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## Survey of family-related factors of children treated under dental general anaesthesia

### ABSTRACT

**Aim** Treatment under general anaesthesia (DGA) is a rising trend in Finland. There is a great need to investigate the causes leading to it. Our purpose was to examine family-related factors reported by parents, such as the family size and favoring DGA in the family, and their influence on children being treated under DGA. This survey was based on a questionnaire targeted to parents of children whose dental treatment could not be performed in a conventional setting.

**Study design and methods** Guardians of 87 healthy children treated under DGA at a municipal health center in the city of Oulu, Finland, between November 2014 and December 2015 answered the questionnaire on family-related background factors and on the respondent's own as well as their child's presumed dental fear.

**Results** According to most guardians (83.9% of the cases), the reason for DGA was caries. Male gender, vague family structure, large number of siblings ( $\geq 4$ ),

and DGA history in the family were all important family-related background factors leading to DGA. Self-reported parental dental fear was quite common (25.3%). Children's dental fear reported by parents was associated with DGA in almost half of the cases (46.0%).

**Conclusions** The survey highlights the role of the entire family in association with children ending up being treated under DGA. It is essential for the success of dental health care to also consider family-related factors when planning the treatment, particularly with children demanding DGA.

**Keywords** Dental fear; Dental general anaesthesia; Family-related factors.

## Introduction

Dental caries in permanent teeth is the most prevalent disease worldwide, and untreated dental caries in primary dentition affects 9% of the global population [Kassebaum et al., 2015]. About 5–10% of children in Finland have serious caries problems [Brander-Aalto et al., 2005], occasionally even requiring dental general anaesthesia (DGA). In Oulu, Finland, 0.2% of 0–6-year-old healthy children underwent DGA in 2014 (statistics from the City of Oulu), which is in line with the findings concerning children living in Helsinki, Finland [Savanheimo et al., 2005]. Family-related risk factors preceding the onset of dental caries at early age include, for example, maternal low basic education, higher number of siblings, parental inability to control sugar consumption leading to a high snacking frequency, parental indifference about the child's tooth brushing, unassisted tooth brushing by the child, and parental tooth brushing frequency less than twice daily [Sujlana and Pannu, 2015]. Parental beliefs and attitudes have a key role in moderating harmful oral health-related behaviours in small children that can lead to the development of caries lesions [Pine et al., 2004].

In Finland, all children under 18 years of age are entitled to free public dental health services. If there is a need for DGA (e.g. a vast treatment need with respect to age or cooperation), healthy children are treated under DGA and must pay only a minor fee while majority of the costs are covered by social services. Medically compromised children and small children (<15 kg) are treated in a hospital setting if they need DGA.

Dental fear and repeated unpleasant experiences during dental care are the most important factors leading to DGA, when reported by parents [Savanheimo

et al., 2005]. Dental fear and caries are the most common self-reported and parental-reported (children under 12 years of age) causes for referral to DGA [Taskinen et al., 2014]. In earlier studies, the reported proportion of dental fear has been between 20–40% in children between 3–9 years [Rantavuori et al., 2004]. Important aetiological factors of dental fear in children are general fears, age of the child, and maternal dental fear [Klingberg et al., 1995]. In the general population, approximately 15.5% of subjects have some degree of dental fear [Gatchel et al., 1983]. In the study of Luoto et al. [2014], 13% of the responding Finnish mothers and 7% of the responding fathers had severe dental fear. Children's quality of life after dental treatment under GA improves as for physical, psychological, and social aspects [Jankauskiene and Narbutaite, 2010]. Dental treatment under GA affects the entire family. Parents are usually overwhelmingly positive about the care their child receives under GA despite the circumstances; however, this may vary from country to country. Parents report their children to be postoperatively dental pain-free, eat better, sleep more, have better overall health, look better, smile more, perform better at school, and be more social [White et al., 2003]. However, causes leading to DGA are initially difficult to erase from behavioural patterns [Abreu et al., 2015].

The aim of this survey was to investigate family-related factors as perceived and reported by the parents of children treated under DGA. DGA here was provided by the community dental health services for healthy children. Another aim was to investigate the role of self-reported dental fear of parents in this survey population. Our hypothesis was that family-related factors, such as the family size and favoring DGA in the family, can have a significant influence on children being treated under DGA. Another hypothesis was that parental dental fear is associated with children's DGA.

## Materials and methods

This survey was based on a questionnaire targeted to parents/guardians of children whose dental treatment could not be performed in a conventional setting, but the child had to be referred to a paediatric dentist who considers the need for dental general anaesthesia (DGA). A fixed protocol in the City of Oulu is used for referring a patient to a paediatric dentist/DGA. At first, the public health dentist must try to accomplish dental treatment with or without oral sedation. If the treatment is not successful, or if the child's treatment need is considered too extensive in relation to his/her cooperation skills, the dentist refers the child to the paediatric dentist of the City of Oulu. In addition to the paediatric dentist, an experienced dentist in paediatric dental health care treats these referral patients. They both use behavioural techniques (CBT or cognitive

behavioural technique) and, if needed, also oral or nitrous oxide sedation, and as the last option, dental treatment under general anaesthesia (DGA).

All children are given a diagnosis by the paediatric dentist before DGA, which, according to the statistics of the City of Oulu, in most cases is K02.1 (dental caries) and/or F93.1 (lack of cooperation due to young age) (Statistics, City of Oulu 2015). Only generally healthy children (ASA I–ASA II) are treated under DGA at the public health center in Oulu.

### Sample selection

All the guardians escorting their children to DGA (n=87) at a municipal health center in Oulu, Finland, during the period from November 2014 to December 2015 were asked to answer a structured questionnaire. The parents were asked to report their perception on the cause for DGA. All the children were younger than 12 years of age. In this survey, the questionnaires were given to the guardian after the DGA in the recovery room, while he/she waited for the child to recover and to be released from the clinic.

### Questionnaire

The questionnaires answered by the parents comprised the survey material. The manual questionnaire comprised mainly multiple-choice questions and a few open-ended questions. The total number of the questions was 38. However, not all the parents responded to all the questions in the survey, and therefore the number of the responses varies. The guardians were asked to provide the following details: the gender (male/female) and the age of the child (years), the respondent's relationship with the patient (mother/father/guardian/someone else), the age of the respondent (years), the number of adults living in the family (n), the number of children living in the family (n), the number of the child's DGA treatments (n), whether siblings have been treated under DGA (yes/no), if the respondent has dental fear (yes/no), if the respondent or the other parent has been treated under DGA (yes/no), and the respondent's response to the child's DGA (good/relieved/poor/frightening).

The present questionnaire had been piloted with parents of DGA patients treated at the Oulu University Hospital during the period from 2009 to 2010. The questionnaire in that survey was sent to the parents (n=141) four years after their child's DGA treatment. The parents could provide their answers either through a Webropol online survey or by filling out a paper questionnaire. The weakness of that survey was the 86% dropout rate (the number of respondents was n=20). The responses, however, were most valuable and the questionnaire was revised accordingly. The questions used in the present survey are based on the questionnaire used in the pilot survey [Huohvanainen et al., unpublished].

### Statistical analyses

Presuming 20% difference between groups, a sample size of 80 children was calculated as a minimum number of participants for the present purpose with power  $1-\alpha=0.95$ . For the analyses, the participants were divided into two age categories:  $\leq 6$  years and 7–11 years of age. The outcomes of this descriptive survey were analysed and presented in frequencies, proportions, means, and standard deviations (SD). Association between the variables was analysed using cross-tabulation. The significance of the findings was tested using a chi-squared test. Logistic regression analysis was conducted using dental fear of children (yes/no) and the number of DGAs of children ( $1/\geq 2$ ) as dependent variables and the number of parents and siblings, number of DGAs of parents and siblings, and gender of the child as independent variables, and OR and 95% CI were calculated. Difference between the groups was considered as statistically significant with  $p$  values  $<0.05$ . The SPSS software version 20.0 was used in the analyses (SPSS, Chicago, Illinois, USA).

### Ethics

Permission for this survey was granted by the registrar of Oral Health Care at the municipal health center in the city of Oulu, Finland, concerning the individuals in the survey population. The Ethical Board of the Northern Ostrobothnia Hospital District, Finland, did not consider their permission to be necessary. Answering the questionnaire was voluntary and anonymous and answering did not influence the treatment after DGA.

## Results

The survey population was slightly dominated by those in the age group 7–11 years (Table 1). Males dominated both groups: in the younger group, the proportion of males was 72.2%, whereas in the older group, the proportion of males was 61.2% (Table 1). In 74.7% of the cases, the number of guardians in the family was two (MEAN 1.7, SD 0.70). In most cases (71.3%), the mother escorted the child to the DGA; among the younger girls, the proportion was 100% (Table 1). The families with more than one child were most typical. Only about one out of 20 families (6.9%) had only one child, 55.2% had 2–3 children, and 34.4% had  $\geq 4$  children (Table 1).

None of the parents refused to respond, but some of them left some questions unanswered. In one case, both the mother and the father together completed the questionnaire, in another case, the respondent was the foster mother, and in one case a foster home employee. Additionally, the age of the child was missing in one case and the gender of the child was missing in another one. Three of the guardians did not answer how many children there were in the family. Again, about 10% (11.5%) of the escorting guardians did not give any answer when asked about the number of the guardians in the family (Table 1).

The number of DGAs was not statistically significantly associated with any variables used in the logistic regression model. Regression analyses showed that female gender was associated with increased risk for

Variable		Age group <sup>1</sup>					
		0-6 n (%)			7-11 n (%)		
		Male	Female	Total	Male	Female	Total
		26 (72.2)	10 (27.8)	36 (42.4)	30 (61.2)	19 (38.8)	49 (57.6)
Number of guardians	1	4 (15.4)	2 (20.0)	6 (16.7)	3 (10.0)	1 (5.3)	4 (8.2)
	2	19 (73.1)	5 (50.0)	24 (66.7)	25 (83.3)	16 (84.2)	41 (83.7)
	>2	1 (3.8)	0 (0.0)	1 (2.8)	0 (0.0)	0 (0.0)	0 (0.0)
	no answer	2 (7.7)	3 (30.0)	5 (13.9)	2 (6.7)	2 (10.5)	4 (8.2)
Guardian <sup>1</sup>	mother	17 (65.4)	10 (100.0)	27 (75.0)	23 (76.7)	12 (63.2)	35 (71.4)
	father	9 (34.6)	0 (0.0)	9 (25.0)	6 (20.0)	6 (31.6)	12 (24.5)
	someone else	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.3)	1 (5.3)	2 (4.1)
Number of children <sup>2</sup>	1	2 (7.7)	0 (0.0)	2 (5.6)	3 (10.0)	0 (0.0)	3 (6.1)
	2-3	12 (46.2)	5 (50.0)	17 (47.2)	20 (66.7)	11 (57.9)	31 (63.3)
	$\geq 4$	11 (42.3)	5 (50.0)	16 (44.4)	6 (20)	8 (42.1)	14 (28.6)
<sup>1</sup> one missing value, <sup>2</sup> three missing values							

TABLE 1 Gender, age and family members of children treated under DGA.

dental fear (OR 2.87, 95% CI 1.00, 8.19).

DGA history in the families was obvious. More than one in four (26.5%) of the older children had had two or more DGA treatments themselves before, whereas the proportion was 13.8% among the younger children (Table 2). One in 10 parents (11.5%) had had DGA themselves, whereas the respective proportion for the siblings was 17.2% (Table 2). In the younger age group, even one fifth of the siblings (18.9%) and almost every eighth of the parents had had DGA (13.5%).

The parents of children treated under DGA reported dental caries treatment (83.9%) to be the cause for referral. Only a small proportion reported that the reason for DGA was something else than caries, such as orthodontic teeth extractions (2.3%) or developmental disorders of the dentition (8%). The cause for DGA was reported by parents to be dental fear in almost half of the cases (46.0%). The excessive need for dental treatment and inability of providing dental care in an ordinary dental office were reported to be the causes for DGA in one third of the cases (27.5%). In many cases, there were more than one reason.

One fourth of all the parents/guardians also reported their own dental fear; the fear was more common among the parents/guardians of the younger children (32.4%) than among the parents of the older children (20.4%). In the group of the older children, the fathers did not report dental fear at all ( $p < 0.05$ ). In the group of the younger children, the fathers reported similar dental fear as the mothers did (Table 2). The association of self-reported parental dental fear with DGAs of the respondent or the other guardian was statistically significant ( $p < 0.001$ ).

## Discussion

The main hypothesis was that family-related factors play an important role in children being treated under DGA. This was confirmed. As far as we know, the family structure and the number of siblings in relation to the frequency of DGA has hardly been studied so far, which adds to the value of the present survey. Dental fear was common among the parents, which supports our second hypothesis. In addition, families had on average significantly more DGA history than the population in general [Savanheimo et al., 2005].

Many of the family-related factors were found to be associated with DGA, although in Finland the differences in socioeconomic status (SES) are smaller than in many other countries. SES influences children's oral hygiene practices and diet, consequently leading to oral diseases like dental caries. This was demonstrated in the study of Abreu et al. [2015], where children in families of parents with low education or household income or being unemployed, single-parent families, and families having more than two children have a high

Variable	Age group <sup>1</sup>		
	0-6 n (%)	7-11 n (%)	
		36 (42.4)	49 (57.6)
Number of DGAs <sup>1</sup>	1	31 (86.1)	36 (73.5)
	2	5 (13.8)	11 (22.4)
	>2	0 (0.0)	2 (4.1)
Parents' DGA <sup>2</sup>		5 (13.5)	5 (10.2)
Siblings' DGA <sup>3</sup>		7 (18.9)	7 (14.3)
Cause for DGA <sup>1</sup>	fear	15 (40.5)	25 (51.0)
	other	21 (56.8)	24 (49.0)
Maternal dental fear <sup>3</sup>		8 (29.6)	9 (25.7)
Paternal dental fear <sup>1, *</sup>		3 (33.3)	0 (0.0)

\* $p < 0.05$ , <sup>1</sup> one missing value, <sup>2</sup> four missing values, <sup>3</sup> two missing value

TABLE 2 DGA history and dental fear in the families of the children treated under DGA.

risk for dental caries. Good oral health-related habits are well known protective factors against dental caries, yet, challenges in everyday life seem to restrict parents' ability to adopt them [Alijafari et al., 2014]. SES has the strongest association with the risk for dental caries among children [Meurman et al., 2010]. Only some aspects of SES were questioned here, which can be considered a shortcoming of the present survey.

The proportion of boys was overrepresented here. The reason for this might be that oral health behaviour of Finnish boys is poorer than that of girls [Harris et al.] and therefore the risk for caries incidence is higher among boys than girls [National Institute of Health and Welfare. School Health Promotion Study 2010/2011], which may eventually lead to DGA. One reason for the poorer oral health condition of the boys in Finland may be poor paternal role modelling, which is important in terms of oral health behaviour [Käkilehto et al., 2013]. Oral health behaviour is known to be poorer among men than women in Finland [Poutanen et al., 2007]. Single-parent families may lack paternal role models altogether.

Association with family size and dental caries has been well established [Abreu et al., 2015], while this survey aimed to investigate their association with DGA. In this survey, majority of the families had two parents, but the number of parents was on average less than two, which indicates a similar trend as seen for dental caries. The proportion of single parents may have been even higher because some respondents refused to answer this question. Today's families are often blended, which may to some extent influence the family dynamics. Whether the respondent was the child's biological parent was not questioned.

The mothers' influence on their children's daily life

is outstanding, also in terms of dental health and caries experience [Meurman et al., 2010]. When parents are overloaded by daily routines, they may become stressed, which is found to be one of the best predictors for ECC [Menon et al., 2013]. It has been proven that counselling of mothers and regular infant dental visits are effective in preventing early childhood caries [Medeiros et al., 2015]. Consequently, this could also be the best method in the prevention of DGAs.

Our survey indicates that a larger number of children in the family may be a potential factor leading to a child being treated under DGA. According to Statistics Finland, in 2014 there were on average 1.84 children per family. In this survey, more than one third of the families had at least four children, while the respective national figure is 5% [Suomen virallinen tilasto (SVT): Perheet (verkkosivustokäyttö)]. In Northern Finland, where the survey was conducted, the family sizes are bigger than on average because of the conservative religion (Conservative Laestadianism) in the region banning contraception. Being the fourth-born child in the family or later has been found to be a risk indicator for early childhood caries ECC [Dabawala et al., 2016], which is in line with our findings.

There are several aspects to be considered in attitudes leading to DGA. In this survey, the proportion of parents and siblings in the same family treated under DGA was high, indicating that DGA is considered as a family tradition. This is in line with the study by Olley et al. [2011]. High proportion of DGAs in some families may be explained by parents being highly satisfied with DGA and tending to find it as an easy way out of conventional dental treatment. The increase in the demand for DGAs may be because DGA treatments in public health care are practically free of charge in Finland. The low threshold for referring a child to DGA may also be due to lack of cooperation, causing dental practitioners to feel frustrated in their efforts to promote oral health of those children [Alijafari et al., 2015]. Parents may also require DGA and repeated DGA treatment for all their children. Repeated DGAs were not significantly associated with any explaining factors, which emphasizes the importance of careful evaluation of indications to repeated DGAs.

Children's dental fear reported by parents was an important cause leading to DGA. As shown in previous literature, female gender was statistically significantly associated with dental fear [Luoto et al., 2014]. Maternal dental fear was also more common than paternal dental fear in this survey. Parental dental fear *per se* was more common in this survey than in the ordinary populations of previous studies. This may be because here the questionnaires were delivered in connection with the DGA treatment, whereas, for example, in the study by Luoto et al. [2014], parents answered the questionnaires in connection with a normal oral examination of their children. Parental

fear may be implicated in the life style and priorities concerning health issues in the family, thus indirectly leading to their own and their children's DGA. This was seen when analysing whether the siblings had undergone DGA: the more often the parents reported dental fear, the more often the siblings had also been treated under DGA. Prevention of dental fear in childhood and taking the possibility of dental fear into consideration in all dental care of children and adults is most likely beneficial [Rantavuori et al., 2004]. It must always be borne in mind that that DGA does not deal with person's dental fear.

One strength of this survey is that the dropout rate was zero. All parents asked to participate in the survey agreed to answer the questionnaire. This may be because the parents were eager to have something to do while waiting for their child to recover and because the staff provided questionnaires for them at that time. One weakness of this survey is that we did not categorise fear. Because the questionnaire was available only in Finnish, those who could not read or speak Finnish, or did not have an interpreter available, were excluded. These individuals were not registered. Yet, including them, mostly refugees and asylum seekers, could have influenced the outcome [Savanheimo et al., 2012]. This survey concentrates on family aspects of children treated in DGA rather than clinical causes leading to DGA.

## Conclusions

The most significant justification for, and the main strength of this survey, is the rising trend of DGAs, however situations may vary from country to country. In Oulu, Finland, the rising trend is obvious: there were 100 DGA patients in the year 2010, and the number increased by 10% by the year 2014 (Statistics, City of Oulu). DGA has become a routine in dentistry and well-known among dentists and parents. Because of that, and the increasing number of oral and systemic diseases and child behavioural problems, there remains a need [Nelson and Xu, 2015] for DGAs in paediatric dentistry even though it is not without risks and does not deal with the main causes for DGA, i.e. dental fear and caries. Dentists should recognise beforehand which children are at risk of ending up in repeated DGAs. They should carefully evaluate indications for DGA and put more effort into introducing preventive measures with regular dental visits for those children and their families, especially mothers.

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