

ORIGINAL ARTICLE

Dental Discomfort Questionnaire for young children before and after treatment

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Abstract

Objective. To present a follow-up using the Dental Discomfort Questionnaire (DDQ) before and after the treatment of children, under the assumption that the number of toothache-related behaviors diminishes as a result of treatment, and to see whether this effect is related to the site of the carious teeth or to the treatment itself. **Methodology.** Sixty-one parents completed the DDQ before and after the treatment of their child, aged between 30 and 59 months. The available dental records were used to assess the status of the caries and the consecutive treatment. **Results.** Overall, there was a significant decrease in the average number of post-treatment behaviors displayed by children. However, children with extractions during treatment or children with caries in their front teeth did not change their behavior. These children continued to have difficulty with chewing and biting. **Conclusions.** The dental treatment of children leads to reduced toothache-related behaviors. Our study showed the DDQ to be a useful instrument for acquiring insight into the behavioral aspects of young children as a consequence of toothache or dental treatment, thereby underlining the importance of a behavioral approach in young children.

Key Words: Children, dentistry, pain, toothache

Introduction

In The Netherlands, sound teeth are no longer the norm for 5-year-old children, in fact only half still have caries-free dentition [1]. Many of these children have several carious lesions, which may have a significant impact on their quality of life; they eat less, sleep less, and experience pain [2]. Furthermore, dental caries experienced at a young age is said to be predictive of caries development later in the permanent dentition [3], and when left unrestored there is a risk of subsequent pain and dental anxiety [4,5].

Pain in young children is not always recognized. As a result of cognitive immaturity, and perhaps the consistency of the pain over a long period, young children with dental caries, or even rampant caries, do not always verbalize feelings of pain. A study by Thomas et al. on the effects of dental caries on the quality of life in children (mean age 44 months) showed that only 48% of parents reported that their children with

carious lesions had pain or discomfort. However, these children did manifest effects in other aspects of their daily living, especially with eating, sleeping, and agitated behavior [2].

A single treatment session under general anesthesia allowing complete elimination of the caries and rehabilitation of the teeth showed subsequent improvement in the quality of life of young children (e.g. eating, sleeping, pain) as reported by the parents [6,7]. Besides physical improvement after treatment, research also found improvement in social quality of life, e.g. more smiling, improved school performance, and increased social interaction [8].

It seems toothache can be recognized in the behavior of young children, i.e. through their eating, sleeping, and other pain-related behaviors, the Dental Discomfort Questionnaire (DDQ) was developed. This is a questionnaire that can be used to identify toothache in young children (2–4 years of age) by their specific behaviors. The DDQ has been developed based on

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Table I. Percentage of children who displayed a specific behavior before and after treatment

Behavior items DDQ	<i>n</i> *	Before treatment	After treatment	<i>p</i>
1. Problems with brushing the upper teeth	59	54%	41%	0.077
2. Puts away something sweet to eat	60	40%	32%	0.359
3. Problems with brushing the lower teeth	55	44%	27%	0.022
4. Bites with the molars rather than the teeth	59	44%	46%	1.00
5. Chews at one side	54	32%	30%	1.00
6. Problems chewing	60	22%	17%	0.648
7. Reaches for the cheek while eating	60	17%	7%	0.109
8. Crying during meals	58	16%	7%	0.125

* Not all items were always completed.

descriptions of behaviors associated with toothache according to the parents of referred children with caries and toothache. A strong association is shown between the behaviors of the DDQ and toothache in young children as reported by the parent. Furthermore, it has been found that the DDQ has a good predictive value for the existence of toothache [9].

The aim of the present study was to present a follow-up using the DDQ before and after the children are treated, under the assumption that the number of toothache-related behaviors diminishes as a result of treatment, thereby testing its clinical use as a pain-assessment tool. A second aim was to see whether this effect is related to the site of the carious teeth or the treatment content.

Material and methods

Subjects

Both before and after all dental disease was treated, questionnaires were sent to 109 parents, of whom 61 (59%) replied both times. On average, there was a period of 7.7 months (SD 1.95) between the two measurements. The children were aged between 30 and 59 months (mean 49.0, SD 8.05) and the study population consisted of a convenience sample of children treated at a special dental care center (SBT) in Amsterdam or at a comparable secondary dental care clinic specialized in treating referred children. The Netherlands Institute of Dental Sciences (IOT) at the Academic Centre of Dentistry in Amsterdam approved the study. Parental consent was obtained.

Measures

Dental Discomfort Questionnaire. Owing to the age of the children, the parents were asked to fill out the DDQ on their behalf. The list consists of two parts. The first part includes a question concerning the occurrence of toothache. The parent is asked if he/she noticed that the child had toothache; this question can be answered with: "never", "sometimes", "often", or "I do not know". The second part of the DDQ consists of eight questions regarding different behaviors associated with toothache or caries, e.g. crying during meals or chewing problems. For each item, the parent is asked to

rate how often their child shows that specific behavior. The questions can be answered on a 3-point scale: 0 "never", 1 "sometimes", and 2 "often". Sum scores thus range from 0 to 16. The sum score of the DDQ is based on the questionnaires in which at least 6 out of 8 questions are answered. The missing values are calculated by "series mean", a technique where the missing value is replaced with the subject's mean for the filled out items.

Dental history. The available dental records are used to assess the status of the caries and the consecutive treatment.

Statistical analyses

McNemar tests to compare paired proportions were conducted to compare the DDQ items before and after treatment [10]. For this analysis, the response categories were dichotomized into "0" never versus "1" sometimes and often. Wilcoxon tests, a non-parametric equivalent to the *t*-test, were conducted to compare the mean DDQ scores before and after treatment for different independent variables, i.e. toothache before treatment (yes/no), extractions as treatment (yes/no), and front caries (yes/no). Mann-Whitney U-tests, a non-parametric equivalent to the *t*-test, were used to compare children with or without toothache, extractions as treatment or front caries. To minimize the probability of a type-I error, the *p*-value was adjusted according to the Bonferroni correction, the maximum number of tests was seven; the *p*-value was therefore set on *p*=0.007. The tests were one-tailed unless otherwise indicated.

Results

Before treatment, 51% of the parents reported that their child had toothache. Overall, there was a significant decrease in the mean DDQ score for children after they had been treated (mean 3.40 vs 2.44; $Z = -2.598$, $p = 0.0045$). Taking the items separately, it was found that after treatment fewer children had problems with, for example, brushing the lower teeth (44% vs 27%), brushing the upper teeth (54% vs 41%), puts away something sweet

Table II. Mean DDQ score (M) and standard deviations (SD) of children before and after treatment divided for prevalence of toothache, extractions and front caries

	Toothache before treatment						Extractions				Caries in front			
	<i>n</i> = (60)		No (<i>n</i> = 26)		Yes (<i>n</i> = 30)		No (<i>n</i> = 21)		Yes (<i>n</i> = 36)		No (<i>n</i> = 32)		Yes (<i>n</i> = 24)	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Before treatment	3.40*	2.84	2.24†	2.16	4.42*†	3.00	2.73*	1.61	4.02	3.27	3.01*	2.47	4.32	3.18
After treatment	2.44*	1.98	1.93	1.76	2.90*	2.14	1.53*‡	1.36	3.14‡	2.03	1.71*‡	1.72	3.67‡	1.71

* Significant difference before and after treatment; $p < 0.007$.

† Significant difference before treatment; $p < 0.007$.

‡ Significant difference after treatment; $p < 0.007$.

to eat (40% vs 32%), reaching for the cheek while eating (17% vs 7%), and crying during meals (16% vs 7%), although these differences did not reach significance (see Table I for details).

In the current study, 59% of the parents responded to both questionnaires. Further analysis showed that after treatment the non-responders had a higher initial DDQ score than the responders (5.10 vs 3.27; $Z = -2.79$, $p = 0.002$).

Toothache versus no toothache

Before treatment, children with reported toothache had a significantly higher DDQ score than children without reported toothache (mean 4.42 vs 2.24; $Z = -2.85$, $p = 0.002$). Children with toothache showed a significant decrease in DDQ score after treatment (mean 4.42 vs 2.90; $Z = 2.56$, $p = 0.005$) this not being the case for children without toothache (mean before 2.24, mean after 1.93) (see also Table II).

Extractions versus no extractions

Children without extractions during their treatment had a significantly lower DDQ score after treatment (mean 1.53) than before (mean 2.73; $Z = -3.17$, $p = 0.001$); they also had significantly lower DDQ scores after treatment compared with children who did have extractions (mean 1.53 versus 3.14; $Z = -3.12$, $p = 0.001$; see Table II). In detail, it was found that behaviors such as puts away something sweet to eat (44% vs 14%) and chewing on one side (43% vs 10%) were displayed significantly less often by children who did not have extractions during treatment than by children who did have treatment including extractions.

Caries versus no caries in the front teeth

Differences in pain-related behaviors were also found between children with caries in their front teeth and children with caries elsewhere. Children with caries elsewhere had a significantly lower DDQ score after treatment than before treatment (mean 1.71 vs 3.01; $Z = -3.00$, $p = 0.002$) and also a significantly lower DDQ score after treatment than children who had caries in their front teeth (mean 1.71 vs 3.67;

$Z = -4.30$, $p < 0.001$). This latter group did not have a significant reduction in DDQ scores before and after treatment (see Table II). When the behavior items were compared independently, it appeared that after treatment the behaviors "bites with molar instead of teeth" (80% vs 23%), "chews on one side" (44% vs 19%) and "problems chewing" (32% vs 6%) were displayed more often by children who had caries in their front than by children who had caries elsewhere. Before treatment, only "bites with molar instead of teeth" (71% vs 25%) was done more often by children who had caries in their front teeth.

Discussion

In line with our hypotheses, the mean number of behaviors displayed by the children decreased significantly after treatment. The children showed fewer problems on seven items, although none reached significance. However, the behavior of children with extractions as treatment or front teeth caries did not change much after treatment. Children who had extractions continued having problems with eating sweet things and continued to chew on one side. A comparable effect is seen in children who had caries in their front teeth; they continued to have difficulty with chewing, and they bit off things with their molars instead of with their front teeth. The underlying problem here seems to be connected with extraction, since a great number of children with caries in their front teeth need extraction treatment, 83% in our sample. When the front teeth are affected, children are more likely to bite with their molars rather than with their front teeth and to continue with this behavior after treatment because of the absence of the teeth. Another possible explanation is that these behaviors become a habit for these children because they have deceased teeth for an extended period of time. In this specific situation it seems that the pain experience has merely changed into a discomfort attitude. Finally, the group not responding to the follow-up had significantly more pain-related behaviors before treatment. If data had been obtained from this group these might have strengthened the results. Further studies to support this hypothesis and to assess test-retest reliability are mandatory.

To conclude, dental treatment of children leads to reduced toothache-related behaviors. Our study showed the DDQ to be a useful instrument for gaining insight into the behavioral aspects of young children as a consequence of toothache or dental treatment, thereby underlining the importance of a behavioral approach in young children.

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