were calculated.[17]

McNemar's test was used for the comparison of the parents/caregivers' help with their child's brushing before and after treatment.

The treatment data collected consisted of the number, surfaces and materials of restorations placed, and the number of extractions undertaken.

Table 2. Change of ECOHIS scores with the dental rehabilitation under general anaesthesia (Sensitivity of the ECOHIS)

ECOHIS domains (number of items and possible score range)	Pre-treatment mean (±SD)	Post-treatment mean (±SD)	P-value	Mean change in score (±SD)	Effect size
Child impact section (9 items; range 0-36)	12.7 ±5.7	6.6 ±5.3	<0.001*	6.2 ±6.6	+1.0
Child symptoms (1 item; range 0-4)	2.5 ±1.0	0.8 ±1.0	<0.001*	1.7 ±1.5	+1.6
Child function (4 items; range 0-16)	5.7 ±2.0	2.9 ±2.4	<0.001*	2.9 ±3.1	+0.9
Child psychology (2 items; range 0-8)	2.4 ±2.1	1.6 ±1.6	0.002*	0.8 ±2.4	+0.4
Child self-image and social interaction (2 items; range 0-8)	2.1 ±2.1	1.4 ±1.8	0.004*	0.7 ±2.5	+0.3
Family impact section (4 items; range 0-16)	6.5 ±3.5	2.1 ±2.6	<0.001*	4.4 ±3.9	+1.2
Parental distress (2 items; range 0-8)	4.4 ±2.3	1.5 ±1.8	<0.001*	2.9 ±2.7	+1.2
Family function (2 items; range 0-8)	2.1 ±2.1	0.6 ±1.1	<0.001*	1.4 ±2.2	+0.6
Total ECOHIS score (13 items; range 0-52)	19.2 ±8.3	8.7 ±7.2	<0.001*	10.5 ±9.4	+1.2

*Statistically significant (P<0.05), Wilcoxon signed-rank test.[1]

RESULTS

The parents/caregivers of 120 children were recruited during the study period. For the reasons such as: questionnaires containing incomplete items, children fail to attend for follow-up appointments; 98 children (81.6%) included the study. The child sample comprised 67.3% (66/98) males and 32.6% (32/98) females with a mean age of 50.8±14.2 months. Treatments provided under GA is presented in Table 1.

Between pre- and post-treatment total ECOHIS scores, there was a statistically significant reduction (p<0.001). 54.7% reduction was observed in the total ECOHIS scores after treatment. Also when sub-scales were evaluated in the CIS and FIS scores, there was 48.4% and 67.4% reduction respectively (p<0.001). For all domains of sub-scales statistically significant reduction was found after treatment (p<0.005). Effect sizes of the domains of ECOHIS scores is presented in Table 2. The effect sizes of 'child psychology', 'child self-image and social interaction' and 'family function' domains were between 0.2–0.7, this means magnitude of change was moderate. According to the effect sizes of remaining domains; for total ECOHIS, CIS and FIS scores, magnitude of changes were large (>0.7).

According to the global transition judgement item, among 98 parents, 87.8% (86/98) reported their child's condition as 'better', 11.2% (11/98) reported as 'no change' and one parent reported as 'worse' following treatment. The mean pre- and post-treatment ECOHIS scores for the groups are presented in Table 3, along with effect sizes.For the group of the parents/caregivers who reported 'better' for their child's condition following treatment, the overall ECOHIS scores showed a large and statistically significant decrease after treatment (p≤0.001). Except 'child psychology' and 'child self-image and social interaction' domains, all domains, sub-scales and total ECOHIS scores showed large effect sizes (>0.7). Other two domains displayed moderate effect sizes (0.2–0.7). In the 'no change' answer group, with the exception of 'child symptoms' domain, there were no significant differences between pre- and post-treatment ECOHIS scores (p>0.05). A statistically significant change was observed in the 'child symptoms' domain (p=0.034). The effect size of the total ECOHIS was –0.13, and for CIS and FIS the effect sizes were -0.13 and -0.11, respectively. For the 'child symptoms' domain it was found 0.9 which indicates a large change. For the 'worse' answer group to the child's condition (one parent); no change was observed for the 'child symptoms' and 'child psychology' domains, and in the remaining scales negative changes were observed (Table 3).

After treatment, 91% of parents regarded the experience to be positive which indicates a high degree of satisfaction. But, 33% of parents reported that they would not consider a general anesthesia for treatment again (Table 4). Before treatment 24.5% (24/98) of parents provided help with their child's brushing of their teeth, after treatment the ratio significantly changed and increased to 83.7% (82/98) (p<0.05).

DISCUSSION

This study aimed to determine whether dental treatment under GA improved oral health-related quality of life (OHRQoL) for pre-school children and their families. Substantial reduction was observed in ECOHIS scores, both for child and family impact sections.

In the literature, studies evaluating changes in aspects of children's OHRQoL following dental treatment under GA[1,3,4,6-10,12,18-20] have been reviewed, and it was found that few of them had used validated instruments. Gaynor and Thomson, Malden *et al*., Klaassen *et al.* and Jabarifar *et al.* had used child oral health-related quality of life (COHRQoL) which includes a Parental-Caregivers Perceptions Questionnaire (P-CPQ) and a Family Impact Scale (FIS).[6,7,13,22] Also, Thomson and Malden had assessed the change in the family impact by using FIS (component of the COHRQoL Questionnaire).[23] Versloot *et al* used Dental Discomfort Questionnaire which consists of questions regarding toothache-related behaviours.[9] A special OHRQoL questionnaire for pre-school age children; Early Childhood Oral Health Impact Scale (ECOHIS) was used by Klaassen *et al.2009* and Lee *et al*.[1,18] In these studies similar improvements had been reported following dental treatment under GA, however the age groups of children were different from each other.

In the present study ECOHIS questionnaire was used, as our target population was pre-school children. Also validation and responsiveness of this questionnaire have been evaluated and the use in the evaluation of interventions related to oral health problems have been supported in the previous studies.[1,11,14,24,25] Moreover, ECOHIS provides more informative answers that increases reliability of the questionnaire.[21]

Table 3. Change of ECOHIS scores with the global transition judgment item (Responsiveness of the ECOHIS)

ECOHIS domains (number of items and possible score range)	Pre-treatment mean (±SD)	Post-treatment mean (±SD)	P-value	Mean change in score (±SD)	Effect size
Better (N=86)					
Child impact section (CIS)	13.5 ±5.5	6.5 ±5.4	<0.001*	7.0 ±6.5	+1.2
Child symptoms	2.6 ±1.0	0.8 ±1.0	<0.001*	1.8 ±1.5	+1.7
Child function	6.1 ±2.8	2.9 ±2.4	<0.001*	3.2 ±3.1	+1.1
Child psychology	2.5 ±2.1	1.5 ±1.6	<0.001*	1.0 ±2.4	+0.4
Child self-image and social interaction	2.3 ±2.1	1.3 ±1.8	0.001*	0.9 ±2.5	+0.4
Family impact section (FIS)	6.9 ±3.4	2.0 ±2.4	<0.001*	4.9 ±3.6	+1.4
Parental distress	4.7 ±2.2	1.4 ±1.7	<0.001*	3.3 ±2.5	+1.5
Family function	2.2 ±2.1	0.6 ±1.1	<0.001*	1.6 ±2.3	+0.7
Total ECOHIS score	20.4 ±7.8	8.4 ±7.1	<0.001*	11.9 ±8.8	+1.5
No change (N=11)					
Child impact section (CIS)	6.8 ±3.6	7.3 ±5.0	0.932	-0.5 ±1.9	-0.1
Child symptoms	1.7 ±0.9	0.9 ±1.0	0.034*	0.8 ±1.0	+0.9
Child function	2.9 ±2.3	2.9 ±2.0	1.000	0 ±1.5	0
Child psychology	1.4 ±1.7	2.0 ±1.8	0.196	-0.6 ±1.7	-0.3
Child self-image and social interaction	0.8 ±1.5	1.5 ±2.5	0.285	-0.6 ±1.9	-0.4
Family impact section (FIS)	3.0 ±2.4	3.3 ±3.6	0.942	-0.3 ±2.6	-0.1
Parental distress	2.1 ±1.6	2.2 ±2.6	0.796	-0.1 ±2.4	-0.1
Family function	0.9 ±1.6	1.1 ±1.4	0.655	-0.2 ±1.4	-0.1
Total ECOHIS score	9.8 ±5.8	10.5 ±8.3	0.754	-0.7 ±5.1	-0.1
Worse (N=1)					
Child impact section (CIS)	8	16	-	-8	-
Child symptoms	2	2	-	0	-
Child function	4	6	-	-2	-
Child psychology	0	0	-	0	-
Child self-image and social interaction	2	8	-	-6	-
Family impact section (FIS)	4	10	-	-6	-
Parental distress	4	8	-	-4	-
Family function	0	2	-	-2	-
Total ECOHIS score	12	26	-	-14	-

*Statistically significant (P≤0.05), Wilcoxon signed-rank test.[1]

ECOHIS was originally developed in English[11], since then different versions such as Chinese, French, Brazilian, have been adapted for use in other languages.[14,15,24,25] However, in the literature Turkish version of ECOHIS has not been used, thus this is the first study using the Turkish version.

In the present study, pre-treatment ECOHIS scores are higher than in the studies of Li *et al* and Klaassen *et al*,[14,18] and also as high as in the study of Lee *et al*.[1] As Lee *et al* explained; this could be the result of the caries experience of the study population that had caused substantial upset, so this may led the parents to decide their child to receive dental treatment under GA.

The ECOHIS scores significantly reduced after treatment, which displays considerable improvement in OHRQoL. The magnitude of changes for total, subscale and domains of ECOHIS scores were mostly large and moderate changes. So, the sensitivity of ECOHIS has been shown by significant changes after comprehensive oral rehabilitation under GA for pre-school children.

According to the global transition rating, among 98 parents, 87.8% (86/98) reported their child's condition as 'better', 11.2% (11/98) reported as 'no change' and one of the parents reported as 'worse' following treatment. In the 'better' group, considerable changes were observed in the ECOHIS scores and the magnitude of changes were moderate to large. In the 'no change' group, except 'child symptoms' domain, there were no significant changes in the ECOHIS scores. Despite the magnitude of change for 'child symptoms' was large, parents reported 'no change' for their child's condition after treatment. In this group, the high rate of tooth extraction may be the result of parents' reportings. As in the study of Lee *et al*, the negative changes in the ECOHIS scores could be related to the absence of teeth.[1] Absence of teeth is associated with the child function (eating, speaking), psychology, self-image and social interaction (child appearance). In the treatment of one child (age:62 months) whose parent reported 'worse', 14 teeth extracted and two teeth were restored. A large number of teeth extraction may be the

Table 4. Parental satisfaction with the dental rehabiltation under general anaesthesia[3]

Questionnaire item	Number of respondents (%)	
	Yes	No
Received enough information before treatment	97%	3%
Knew where and how to access help after treatment	94%	6%
Regarded the experience to be positive	91%	9%
Had any concerns about the care received	44%	56%
Has had follow-up care arranged	92%	8%
Would consider a general anaesthesia for treatment again	67%	33%

cause of larger problems and negative changes in the life of the child and family. So this reflected to the post-treatment ECOHIS scores.

Global transition rating groups are compatible with statistical differences between pre- and post-treatment scores. This result provided evidence to support the responsiveness of the ECOHIS.

When parental satisfaction was evaluated, 91% of parents regarded the experience to be positive. This finding shows a high degree of satisfaction with the outcomes of treatment. Despite most of the parents regarded the experience to be positive, 33% of the parents reported that they would not consider general anesthesia for treatment again. This may be due to the parents' concerns about general anesthesia, because %44 of parents answered as they had concerns about the care received, and this may be related to the risks and complications associated with general anesthesia.

Before treatment, the data on parental help with their child's brushing was disappointing with a value of 24.5% and after treatment a promising and significant change was observed, the value increased to 83.7%. It seems that awareness of parents/caregivers was increased with the treatment provided. Despite the significant change, long term follow up of the children should be done, because this change could be a temporary situation.

CONCLUSION

Children's OHRQoL and the impact on their families showed a significant improvement after dental treatment under GA. For the majority of parents, oral rehabilitation under GA of young children appears to be an acceptable treatment choice. Also, Turkish version of the ECOHIS was sensitive to dental treatment under GA for pre-school children and these findings suggest that the ECOHIS is responsive to within global transition judgment group changes.

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