ACTA ODONTOLOGICA SCANDINAVICA, 2017
VOL. 75, NO. 4, 255–261
http://dx.doi.org/10.1080/00016357.2017.1286034

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ORIGINAL ARTICLE

Follow-up of children's oral health-related quality of life after dental general anaesthesia treatment

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ABSTRACT

Objective: Our aim was to analyze longitudinally the impact of young children's dental general anaesthesia (DGA) treatment on their OHRQoL and to determine their post-operative oral health status at the six-month follow-up together with parental ratings of their children's oral health.

Material and methods: We conducted a prospective follow-up study of OHRQoL among Lithuanian child patients treated under general anaesthesia ($n = 144$). The study consisted of clinical dental examinations performed by two examiners at the time of DGA and at the six-month recall, along with OHRQoL surveys and data collected from the patients' files. The dmft index and Silness–Löe plaque index served as clinical measures. The survey tool for assessing the children's OHRQoL was the previously tested Lithuanian version of the ECOHIS. The Wilcoxon signed-rank test served for the statistical analysis ($p < 0.05$).

Results: The ECOHIS scores clearly decreased post-operatively, indicating a significant ($p < 0.001$) improvement in the children's OHRQoL after the DGA treatment. The ECOHIS scores were lower immediately after the DGA treatment and remained low at the six-month recall. Parents rated their child's oral health as higher after the DGA treatment ($p < 0.001$). The majority (75%) of the patients had poor or satisfactory oral hygiene at follow-up.

Conclusions: This longitudinal study showed a sustained improvement in the children's OHRQoL six months after their DGA treatment. Post-operative parental ratings of their child's oral health were higher after the DGA treatment, but the children exhibited insufficient oral hygiene and new caries lesions. An appropriate follow-up system for children receiving DGA treatment with special focus on preventive care is needed.

ARTICLE HISTORY
Received 15 June 2016
Revised 18 January 2017
Accepted 19 January 2017

KEYWORDS
Children; dental general anaesthesia; follow-up; oral health; quality of life

Introduction

Early childhood caries (ECC) remains one of the most common health problems among preschool children [1]. In cases where a young child unable to cooperate requires extensive dental treatment, general anaesthesia (GA) is an important part of providing comprehensive, high-quality dental care. The majority of young children referred for dental general anaesthesia (DGA) are otherwise healthy, but suffer from ECC [2,3]. The demand for treatment under DGA in children is growing in many countries, but the percentage of treated children varies greatly [4,5].

Even though GA provides optimal conditions for dental treatment, failure rates for restorations provided under GA are high [6]. Moreover, children with ECC are highly susceptible to developing new and recurrent caries lesions [7,8].

Measurements of children's oral health-related quality of life (OHRQoL) serve to assess the outcomes of DGA treatment. The Early Childhood Oral Health Impact Scale (ECOHIS) [9] as well as the short-form versions of the Parental-Caregiver Perceptions Questionnaire (P-CPQ) and the Family Impact Scale (FIS) [10] are tools designed to measure OHRQoL among preschool-age and younger children. Children's parents greatly appreciate DGA treatment [11], as it significantly improves the oral health-related quality of life of young children and benefits their families [12–17] when measured shortly after DGA treatment. Although the OHRQoL benefits of DGA are known [18], more information on the sustainability of the effects are needed [19].

The prevalence of ECC in Lithuania is much higher than in many other countries [20], and a recent study [2] showed that oral health among young children receiving DGA treatment was among the poorest worldwide [11,12,21,22]. DGA-treated children in Lithuania are not followed systematically, so data on oral health among these children are not available.

Our aim was to analyze longitudinally the impact of young children's DGA treatment on their OHRQoL and to determine their post-operative oral health status at the six-month follow-up together with parental ratings of their children's oral health.

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Material and methods

We conducted a prospective follow-up study of OHRQoL among Lithuanian child patients who were treated under general anaesthesia. The Kaunas Regional Research Ethics Committee approved the study.

The study included all patients under the age of six who received comprehensive dental treatment under GA during a three-year period in 2010–2012 at the Lithuanian University of Health Sciences (LUHS) Hospital in Kaunas, Lithuania. All the patients were referred for DGA treatment from the Clinic for Preventive and Paediatric Dentistry (LUHS) after a consultation appointment with a specialist in paediatric dentistry [2]. The children were treated under GA due to their inability to accept treatment under local anaesthesia. A total of 144 patients under the age of six (mean age 3.9, SD 0.8) participated in the study (those with developmental disorders and general diseases such as cerebral palsy and autism were excluded) [2]. The study was voluntary, and the children's parents provided their written informed consent. A detailed description of the participants appears elsewhere [2,23].

The study consisted of clinical dental examinations performed at the time of DGA and at the six-month recall, along with OHRQoL questionnaires and data drawn from the patients' files. The children's parents completed the OHRQoL questionnaire at the time of the DGA treatment, at the post-treatment recall (one month after the DGA treatment), and finally at the six-month recall.

The personal background data included the children's gender and age in months, along with parental education (university, college, secondary, primary) and area of residence (city, town, small town, village).

Each GA session included a comprehensive clinical dental examination and full dental rehabilitation. We recorded the findings of the examination, diagnoses, data on dental treatment and duration of GA. The decayed, missing and filled teeth (dmft) index served as a measure of dental caries experience [24]. The Silness–Löe plaque index (PI) [25] was used to assess oral hygiene status. The clinical examinations were conducted by two examiners (inter- and intra-examiner kappas >0.8). Full descriptions of the protocols for the clinical dental examination and DGA treatment appear elsewhere [2,23].

Oral health-related quality of life

On the day of the DGA at the hospital, the child's parent/caregiver completed a self-administered questionnaire measuring OHRQoL. The questionnaire enquired about the child's oral health and wellbeing over the previous three months. The patients' parents were invited to the clinic to attend their child's dental check-up and to participate in the follow-up survey one month and six months after the DGA treatment. The follow-up survey used the same questionnaire, but enquired about the child's oral health after the DGA treatment. If the parents failed to come to the appointment ($n = 23$), they received the questionnaire by mail (five were returned).

The survey tool for assessing children's OHRQoL was the previously tested Lithuanian version of the ECOHIS [26], which consists of 13 questions pertaining to preschool-age children [9]. The survey questionnaire relies on parental ratings of the 13 items grouped into two main parts: the child impact section and the family impact section. The child impact section covers four domains: child symptoms (1 item), child functions (4 items), child psychology (2 items), and child self-image and social interaction (2 items). The family impact section covers two domains: parental distress (2 items) and family function (2 items). Each question enquires about the frequency of an oral health-related problem and is scored on a scale from 0 to 5 as follows: never (score 0), hardly ever (score 1), occasionally (score 2), often (score 3), very often (score 4) and don't know (score 5).

Our questionnaire included two additional general questions about the oral health and general well-being of the child, as did the original ECOHIS [8], measured on a Likert scale. The first general question 'How would you rate the health of your child's teeth, lips, jaws and mouth?' had five answer options: 'excellent', 'very good', 'good', 'fair' or 'poor' (score 1–5). The second general question was a modification of the original ECOHIS: 'How much does the condition of your child's teeth, lips, jaws or mouth affect his/her overall wellbeing?' The four response options were: 'not at all', 'some', 'a lot' or 'very much' (score 0–3). In addition, at the follow-up one question assessed perceived change in children's overall wellbeing since the treatment (global transition rating). The three responses were: 'stayed the same', 'changed a little' or 'changed a lot' (score 1–3).

Data analyses

To represent OHRQoL, we summed the item scores to create a total ECOHIS score; the higher the score, the greater the impact on quality of life. 'Don't know' responses were recoded as missing. For those with up to 30% missing responses, we imputed a score for the missing items as the average of the remaining items of the questionnaire. Questionnaires missing more than 30% of the responses were excluded from the analysis. We calculated the total scores for the entire ECOHIS, the child and family sections, and the following domains: child symptoms, child function, child psychology, child social wellbeing, parent distress and family function [9].

We then determined the magnitude of change in OHRQoL after the DGA treatment by subtracting the post-treatment ECOHIS scores from the baseline scores. We made the same calculations for the child and family sections as well as for all the domains of the ECOHIS. We also calculated the effect size by dividing the mean of change score by the SD of the baseline score [27]. An effect of <0.2 indicated a small, but clinically meaningful magnitude of change, 0.2–0.7 a moderate change and >0.7 a large change.

Statistical analyses

We used the IBM SPSS Statistics for Windows version 22.0 (IBM Corp., Armonk, NY) to analyze the data. Chi-square test was used to compare frequencies of the qualitative variables.

The Student's two-sided test and nonparametric Wilcoxon signed-rank test served for the statistical analysis of the quantitative data. The McNemar's test was used to compare prevalence of the most frequently reported impacts at baseline and follow-up. A p value <0.05 was considered to be statistically significant.

Results

A total of 144 children (79 boys and 65 girls), who met the inclusion criteria, participated in the study [mean age 3.9 (SD 0.8)]. Of the children, 40% resided in cities and about half of the parents (47%) had higher education. A few (15%) had previously received DGA treatment. At the time of the DGA treatment, the children mostly exhibited untreated caries (mean dt = 12.1) and low numbers of previously filled (mean ft = 0.2) or extracted teeth (mean mt = 0.6). The majority of the patients (80%) had poor oral hygiene (Silness Löe PI $\geq$2, mean PI = 2.18).

OHRQoL

Of the patients ($N = 144$) participating in the study, we excluded four from the OHRQoL analysis because more than 30% of their answers in the baseline survey were missing. We obtained a complete data set for 122 (84.7%) patients at the post-treatment recall and for 118 (81.9%) patients at the six-month follow-up. We found no statistically significant differences in baseline characteristics between those retained and those lost ($p > 0.05$).

The prevalence of the child and family impacts reported at baseline appear in Table 1. Nearly half of the children suffered from frequent dental pain, and about 60% of them often experienced eating difficulties (according to parental reports). The majority of parents often felt upset and guilty about their child's dental problems or related treatment, though reports of social problems related to the children's dental status were less common.

Table 2 presents data on changes in ECOHIS scores from baseline to follow-up. The total ECOHIS score and nearly of all its subscale scores decreased significantly after the DGA treatment, demonstrating large (>0.7) effect sizes. Social wellbeing was the only domain which demonstrated a moderate (0.4) effect size. The largest decreases in scores were in the domains of child symptoms and child psychology in the child section and in the domain of parental distress in the family impact section.

Figure 1 shows the ECOHIS scores before and after the DGA treatment. The ECOHIS scores clearly decreased postoperatively, showing a significant ($p < 0.001$) improvement in the children's OHRQoL after the DGA treatment. The ECOHIS scores decreased immediately after the DGA treatment and remained low at the six-month recall. The greatest change in score occurred in the family impact section.

Table 1. The prevalence of reported impacts on the children and their familyat baseline ($N = 140$)[a].

	Prevalence of impacts reported			
Item	'Never or hardly ever' %	'Sometimes' %	'Often' or 'very often' %	Don't know answers %
Pain in the teeth mouth and jaws	34.0	24.3	41.6	0
Difficulty drinking hot or cold beverages	45.9	22.9	31.2	0
Difficulty eating some foods	16.7	25	55.6	2.8
Difficulty pronouncing some words	56.5	16.7	15.0	10.9
Missing preschool, daycare or school	71.7	17.4	9.9	0.7
Trouble sleeping	50.7	25	24.3	0
Being irritable or frustrated	22.4	39.2	38.6	0
Avoided smiling or laughing	85.8	7.1	2.8	4.3
Avoided talking	78.0	11.3	0	10.6
Parents being upset	12.5	11.8	75.7	0
Parents feeling guilty	15.2	18.1	66.3	1.4
Parents taking time off from work	58.5	28.9	12.7	0
Financial impact on the family	78.1	11.7	9.5	0.7

[a]Values are the percentage of parents, reporting the impact 'Never' or 'Hardly ever', 'Sometimes', 'Often' or 'Very often' and choosing a 'Don't know' option.

Table 2. The change in standardized mean ECOHIS domain scores with effect sizes from baseline to the one and six-month follow-ups ($N = 118$).

	Baseline	After 1 month		After 6 months		
ECOHIS domains (number of items)	Mean (SD)	Mean (SD)	Effect size	Mean (SD)	Effect size	Description
Total ECOHIS [13]	1.6 (0.5)[a,b]	0.5 (0.4)[a,c]	2.1	0.7 (0.6)[b,c]	1.8	Large
Child impact section [9]	1.5 (0.6)[a,b]	0.5 (0.4)[a,c]	1.6	0.6 (0.6)[b,c]	1.5	Large
Child symptoms [1]	2.1 (1.1)[a,b]	0.5 (0.7)[a]	1.6	0.6 (0.9)[b]	1.4	Large
Child functions [4]	1.6 (0.7)[a,b]	0.8 (0.7)[a,]	1.3	0.9 (0.7)[b]	1.0	Large
Child psychology [2]	1.9 (0.8)[a,b]	0.4 (0.5)[a]	1.8	0.4 (0.7)[b]	1.8	Large
Child self-image and social interaction [2]	0.5 (0.8)[a,b]	0.1 (0.3)[a,c]	0.4	0.2 (0.6)[c]	0.4	Moderate
Family impact section [4]	1.9 (0.6)[a,b]	0.5 (0.5)[a,c]	2.4	0.9 (0.8)[c]	1.7	Large
Parent distress [2]	2.9 (0.9)[a,b]	1.0 (1.0)[a,c]	2.2	1.4 (1.2)[c]	1.7	Large
Family function [2]	1.1 (0.9)[a,b]	0.1 (0.3)[a,c]	1.1	0.3 (0.5)[c]	0.9	Large

Values are mean scale score (brackets contain SD).
[a]$p < 0.01$, comparing results at baseline and 1 month follow-up.
[b]$p < 0.001$, comparing results at baseline and 6 months follow-up.
[c]$p < 0.05$, comparing results at 1 month and 6 months follow-up; Wilcoxon signed-rank test.

Dental health status at the six-month recall

Of the 118 patients in the six-month follow-up survey, 108 (75% participation rate) underwent a full clinical examination (10 were excluded due to uncooperative behaviour). The mean dmft at the six-month follow-up was 14.1 (3.0) [mean dt = 4.3 (3.2), mean ft = 4.5 (2.2), mean mt = 5.3 (2.9)].

The oral hygiene index was significantly lower at the six-month follow-up than at baseline (Silness–Löe index 1.2 and 2.2, respectively; $p < 0.001$). The majority (75%) of the patients had poor to satisfactory oral hygiene at follow-up (Table 3).

Parental ratings of their child's oral health after the DGA treatment were positive. More than half of the respondents (57%) rated their child's oral health as good or excellent at the post-treatment recall as opposed to 84% of them rating it as poor prior to the treatment. At the six-month follow-up, 26% of the parents rated their child's oral health as good or excellent, and 61% as fair. The majority of the parents (82% prior to the treatment and 69% six months after the treatment) reported that oral health status affected their child's overall well-being considerably. Global transition rating showed that more than half of the parents (55%) reported much/great improvement in the children's oral health after treatment, while 21% reported little improvement and 24% no change.

Discussion

This longitudinal study showed a significant improvement in children's OHRQoL six months after DGA treatment. The treatment effect sustained through the follow-up. The parents rated their children's oral health as higher after the treatment, but their children's oral hygiene remained poor, and new caries lesions had developed.

Importance of DGA and potential relapse

It is clear from previous studies that young children suffer greatly from the consequences of severe dental caries [28,29]. Children who do not comply with conventional treatment still benefit from DGA treatment, with significant improvements in their OHRQoL observed almost immediately after DGA treatment [13,14,16]. The immediate benefits include: instant relief from the child's oral symptoms; significant improvement in the child's psychological, social and overall wellbeing; and less family distress [15,16]. However, the big challenge with these child patients is that their oral health very easily deteriorates soon afterwards; DGA patients are highly susceptible to developing new and recurrent caries lesions, as our and other studies have found [7,8,30]. This was the case among our DGA patients, who presented with new caries lesions six months after the treatment; studies

Table 3. Oral hygiene and dental caries experience at baseline and at the six-month follow-up ($N = 108$).

	Baseline Mean (SD)	Follow-up Mean (SD)	p value
Oral hygiene (PI)	2.18 (0.68)	1.2 (0.87)	[a] $p < 0.001$
Dental caries (dmft)	13.5 (3.1)	14.1 (3.0)	[b] $p < 0.001$

$Z = 6708$.
[a] $p < 0.001$, Wilcoxon test.
[b] $p < 0.001$, paired samples t-test.

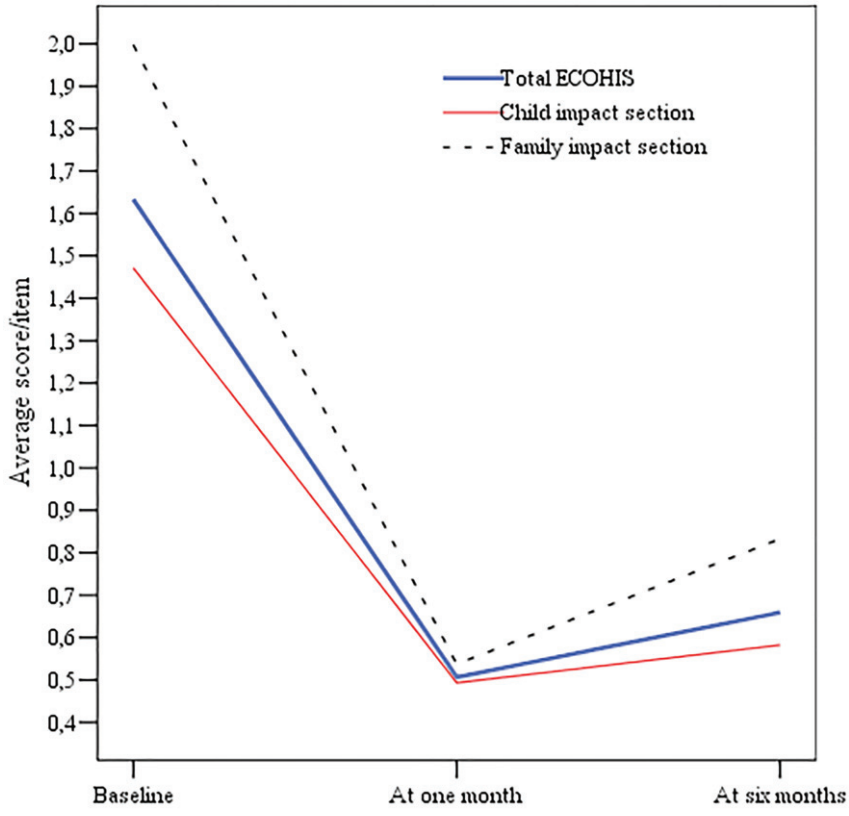

Figure 1. ECOHIS scores for the child patients during the follow-up period (from baseline to six-months) ($N = 118$).

with the same follow-up period have reported similar findings [8,31], that these children required retreatment so fast reflects the rapid progression of dental caries in high-risk patients and ongoing poor oral health behaviour. Thus it is likely that their OHRQoL will deteriorate again in future, as DGA just treats existing decay – it does not prevent further decay. Our findings support for changes in DGA treatment services, such as revising the existing DGA treatment protocol and implementing a proper follow-up strategy for these patients. That would enable them to maintain improvements obtained with the treatment and should be considered highly important, since a high caries experience in early childhood relates to a significantly higher caries burden in adulthood [32].

Children's dental plaque index was significantly reduced after the DGA treatment, but a majority of the patients still had insufficient oral hygiene at the six-month follow-up. This is common among young DGA patients and characteristic for high caries-risk patients in general [33]. Insufficient oral hygiene among young DGA patients both before and after DGA treatment clearly shows the lack of parental efforts and responsibility. Low socio-economical level might be related to high caries experience and poor oral hygiene, however in our study about half of the children were city residents and their parents had higher education. Therefore it is necessary to enhance preventive efforts and improve parental knowledge and attitude towards importance of oral hygiene in order to maintain good oral health after children's DGA treatment.

Because some of the children (8.5%) were not cooperative at the follow-up, they could not undergo examination and were therefore excluded from the study. Children's uncooperative behaviour during a follow-up visit demonstrates that dental fear and behavioural problems persist after DGA treatment, something other studies have also noticed [34], and should be addressed soon after treatment. As recommended in a recent longitudinal study, both the child's parents and the oral health care professionals involved must commit to further intensive preventive care, and the children need to be familiarized with normal dental care after DGA [21].

In our study, parental ratings of their children's oral health improved, which is in agreement with parental reports of their satisfaction with the DGA treatment [35]. Nevertheless, parental ratings were higher shortly after the DGA treatment than at the six-month recall, most likely because the greatest benefit of the DGA treatment is visible immediately after it. As this six-month follow-up study showed, the DGA patients continued to develop caries lesions after the treatment, which may explain why parental ratings of their children's dental health were lower at the final follow-up.

International comparisons

The impacts of poor dental health on OHRQoL were greater for our patients for those in some other studies [15,16], possibly due to the questionnaire we used and the poor dental health status of our patients. The most commonly reported impacts (child symptoms and parental distress) in our sample were similar to those in previous DGA studies [16,22].

A surprising finding was that one-third of the children had never or hardly ever complained about pain in their mouth (based on parental reports) even though a majority of the DGA-treated children had multiple and severe caries lesions. Thomas & Primosch [36] noticed a similar phenomenon: half of the children in their study did not complain about dental pain. Parents' limited knowledge of their children's painful experiences of chronic disease may partially explain this finding.

The effect size for the total ECOHIS score observed at the six-month recall was similar to those of a Turkish and Brazilian studies [13,18], but higher than in some other studies [14,22] that used, the same questionnaire. Although these findings may partly be attributable to different follow-up times, the high prevalence of caries and poor dental health among young Lithuanian children are certainly contributing factors also. The greatest improvement observed at the six-month recall was in the child psychology and parent distress domains. The family impact section showed greater improvement one month after treatment than did the child impact section, which is in line with the results of earlier studies [13,14,22]. Our study, as well as two others [29,37], presents data on child patients' OHRQoL at six months after DGA; all three studies show significant improvement in the children's OHRQoL six months after treatment. More defined comparisons between the children's scores proved impossible because the studies used different questionnaires. Nevertheless, the findings show an important difference: in the US study [29], children's OHRQoL improved from the first month to the six-month recall, whereas in our study, the six-month follow-up scores remained low, although with a slight reversion. This difference may partly stem from the different survey tools used in the studies, but the fact that our patients presented with new caries lesions six months after the DGA treatment may also be related to the high caries situation in the country [20]. Among our child patients for instance, the number of untreated caries at the time of DGA treatment (mean dt = 12.1) was high by international standards.

In our study of young DGA patients, we collected the data over a three-year period and followed-up on the child patients and their oral health re-evaluated six months after treatment. All children underwent treatment in a tertiary-care treatment hospital, and though the findings of this study do not represent the whole of Lithuania, our findings, as discussed earlier [2], are likely to be close to those of the general population, since the LUHS hospital is the main medical referral centre for all regions in the country.

Strengths and limitations

The strengths of the study, as our previous reports have already pointed out, include its high follow-up rate together with its full baseline sample [2,26]. The prospective design of the children's clinical evaluation, a rare design feature among DGA studies, is clearly another strength of our study. In addition, we measured the children's OHRQoL immediately after their DGA treatment and at the six-month follow-up, whereas most other studies present only short-term results.

This study design allowed us to determine how long-lasting the post-GA improvements in OHRQoL actually were. One limitation may be its lack of a control group, since DGA treatment cannot be withheld from patients who require it. Another limitation could be the different conditions of the dental examinations: at baseline, the children were examined under GA, whereas at the follow-up examination, they were conscious; thus, the accuracy of the dental check-up depended on the children's behaviour and poor cooperation.

We chose the ECOHIS as the validated instrument for preschool-age children at the time of our study. As discovered later, the ECOHIS seems to have some limitations which could have compromised its suitability for use among children with poor dental health [38]. Therefore, Thomson et al. [10] recommended using the recently developed short-form P-CPQ and FIS scales when evaluating OHRQoL among young DGA patients [38].

Conclusions

This longitudinal study showed a significant improvement in children's OHRQoL six months after DGA treatment. Postoperative parental ratings of their child's oral health were higher after the DGA treatment, but the children exhibited poor oral hygiene and new caries lesions. Our study highlights the urgent need for an appropriate follow-up system for children undergoing DGA treatment with a special focus on preventive care.

Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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References

[1] Congiu G, Campus G, Lugliè PF. Early childhood caries (ECC) prevalence and background factors: a review. Oral Health Prev Dent. 2014;12:71–76.

[2] Jankauskienė B, Virtanen JI, Kubilius R, et al. Dental general anesthesia treatment for children under six years of age in Lithuania. Medicina (Kaunas). 2013;49:403–408.

[3] Alcaino E, Kilpatrick NM, Smith ED. Utilization of day stay general anaesthesia for the provision of dental treatment to children in New South Wales, Australia. Int J Paediatr Dent. 2000;10:206–212.

[4] Klingberg G, Dahllöf G, Erlandsson A-L, et al. A survey of specialist paediatric dental services in Sweden: results from 2003, and trends since 1983. Int J Paediatr Dent. 2006;16:89–94.

[5] Madan C, Kruger E, Perera I, et al. Trends in demand for general anaesthetic care for paediatric caries in Western Australia: geographic and socio-economic modelling of service utilisation. Int Dent J. 2010;60:190–196.

[6] Tate AR, Ng MW, Needelman HL, et al. Failure rates of restorative procedures following dental rehabilitation under general anesthesia. Pediatr Dent. 2002;24:69–71.

[7] El Batawi HY. Factors affecting clinical outcome following treatment of early childhood caries under general anaesthesia: a two-year follow-up. Eur Arch Paediatr Dent. 2014;15:183–189.

[8] Amin MS, Bedard D, Gamble J. Early childhood caries: recurrence after comprehensive dental treatment under general anaesthesia. Eur Arch Paediatr Dent. 2010;11:269–273.

[9] Pahel BT, Rozier RG, Slade GD. Parental perceptions of children's oral health: the Early Childhood Oral Health Impact Scale (ECOHIS). Health Qual Life Outcomes. 2007;5:6.

[10] Thomson WM, Foster Page LA, Gaynor WN, et al. Short-form versions of the Parental-Caregivers Perceptions Questionnaire (P-CPQ) and the Family Impact Scale (FIS). Community Dent Oral Epidemiol. 2013;41:441–450.

[11] Savanheimo N, Vehkalahti MM, Pihakari A, et al. Reasons for and parental satisfaction with children's dental care under general anaesthesia. Int J Paediatr Dent. 2005;33:379–388.

[12] Ridell K, Borgström Lager E, et al. Oral health-related quality-of-life in Swedish children before and after dental treatment under general anesthesia. Acta Odontol Scand. 2015;73:1–7.

[13] Almaz ME, Sönmez IS, Oba AA, et al. Assessing changes in oral health-related quality of life following dental rehabilitation under general anesthesia. J Clin Pediatr Dent. 2014;38:263–267.

[14] Cantekin K, Yildirim MD, Cantekin I. Assessing change in quality of life and dental anxiety in young children following dental rehabilitation under general anesthesia. Pediatr Dent. 2014;36:12–17.

[15] Gaynor WN, Thomson WM. Changes in young children's OHRQoL after dental treatment under general anaesthesia. Int J Paediatr Dent. 2012;22:258–264.

[16] Thomson WM, Malden PE. Assessing change in the family impact of caries in young children after treatment under general anaesthesia. Acta Odontol Scand. 2011;69:257–262.

[17] Malden PE, Thomson WM, Jokovic A, et al. Changes in parent-assessed oral health-related quality of life among young children following dental treatment under general anaesthetic. Commun Dent Oral Epidemiol. 2008;36:108–117.

[18] Abanto J, Paiva SM, Sheiham A, et al. Changes in preschool children's OHRQoL after treatment of dental caries: responsiveness of the B-ECOHIS. Int J Paediatr Dent. 2016;26:259–265.

[19] Thomson WM. Public health aspects of paediatric dental treatment under general anaesthetic. Dent J.2016;4:20.

[20] Slabšinskienė E, Milčiuvienė S, Narbutaitė J, et al. Severe early childhood caries and behavioral risk factors among 3-year-old children in Lithuania. Medicina (Kaunas). 2010;46:135–141.

[21] Savanheimo N. Dental care under general anaesthesia in public oral health services: longitudinal perspectives. [dissertation]. Helsinki: University of Helsinki; 2016.

[22] Lee GH, McGrath C, Yiu CK, et al. Sensitivity and responsiveness of the Chinese ECOHIS to dental treatment under general anaesthesia. Community Dent Oral Epidemiol. 2011;39:372–377.

[23] Jankauskienė B. Early childhood caries treatment under general anaesthesia and its impact on children's oral health-related

quality of life: summary of doctoral dissertation. Kaunas: Lithuanian University of Health Sciences; 2015.
[24] World Health O. Oral health surveys - basic methods. 4th ed. Geneva: World Health Organization; 1997.
[25] Loe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. Acta Odontol Scand. 1963;21:533–551.
[26] Jankauskienė B, Narbutaitė J, Kubilius R, et al. Adaptation and validation of the early childhood oral health impact scale in Lithuania. Stomatologija. 2012;14:108–113.
[27] Cohen J. Statistical power analysis for the behavioural sciences. Hillsdale (NJ): Lawrence Erlbaum and Associates; 1988.
[28] Martins-Júnior PA, Vieira-Andrade RG, Corrêa-Faria P, et al. Impact of early childhood caries on the oral health-related quality of life of preschool children and their parents. Caries Res. 2013;47:211–218.
[29] Huntington NL, Spetter D, Jones JA, et al. Development and validation of a measure of pediatric oral health-related quality of life: the POQL. J Public Health Dent. 2011; 71:185–193.
[30] Eshghi A, Samani MJ, Najafi NF, et al. Evaluation of efficacy of restorative dental treatment provided under general anesthesia at hospitalized pediatric dental patients of Isfahan. Dent Res J (Isfahan). 2012;9:478–482.
[31] Graves CE, Berkowitz RJ, Proskin HM, et al. Clinical outcomes for early childhood caries: influence of aggressive dental surgery. J Dent Child (Chic). 2004;71:114–117.
[32] Jordan AR, Becker N, Jöhren HP, et al. Early childhood caries and caries experience in permanent dentition: a 15-year cohort study. Swiss Dent J. 2016;126:114–119.
[33] Declerck D, Leroy R, Martens L, et al. Factors associated with prevalence and severity of caries experience in preschool children. Community Dent Oral Epidemiol. 2008;36:168–178.
[34] Savanheimo N, Vehkalahti MM. Five-year follow-up of children receiving comprehensive dental care under general anesthesia. BMC Oral Health. 2014;14:154.
[35] Jankauskienė B, Virtanen JI, Kubilius R, et al. Oral health-related quality of life after dental general anaesthesia treatment among children: a follow-up study. BMC Oral Health. 2014;14:81.
[36] Thomas CW, Primosch RE. Changes in incremental weight and well-being of children with rampant caries following complete dental rehabilitation. Pediatr Dent. 2002;24:109–113.
[37] Baghdadi ZD. Children's oral health-related quality of life and associated factors: mid-term changes after dental treatment under general anesthesia. J Clin Exp Dent. 2015;7:106–113.
[38] Thomson WM, Foster Page LA, Malden PE, et al. Comparison of the ECOHIS and short-form P-CPQ and FIS scales. Health Qual Life Outcomes. 2014;12:36.