Prevalence of dental anxiety and behavior management problems among six to eight years old Danish children

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The aim of this study was to estimate the prevalence of dental anxiety among 6 to 8-year-old Danish children using the Children's Fear Survey Schedule-Dental Subscale (CFSS-DS) and behavior management problems. The study was designed as a population-based cross-sectional survey of children attending the municipal dental service in four municipalities in the county of North Jutland, Denmark. In 2001, the CFSS-DS questionnaire was mailed to the parents of all children born in 1993, 1994, and 1995 (parents of 1666 children) in 4 municipalities. Data on behavior management problems were collected from the children's dental records held by the municipal dental service. Questionnaires were returned from 1281 (76.9%) parents. The prevalence of dental anxiety (i.e. CFSS-DS $\geq$38) was 5.7% (95% CI: 4.6%–7.1%), and the median CFSS-DS score was 22 (1st quartile 19; 3rd quartile 27). A history of behavior management problems was observed in 37.2% (95% CI: 33.3%–41.1%) of all children who had had dental treatment, but more often in children with dental anxiety. □ *Behavior management problems; Denmark; dental anxiety; epidemiology*

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Dental anxiety is the abnormal fear or dread of visiting the dentist for preventive care and treatment. In a Swedish population-based cross-sectional study including more than 3000 children, Klingberg et al. found an association between number of missed appointments and high anxiety scores (1). Skaret et al. found a high frequency of missed dental appointments during adolescence in 20-year-old patients with high dental anxiety in a population-based study of 762 individuals (2). This may have been due to dental anxiety persisting since childhood, since these findings are supported in a cohort study by Locker et al., who followed 976 individuals from age 15 years to age 26 years and found that dentally anxious adolescents had an increased risk of dental anxiety as adults (3). Children of dentally anxious parents seem to be affected by the anxiety of the parents, the anxiety and its consequences thereby being conveyed to the next generation (4, 5). An association has also been found between dental anxiety and deterioration of dental health (1, 6).

Dental anxiety can be measured in two ways: 1) indirect ratings carried out by observers, e.g. reporting of behavior management problems during treatment by the dental staff, or 2) direct ratings by the person him or herself or the parents using questionnaires, picture tests or other methods. In their review article, Artman et al. found that the Children's Fear Survey Schedule-Dental Subscale (CFSS-DS) was a valid and reliable tool for measuring dental anxiety in children. This tool has been used to generate descriptive data from a number of other child populations (7).

In previous population-based cross-sectional studies using the CFSS-DS, different cut-off points have been used to define dental anxiety. In Scandinavia, Klingberg et al. defined dental anxiety as a CFSS-DS score $\geq$38 (8), and found a prevalence of 6.7% in children between 4 and 11 years (4). Andersen found a prevalence of 9.2% in children aged 12 and 13 years using the same cut-off point (9). Using 1 *s* (standard deviation) above the mean as the cut-off point, Raadal et al. found that 12.0% of children were dentally anxious at the age of 10 (10). In The Netherlands, ten Berge et al. used a higher cut-off point (i.e. CFSS-DS $\geq$39) and found a prevalence of 6.0% in 4 to 11-year-old children referred for dental treatment (11).

Dental treatment of children may be disrupted by negative behavior, i.e. behavior management problems. Previous studies have shown that a majority of children with dental anxiety present behavior management problems in dental treatment situations, although a small proportion with dental anxiety do not present behavior management problems while another small proportion of children with no dental anxiety do present behavior management problems (1, 12, 13). In a cross-sectional study in Sweden including 4505 children between the ages of 4 and 11 years, the prevalence of behavior management problems was 10.5% (14).

Since dental caries is a disease that occurs frequently among children in developed countries, the majority have to cope with dental treatment. Despite the well-developed child dental care system in Denmark, with a high attendance rate, only a few surveys have been conducted

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on dental fear and anxiety, and on behavior management problems (9, 15, 16). Two were carried out 30 years ago (15, 16) and with instruments other than those used presently. Consequently our knowledge of the extent of these problems in Danish children today is limited.

The aim of the present study was to estimate the prevalence of self-reported dental anxiety and behavior management problems reported by the dental staff in young Danish children.

Materials and methods

Study population and design

In Denmark, the local municipalities administer the public dental health service for children; the service is tax-supported and free for all children from 0 to 18 years of age, with an attendance rate of almost 100%. The public administration of the four municipalities (Nibe, Sejlflod, Skørping, and Støvring) in the county of North Jutland, Denmark, provided a list of all children aged 6 to 8 years, enrolled in the municipal dental health service for children and adolescents as of 1 August 2001. All 4 municipalities have a population of mixed rural and urban composition. The municipal dental services in the 4 municipalities were established more than 25 years ago. The list of enrolled children totalled 1707. Forty-one of these children were excluded for one or more of the following reasons: orphans or children housed outside their parents' home, language problems, emigrated, protected mail-address, abnormal psychological development, children of dentists who did not use the municipal dental care system regularly. A final total of 1666 children were included in the study. The parents of the children received a questionnaire by mail, and in cases of non-response, up to 2 reminders. They were asked to answer the questionnaire on behalf of their child, and by the end of 2001 all questionnaire data had been collected. The Danish Data Protection Agency and the Regional Ethics Research Committee for the County of North Jutland approved the project.

Measurement of dental anxiety

The CFSS-DS questionnaire consists of 15 items, each covering different aspects of dental and medical situations and was used to measure dental anxiety (17). The possible response to each item is a score between 1 (not afraid) and 5 (very afraid), the total scores ranging between 15 and 75, with a high score indicating dental anxiety. Children with CFSS-DS scores $\geq$38 were defined as dentally anxious, in agreement with Klingberg et al. (8).

Before using the CFSS-DS questionnaire, the English version was translated into Danish. A Danish person skilled in both the English language and dentistry then back-translated the translated version. Any disparities were adjusted to achieve the final version.

For questionnaires not containing answers on all items, the CFSS-DS score was calculated as the mean of the items answered multiplied by 15. Questionnaires with more than 4 missing CFSS-DS items were excluded from the analysis.

Measurement of behavior management problems

It is common practice in Danish dental care for children to make a note in the dental record if the child shows any problems cooperating during the dental appointment. At the end of the questionnaire, the parents are requested to consent to our obtaining data on behavior management problems from their child's dental records. Data since the first dental treatment session, including dental fillings or extractions, were obtained. Behavior management problems noted in the child's dental records were: 1) report of pain felt during treatment, 2) insufficient fillings due to lack of cooperation, 3) expression of anxiety during treatment, 4) dental treatment under compulsion, 5) verbal or physical protest from the child during treatment, and 6) cessation of treatment due to lack of cooperation from the child.

Analysis of non-response

A comparison between non-respondents and respondents was performed with respect to age, gender, and municipality. In addition, as part of the administrative routines in 2 of the municipalities, dental caries (deft), number of appointments, and number of treatment sessions in the total population of the 3 age groups were monitored. The mean of these variables in the group of non-respondents was computed by subtracting the total values in the respondent group from the total number in the population group, and then dividing by the number of children in the non-respondents group.

Statistical analysis

Data were entered in EpiData and analysed in SPSS (version 10.0). As dental anxiety is measured on a rank sum scale and does not follow a normal distribution, histograms, medians, and quartiles were used to describe the data. Cronbach's Alpha was calculated in order to determine the internal reliability. In order to compare with previous studies, we also reported mean and standard deviations of CFSS-DS scores. The prevalence of dental anxiety was estimated as the proportion of children with CFSS-DS $\geq$38, along with 95% confidence intervals. The prevalence of behavior management problems was estimated as the proportion of children with a history of one or more behavior management problem reported

Table 1. Distribution of respondents and non-respondents according to age, gender, and municipality

Parameter	Respondents *n*	Non-respondents *n* (%)
6 years	416	127 (23.4)
7 years	438	129 (22.8)
8 years	436	120 (21.6)
Girl	620	160 (20.5)
Boy	670	216 (24.4)
Municipality 1	248	73 (22.7)
Municipality 2	428	120 (21.9)
Municipality 3	299	98 (24.7)
Municipality 4	315	85 (21.3)

since their first dental treatment visit, along with 95% confidence limits.

Results

Description of the study population

The parents of 1493 children returned the questionnaire. Participation was denied by 203, and 9 questionnaires were incomplete. A total of 1281 questionnaires (76.9%) were therefore included in the analysis. Full information (i.e. questionnaire data and consent of access to the child's dental records) was obtained from 1235 children (74.1%).

Analysis of non-response

Comparisons between respondents and non-respondents reflected no differences between the respondents and non-respondents in relation to age, gender, and municipality (Table 1). The mean numbers of appointments, missed appointments, and deft were lower among respondents than non-respondents in the two municipalities where comparisons of these variables were possible (Table 2).

Dental anxiety and CFSS-DS score

The overall prevalence of dental anxiety was 5.7%. The overall median CFSS-DS score was 22 (range 15–64, 1st quartile 19; 3rd quartile 27), and the overall mean value of the CFSS-DS score was 23.8. Cronbach's Alpha was 0.85. Fig. 1 shows the distribution of CFSS-DS scores. CFSS-DS score according to age and gender is given in Table 3. The prevalence of dental anxiety in children aged 6 years was 7.0%, in children aged 7 years 5.7%, and in children aged 8 years 4.4%. The lowest prevalence of dental anxiety was 3.6% in girls aged 7 years; the highest was 8.7% in girls aged 6 years. Among the 1235 children with data from both questionnaire and dental records, the prevalence of dental anxiety was 5.5% (95% CI: 4.0%–7.5%) in children who had never had dental treatment, and 5.2% (95% CI: 3.6%–7.3%) in children who had had dental treatment. In children who had never had dental treatment, the median CFSS-DS score was 22 (1st quartile 19; 3rd quartile 28), (mean 24.2; *s* 7.1). In children who had had dental treatment, the median CFSS-DS score was 22 (1st quartile 18; 3rd quartile 26) (mean 23.4; *s* 6.8).

The mean scores for each of the 15 items are given in Table 4. "Injections" had the highest rank, with 41.6% of the children answering "a fair amount" (score 3), "pretty

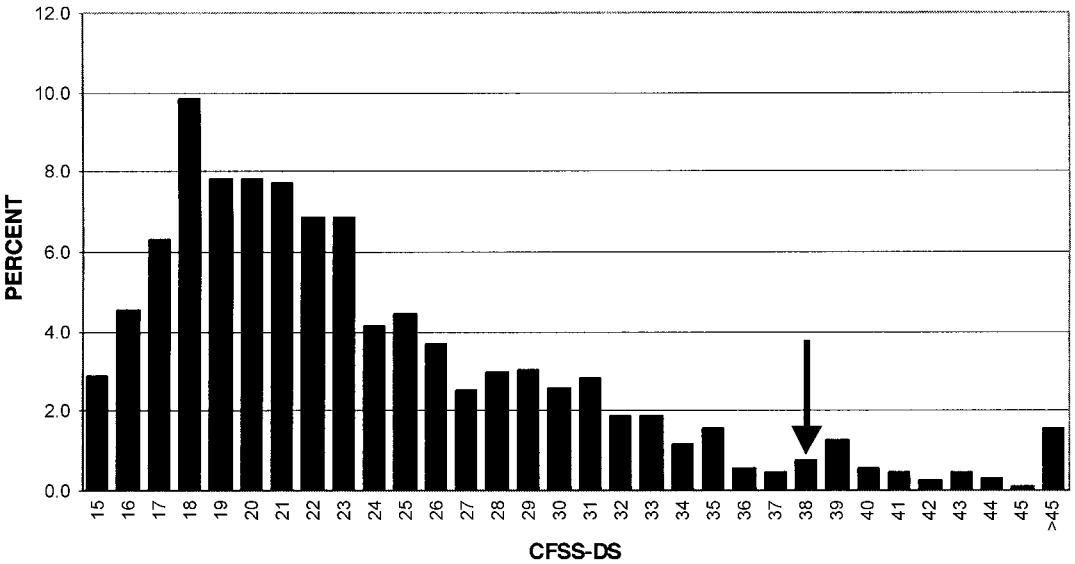

Fig. 1. Distribution of all children according to the CFSS-DS score. The arrow indicates the cut-off point of 38 used in the present study.

Table 2. Number of subjects, mean values of deft, number of appointments, number of missed appointments, and number of treatment sessions in respondents and non-respondents in two of the municipalities

	n	Deft	No. of appointments	No. of missed appointments	No. of treatment sessions
Municipality 1					
Respondents	248	2.0	12.9	0.8	2.2
Non-respondents	73	6.0	13.4	1.7	1.7
Municipality 2					
Respondents	428	3.6	13.1	0.9	1.9
Non-respondents	120	7.2	14.0	2.3	1.9

much afraid" (score 4), or "very afraid" (score 5). The item scoring next highest was "having a tooth drilled", followed by "choking" and "have to go to hospital".

Behavior management problems

Of the 1235 children with data from both questionnaire and dental records, we identified 584 who had had dental treatment. Of those, 37.2% (95% CI: 33.3%–41.1%) had a history of dental behavior management problems. As indicated in Table 5, more than 3 out of 4 children with the highest CFSS-DS (i.e. $\geq$38) had a history of behavior management problems during their treatment sessions, compared to 1 out of 4 in the group with the lowest CFSS-DS.

Discussion

Statement of the principal findings

Data on the CFSS-DS in a young Danish population were reported. The prevalence of dental anxiety was 5.7%, and the median score on the CFSS-DS was 22. The proportion of children with a history of behavior management problems in dental treatment situations was 37.2%.

Selection bias

In this study, data from a public population-based dental service system were used in order to obtain representative prevalence estimates.

Analysis of the non-response showed a higher number of missed appointments in this group, indicating that the study population is not fully representative. Considering the well-known relation between avoidance of dental visits and dental anxiety (1), this prevalence estimate is probably too low.

Our study is limited to four municipalities in one county of Denmark, and is not a representative sample of all Danish children. On the other hand, the population of Denmark is fairly homogeneous, and the structure and organization of child dental services in the country is based on national guidelines.

Information bias

Since the parents answered the CFSS-DS questions on

Table 3. Descriptive statistics of the CFSS-DS scores according to age and gender

Age and gender		No.	Median	1st quartile	3rd quartile	Mean	*s*	Proportion of subjects with CFSS-DS $\geq$38(%)	CI (95%)
6 years	Boys	204	23	19	28	24.4	7.3	5.4	(3.0–9.4)
	Girls	208	23	19	29	25.0	7.6	8.7	(5.5–13.3)
	Total	412	23	19	29	24.7	7.4	7.0	(4.9–9.9)
7 years	Boys	241	22	18	27	23.9	7.8	7.5	(4.8–11.5)
	Girls	196	22	19	28	24.0	6.5	3.6	(1.7–7.2)
	Total	437	22	19	28	24.0	7.3	5.7	(3.9–8.3)
8 years	Boys	220	21	18	26	23.0	6.3	4.1	(2.2–7.6)
	Girls	212	21	18	25	22.8	6.6	4.7	(2.6–8.5)
	Total	432	21	18	25	22.9	6.5	4.4	(2.8–6.8)
Total	Boys	665	22	18	27	23.8	7.2	5.7	(4.2–7.7)
	Girls	616	22	19	27	23.9	7.0	5.7	(4.1–7.8)
	Total	1281	22	19	27	23.8	7.1	5.7	(4.6–7.1)

s = standard deviation.

Table 4. Proportion (%) and rank of items (combined responses "a fair amount", "pretty much afraid", and "very afraid") included in the CFSS-DS scale

Question	% answering "a fair amount", "pretty much afraid", or "very afraid"	Rank
Injections (shots)	41.6	1
Choking	31.2	2
The dentist drilling	31.1	3
Having to go to hospital	28.9	4
The noise of the dentist drilling	9.3	5
Having somebody put instruments in your mouth	7.6	6
The sight of the dentist drilling	6.5	7
Having a stranger touch you	4.5	8
Having the nurse clean your mouth	4.4	9
People in white uniforms	4.3	10
Dentists	3.7	11
Doctors	3.4	12
Having somebody examine your mouth	2.7	13
Having somebody look at you	2.0	14
Having to open your mouth	1.8	15

behalf of their child, the parents' own anxiety could be a source of information bias. On the other hand, Klingberg et al. showed that answers on child dental anxiety from the children themselves were closely related to their parents' answers on the CFSS-DS scale (18).

Data on behavior management problems were collected from the public dental records. Since the dentists themselves handwrite the dental records, it is likely that, in order to save time, the less manifest behavior management problems might be underreported. Furthermore, there might be individual differences between dentists and municipalities in the way behavior management problems are reported.

In this cross-sectional study, it is not possible to point to a causal relation, but we found a relation between dental anxiety measured by the CFSS-DS scale and behavior management problems during dental treatment. Although it was not intended to validate the CFSS-DS scale, these findings support the findings of others who confirmed the validity of the CFSS-DS (8, 19). Not all anxious children showed uncooperative behavior. This may have been because the parents' answers had been influenced by their own anxiety, or because some children were too shy to express their anxiety. Furthermore, underreporting behavior management problems might influence the association. Some children showed uncooperative behavior, although scoring low on the CFSS-DS scale. This might be because data on behavior in dental management situations were collected during a longer period, and behavior problems in young children reflected the child's inability to lie still in the dental chair during the dental treatment session.

Table 5. Distribution of children with a history of behavior management problems during dental treatment according to CFSS-DS score

CFSS-DS score	Behavior management problems		Total
	Yes (%)	No (%)	
15–21	74 (25.8)	213 (74.2)	287
22–30	91 (42.1)	125 (57.9)	216
31–37	29 (56.9)	22 (43.1)	51
$\geq$ 37	23 (76.7)	7 (23.3)	30

Comparisons with other studies

The overall mean CFSS-DS score correlates well with the findings from Sweden, The Netherlands, and Finland (4, 11, 20), but not with the findings from American and Asian countries, where higher mean scores were found (17, 21–23). Different ways of organizing child dental health care systems, cultural differences, and choice of study populations might explain the higher dental anxiety levels found in Asian and American populations.

The ranking of the 15 items in the CFSS scale in this study is similar to the ranking in the study from Sweden (4), while Cuthbert et al. (17) and Chellappah et al. (21) found "choking" having the highest rank. These differences might also be due to cultural differences.

No gender differences in anxiety levels were found. Klingberg et al. (4) found higher anxiety levels in boys, in contrast to others who found that girls had higher anxiety levels (9, 11, 20, 21). Although no significant differences were found in this study between the non-respondents and the respondents according to gender (Table 1), the inclusion of the non-respondents might reveal a gender difference. Also inclusion of a wider age range in this study might have shown gender differences, as Holst et al. found no gender difference until the age of 13, after which a lower acceptance of dental treatment was found in girls, indicating girls being more dentally anxious when reaching adolescence (24).

In accordance with Klingberg et al. (4) and Cuthbert et al. (17), this study showed a higher level of dental anxiety in the youngest age group. This is most probably due to an age effect, but a cohort effect or a time effect cannot be excluded. ten Berge et al. did not find this association (11). Klingberg et al. and ten Berge et al. included a wider age range in their studies, which is to be preferred when studying the correlation between age and anxiety. Dental treatment should also be taken into consideration as a confounder.

The findings of similar CFSS-DS scores in children between those who have experienced dental treatments and those who have not can possibly be understood by means of "the latent inhibition" theory, which means that going through a pain-free dental treatment prevents development of dental anxiety. Findings from previous studies support this theory (1, 12, 25, 26).

The data on behavior management problems were collected as a history of behavior management problems and therefore our prevalence cannot be compared with other reports.

Conclusion

This study found a prevalence of dental anxiety of the same magnitude as that found in previous studies from Scandinavian countries, and confirmed the relation between dental anxiety and behavior management problems found by others.

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