

Oral health-related quality of life in Swedish children before and after dental treatment under general anesthesia

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Abstract

Objective: This study evaluated oral health-related quality of life (OHRQoL) in children and families before and after dental treatment under general anesthesia because of severe caries or molar-incisor hypomineralisation (MIH). *Material and methods:* A consecutive sample of the parents/caregivers of children (3–14 yr) in need of treatment under general anesthesia participated in the study. The children were divided into two groups: 3–6 yr and 7–14 yr. The 49-item questionnaire that was administered before and after general anesthesia comprised the Child Oral Health Quality of Life-components of the Parental-Caregivers Perception Questionnaire (P-CPQ), the Family Impact Scale (FIS), and two global questions concerning oral health and general well-being. The P-CPQ domains were Oral symptoms, Functional limitations, Emotional well-being, and Social well-being. The FIS items assessed impact on family life. *Results:* In both age groups, a significant decrease ($p < 0.001$) occurred in overall P-CPQ, and the Oral symptoms, Functional limitations, and Emotional limitations domains of the P-CPQ. Mean values for the Social well-being domain decreased significantly in the older ($p < 0.05$) but not the younger age group. Mean values for FIS decreased significantly in the younger ($p < 0.001$) and the older ($p < 0.05$) age groups. *Conclusions:* Dental treatment of severe caries or MIH, performed under general anesthesia, had an immediate effect on the oral health-related quality of life in the children in this study and a positive impact on the family situation.

Key Words: *attitude to health, caregivers, children, oral health, questionnaires*

Introduction

The oral health of children and adolescents in Sweden and in other western countries has improved significantly in recent decades. According to the Swedish National Board of Health and Welfare, caries prevalence was reduced to less than half in the last 2–3 decades [1]. However, caries remains a major problem in some groups, such as immigrant children and children living in socially deprived environments [2] as well as in children with certain chronic diseases [3].

A relatively high proportion of children with extensive caries problems and other more complex oral diseases cannot, due to developmental and psychological reasons, cooperate during conventional dental treatment. These children frequently require specific treatment interventions [4,5] such as dental treatment under general anesthesia. Oral problems may present as toothache, loss of function (e.g., chewing, speech), and poor aesthetics, and children and parents report not only symptoms from the oral cavity but an impact on the child's and the family's life in general as well.

While the Swedish Public Dental Service has concentrated on collecting and reporting data on caries prevalence, information about the patients' perspective on their oral health and how it affects overall well-being is scarce. Interest in the relationship between oral health and quality of life (Oral Health-Related Quality of Life [OHRQoL]) has grown and studies have suggested various ways that oral health may be linked to an individual's daily functions and well-being [6,7]. Described as a multidimensional approach, OHRQoL expresses how oral function and oral disease affect the domains of (a) oral symptoms, (b) functional limitations, (c) emotional well-being, and (d) social well-being. The instruments for studying these relationships are based on the individual's own experiences and evaluated by questionnaires.

Earlier reports have discussed the advantages and limitations of OHRQoL measurements [7,8].

The methods for measuring how oral health affects general functional and psychosocial well-being were first developed for adults, but today suitable methods are available for children, as are methods designed for parents as proxy informants. The Child Perceptions Questionnaire (CPQ11-14) that measures OHRQoL among 11–14-year-old children was developed and validated by Jokovic et al. [6]. The Parental-Caregivers Perception Questionnaire (P-CPQ) [9] provides the same opportunity for studying OHRQoL in younger children who are unable to answer questions, and the Family Impact Scale (FIS) [10] measures the effect of a child's oral health on the family. Jokovic et al. [9] and Locker et al. [10] found the P-CPQ and the FIS to have excellent validity and reliability in a Canadian population. The English questionnaires have also been translated into other languages, including Swedish, and validated with good results [11-16].

In the literature, only a few studies use OHRQoL measures to evaluate healthcare interventions in pediatric dentistry. Recently, however, parental questionnaires were used before and after treatment to assess the OHRQoL of New Zealand and Dutch children who received dental treatment under general anesthesia [17-20]. The researchers reported a marked improvement in the children's well-being and quality of life.

No such studies of Swedish children, however, whose oral health situation and where the approach to the use of general anesthesia may be somewhat different, occur in the literature. Thus, the aim of this study was to evaluate OHRQoL in Swedish children and families before and after dental treatment of the children under general anesthesia because of severe caries or molar-incisor hypomineralisation (MIH). The hypothesis was that OHRQoL, measured with the P-CPQ and the FIS, would be improved in the children and their families after treatment of severe dental cases, judged by specialist in need of general anesthesia.

Material and Methods

Study sample

A consecutive sample of the parents/caregivers of children (aged 3–14 yr) referred for pediatric specialist treatment in Skåne county (Region Skåne), Sweden, and in need of treatment under general anesthesia (GA) because of severe caries or MIH (permanent dentition) were invited to participate. The need of dental treatment by a specialist in pediatric dentistry was assessed by the general practitioner and the need of GA was decided by the specialist. The study was conducted between September 2010 and June 2011. All five pediatric specialist clinics in Skåne county participated. These specialist clinics are responsible for all dental treatment of children under general anesthesia in the county, which has a population of approximately 160,000 children in this age group.

The children were divided into two groups: preschool children (aged 3–6 yr) and schoolchildren (aged 7–14 yr). Children in need of general anesthesia for other reasons than caries or MIH were excluded, as were children whose parents had problems with Swedish that could not be solved by professional interpreters or declined to participate in the study.

To detect a 10-unit increase in the P-CPQ score (SD 15) in each group, which was judged to be a clinically relevant difference based on results from earlier studies [18] (p -value [alpha] = 0.05 and strength [1-beta] = 0.90), a sample size of at least 25 individuals in each age group was required. To compensate for drop-outs, a minimum sample size was set to 50 individuals in each group.

Written consent

According to Swedish standard procedures before treatment under GA, parents/caregivers and children were informed about the treatment procedures and dental treatment planning for the child. At that time, oral and written information about the study was given to the

parents/caregivers of the children qualifying for the study. A signed, informed-consent form from the parent/caregiver was required for participation.

Procedures before treatment under general anesthesia

Before treatment, background information on the patient's age, sex, ethnicity (Nordic/non-Nordic origin), and chronic illness (present/not present) was retrieved from the dental records. Cumulative caries data (DMFT/dmft), caries status at the time of examination (DT/dt), and occurrence of other pathological changes such as fistulas and persisting roots were also collected. In cases of non-cooperative children these data were collected under GA before treatment.

The parent/caregiver filled in the questionnaire ≤ 1 month before treatment. In very few cases, a professional interpreter or the dentist/dental assistant was needed for assistance.

Procedures after treatment under general anesthesia

The parent/caregiver filled in a questionnaire with the same questions during a post-operative check-up at the specialist clinic 2–3 months after treatment under GA. If the parent/caregiver did not attend the second visit, they were asked to fill in the questionnaire at home and return it by mail. Otherwise, the child was excluded from the study. At this occasion the parent/caregiver and the dentist/dental assistant had no access to the answers in the questionnaire filled in before the treatment.

Questionnaire

The questionnaire had previously been translated from English to Swedish and validated [16]. The questionnaire exists in two versions: version A is addressed to the parents/caregivers of

preschool children (3–6 yr) and version B to the parents/caregivers of schoolchildren (7–14 yr). The versions differ only in certain terms, such as school/preschool and child/youth.

The questionnaire comprised 47 items from the P-CPQ and the FIS components of Child Oral Health Quality of Life (Child OHQOL) [9,10]. P-CPQ items concern the following domains: Oral symptoms (7 items), Functional limitations (7 items), Emotional well-being (9 items), and Social well-being (10 items). The FIS items (14 items) concern impact on family life. Responses to each item were scored on a 0–4 scale as follows: never (0), hardly ever (1), occasionally (2), often (3), very often (4).

Two global questions concerning oral health and general well-being were included in the questionnaires [6,21]. The first global question “How would you rate the health of your child’s teeth, lips, jaws and mouth?” was answered on a 5-point scale: excellent (1), very good (2), good (3), fair (4), or bad (5). The second global question “How much is your child’s overall well-being affected by the condition of his/her teeth, lips, jaws or mouth?” was also answered on a 5-point scale: not at all (1), very little (2), some (3), a lot (4), or very much (5).

Individuals were excluded from analysis if more than 30% of the item responses were “Don’t know” or blank. If < 30% of the answers were “Don’t know” or missing, the blank or “Don’t know” responses were replaced by the mean item score of the questionnaire [9,17,19].

Statistical analyses

Characteristics of participating individuals (background data) are presented as means.

The scores of the two global questions, each domain and the FIS were added per individual, and a mean value and range for the group was calculated. Mean values for the four domains and for the FIS were also calculated. Mean scores before and after treatment under GA were then compared.

Pearson's chi-square test and the paired *t*-test were used to test the statistical significance of differences in OHRQoL before and after the treatment ($p < 0.05$). Comparisons of OHRQoL were made between baseline (≤ 1 month before treatment under GA) and follow-up (2–3 months after treatment under GA). The comparisons included (i) the global items and mean values for (ii) overall P-CPQ items, (iii) the domains, and (iv) the FIS scores. The paired *t*-test was used to test the significance of the changes ($p < 0.05$). The Statistical Package for the Social Sciences (SPSS, version 20, IBM Statistics) was used to analyze the data.

Results

Figure 1 presents the distribution of individuals participating in the study: 173 individuals (99 [3–6 yr] and 74 [7–14 yr]) were treated under GA for severe caries or MIH during the study period and thus eligible for the study. Of these, 30 individuals (17 [3–6 yr] and 13 [7–14 yr]) were excluded because (i) the parents/caregivers did not want to participate, (ii) questionnaires were missing, or (iii) the child failed to attend scheduled post-treatment visits. Another 11 individuals were excluded due to too many “Don't know” or blank responses. Thus, questionnaires for 132 individuals (75 [3–6 yr] and 57 [7–14 yr]) were analyzed. The mean number of “Don't know” or blank responses in the questionnaires was 1.9 and 2.9 respectively in the two age groups.

Tables I and II present patient characteristics. In the younger age group, the mean age was 4.9 yr. Sixty-nine percent (52/75) had a non-Nordic origin and 5% (4/75) reported a chronic disease. Mean dt was 9.3 and mean dmft was 9.8.

Mean age in the older age group was 9.4 yr. Forty percent of the individuals (23/57) had a non-Nordic origin and 26% (15/57) reported a chronic disease. There were no significant differences in age, origin, or health between boys and girls in either of the two age groups.

3–6-year-old children

Met eligibility criteria and had dental treatment under GA
n = 99



n=17

- excluded due to:
- (10) Don't want to participate (5)
 - (3) Missed appointment after GA (1)
 - (4) One questionnaire missing (7)

Filled out both questionnaires
n = 82



n=7

excluded due to > 30% "Don't know" or blank answers

Included in analysis
n = 75

7–14-year-old children

Met eligibility criteria and had dental treatment under GA
n = 74



n=13

Filled out both questionnaires
n = 61



n=4

Included in analysis
n = 57

Figure 1.

In the 3–6 yr age group, 25% (19/75) had remnants of one or more roots and 17% (13/75) had one or more fistulas. In the older age group, 9% (5/57) had one or more root remnants and 11% (6/57) had one or more fistulas.

In the younger age group, a mean of 4.3 primary teeth (range 0–13) were extracted and a mean of 5.0 (range 0–15) primary teeth were filled during treatment under GA. Only a few permanent first molars were filled.

In the older age group, a mean of 2.8 (range 0–9) primary teeth were extracted and 1.1 (range 0–6) filled. A mean of 1.1 (range 0–4) permanent teeth were extracted and a mean of 2.2 (range 0–12) filled. In the older age group, caries was the main reason for treatment in 68% of the cases and MIH in 32%. There were no significant differences in numbers of extractions and fillings between boys and girls in either of the two age groups.

In the younger age group statistically significant improvements ($p < 0.001$) were seen in the two global questions "How would you rate the health of your child's teeth, lips, jaws and mouth?" and "How much is your child's overall well-being affected by the condition of his/hers teeth, lips, jaws or mouth?". In the older children the results were similar ($p < 0.001$ and $p < 0.01$ respectively).

Tables III and IV present changes in OHRQoL between baseline and follow-up. In both age groups, a significant decrease ($p < 0.001$) in the mean values occurred for overall P-CPQ and for the Oral symptoms, Functional limitations, and Emotional limitations domains. Mean values for the Social well-being domain decreased significantly in the older age group ($p < 0.05$) but the change in the younger age group was non-significant. FIS decreased significantly ($p < 0.001$) in both age groups ($p < 0.05$).

In the Oral symptoms, Functional limitations, and Emotional limitations domains, relative decrease in mean score varied from 38% to 53% in the younger age group and from 45% to 51% in the older age group. The mean score for the Social well-being domain decreased by

38% in the older age group. Mean FIS scores decreased by 59% in the younger age group and 43% in the older age group.

Discussion

The results from the present study indicate that dental treatment under GA in children suffering from severe caries or MIH has a significant influence on the children's and families' quality of life (OHRQoL). Studies in other countries [16-19] have reported similar results, and it also seems to be true for Sweden. It should be stressed, however, that this is not an effect of treatment under GA *per se*, but mainly the effect of relief of pain and discomfort. Sedation could be an alternative to GA, resulting in similar improvements in OHRQoL. However, a review from 2012 [22] found no RCT studies comparing sedation to general anesthesia (GA). The reason for this is, according to the authors, that the available sedation methods of today do not permit as extensive dental treatments as treatment under GA.

In the younger age group (3–6 yr), only a weak, non-significant improvement was seen in the Social well-being domain. This is in line with the results of other studies in young children [17,20], but the reason for this weak treatment effect is unclear. Possibly, at young ages, a child's oral health is not important for peer-group acceptance. In the older age group, significant improvements were seen not only in Social well-being but in all other domains. This indicates that oral health is more important socially when the child reaches school age.

Comparisons of OHRQoL before and after GA between different studies should be made with care. First, the outcome may be influenced by the country's general oral health situation. Thus, the gravity of the dental condition leading to treatment under GA may have an impact on the results, the potential for improvement varying with the degree of severity. Second, cultural differences may have an impact on how children and parents experience an improvement in oral health; in some countries, more serious problems may overshadow oral

health problems. Third, variations in instruments used to measure OHRQoL and age of the participants may influence the results, factors recently discussed in a systematic review [23]. Still, our findings of a positive effect of dental treatment of children with severe caries or MIH are in line with the conclusion made in the Jankauskiene et al. review [23], that dental treatment under GA results in an immediate improvement in quality of life for the child and for the family. Thus, dental treatment under GA seems to be effective, despite differences between countries in oral health and treatment strategies, including differences in indications for referral for treatment under GA.

The questionnaires used in this study have been validated for many languages and found to be valid for measuring OHRQoL in children. However, other instruments such as Early Childhood Oral Health Impact Scale (ECOHIS) measuring OHRQoL have been used in children [19]. The P-CPQ was chosen as it has been used in similar studies in different countries. A Swedish version of the P-CPQ questionnaire was previously translated and interpreted to Swedish conditions in a thesis for Master of Medical Science in Odontology [16]. The validity and reliability was found to be good. The FIS was, however, not included in this Swedish evaluation. The questionnaires were filled in by the parents. When needed, a professional interpreter or the dental personal assisted. Although many parents were immigrants and did not have Swedish as their first language, most had no problem understanding the questions. Questionnaires from only 11 individuals were excluded due to too many “Don’t know” or blank responses.

All children in the county of Skåne in need of dental treatment under GA are taken care of at the five specialist clinics involved in the study. Therefore, the study sample was probably representative for this part of Sweden, covering 13 % of the Swedish population, and possibly also for the whole of Sweden as dental health among Swedish children is comparably homogenous (1). Still, further and more powerful studies in different areas of the country may

be appropriate and it should be stressed that comparisons with other countries should be done with care.

Notably is, that the baseline PCP-Q and FIS scores in our study differ somewhat from the “normative” values in Jokovic et al 2003 [9] and Locker et al 2002 [10]. The reasons for this may vary; differences in population and treatment needs may be two.

The study sample was collected consecutively. More than 80 % of the children who fulfilled the inclusion criteria participated with responses from parents to both questionnaires. Compared to other studies, the number of drop-outs was low. Because background data on the children who did not participate was not available, it is not known whether they differed from the participants.

Nearly 70% of the children in the younger age group were of non-Nordic origin, compared with 40% in the older age group. This is a higher proportion of children than in the general child population of the region and shows that children of non-Nordic origin are overrepresented in the group with a need for dental treatment under GA. At the same time, this overrepresentation needs to be taken into account when generalizing from the present results.

Caries data and number of extractions and fillings performed during the GA session confirm that children referred for treatment under GA have extensive treatment needs compared to the dental needs of Swedish children in general [1]. Only a few children in the younger age group had a chronic disease, while the proportion was somewhat higher in the older age group. Thus, in some schoolchildren, in addition to dental problems, chronic disease seems to be a contributing factor to the need for dental treatment under GA.

Children and adolescents in need of dental treatment under GA often belong to a group who in other ways are vulnerable and thus in need of special attention. The positive effects on the quality of life for these children and their families underline the need for access to GA in

dental care, which should be considered in the allocation of health care resources. However, there is a need for cost analysis studies of treatment of severe caries or MIH under general anesthesia compared to other sedation methods since this has only been scarcely reported in the literature [24].

In conclusion, treatment of severe dental caries and MIH, performed under GA, has an immediate effect on the OHRQoL in children; it also has a positive impact on the family situation. The improvement of the dental health and the parents' perceptions of improvement in areas such as oral symptoms, functional and emotional limitations, and family life show that dental treatment, performed under GA and resulting in an improved oral health, is of great value for the child and the family.

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Figure legend

Figure 1. Flow chart showing the numbers of individuals enrolled in the study at baseline, those who successfully finished the study, and the main reasons for dropping out.

Table I. Characteristics of the participating 3–6-year-old children.

	age mean (SD)	non-Nordic origin (n)	chronic disease (n)	dt mean (SD)	dmft mean (SD)	extractions primary teeth mean (SD)	filled primary teeth mean (SD)	filled permanent teeth mean (SD)
girls (n = 38)	4.9 (1.0)	26	2	8.7 (3.1)	9.2 (3.0)	3.7 (2.4)	5.0 (2.9)	0.2 (0.6)
boys (n = 37)	4.9 (1.0)	26	2	9.9 (2.9)	10.4 (3.1)	5.0 (3.7)	5.0 (2.9)	0.2 (0.9)
total (n = 75)	4.9 (1.0)	52	4	9.3 (3.0)	9.8 (3.1)	4.3 (2.8)	5.0 (2.8)	0.2 (0.8)

Table II. Characteristics of the participating 7–14-year-old children.

	age mean (SD)	non-Nordic origin (n)	chronic disease (n)	DT mean (SD)	DMFT mean (SD)	extractions primary teeth mean (SD)	extractions permanent teeth mean (SD)	filled primary teeth mean (SD)	filled permanent teeth mean (SD)
girls (n = 21)	9.6 (2.4)	7	5	3.2 (1.6)	3.8 (1.8)	2.4 (2.6)	1.1 (1.2)	1.1 (1.6)	2.5 (1.8)
boys (n = 36)	9.3 (2.0)	16	10	2.8 (3.0)	3.2 (3.3)	3.0 (2.8)	1.1 (1.5)	1.1 (1.7)	2.0 (2.6)
total (n = 57)	9.4 (2.1)	23	15	2.9 (2.6)	3.5 (2.8)	2.8 (2.7)	1.1 (1.4)	1.1 (1.6)	2.2 (2.3)

Table III. Mean overall scores, domain scores (oral symptoms, functional limitations, emotional limitations, social well-being) and family impact scores at baseline and follow-up: 3–6-year-old children.

	Baseline Mean score (SD)	Range (Score 0)*	Follow-up Mean score (SD)	Range (Score 0)*	Change in score (SD)
Overall P-CPQ score	19.9 (16.5)	0-88 (1)	9.5 (9.7) ^a	0-43 (9)	11.2 (13.6)
P-CPQ subscale					
Oral symptoms	8.3 (5.4)	0-22 (3)	3.9 (3.3) ^a	0-12 (11)	4.4 (4.9)
Functional limitations	5.5 (6.2)	0-24 (18)	2.9 (4.1) ^a	0-20 (35)	2.9 (5.0)
Emotional limitations	4.0 (5.0)	0-34 (15)	2.5 (4.0) ^a	0-14 (53)	2.7 (4.7)
Social well-being	2.1 (3.5)	0-21 (29)	1.5 (2.7) ^b	0-24 (40)	0.6 (3.9)
Family impact scale	7.9 (7.0)	0-42 (6)	3.2 (3.8) ^a	0-18 (24)	4.7 (6.7)

Statistical comparisons between baseline and follow-up: a = $p < 0.001$; b = $p = 0.173$.

* (Score 0) = number of individuals scoring 0

Table IV. Mean overall scores, domain scores (oral symptoms, functional limitations, emotional limitations, social well-being) and family impact scores at baseline and follow up: 7–14-year-old children.

	Baseline Mean score (SD)	Range (Score 0)*	Follow-up Mean score (SD)	Range (Score 0)*	Change in score (SD)
Overall P-CPQ score	21.1 (17.5)	0-80 (1)	11.6 (14.3) ^a	0-77 (5)	9.7 (12.2)
P-CPQ subscale					
Oral symptoms	8.4 (5.0)	0-19 (2)	4.6 (4.5) ^a	0-18 (7)	3.8 (4.4)
Functional limitations	4.2 (4.7)	0-18 (14)	2.3 (3.8) ^a	0-16 (29)	1.9 (3.2)
Emotional limitations	5.1 (5.4)	0-20 (10)	2.5 (4.0) ^a	0-19 (29)	2.4 (4.3)
Social well-being	3.4 (5.0)	0-25 (16)	2.1 (4.2) ^b	0-24 (26)	1.3 (3.3)
Family impact scale	6.7 (7.5)	0-35 (5)	3.8 (5.5) ^b	0-25 (21)	3.1 (7.1)

Statistical comparisons between baseline and follow-up: a = $p < 0.001$; b = $p < 0.01$.

* (Score 0) = number of individuals scoring 0