

ORIGINAL ARTICLE

## Associations between dental anxiety, dental treatment due to toothache, and missed dental appointments among six to eight-year-old Danish children: a cross-sectional study

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### Abstract

The aims of this study were to estimate the prevalence of missed dental appointments among Danish children at 6 to 8 years of age and to examine the association between dental anxiety, dental treatment due to toothache, and missed dental appointments in a population-based cross-sectional study. The study was conducted in four municipalities in the County of North Jutland, Denmark, and included a total of 1235 children (response rate 74.1%). Data on missed dental appointments and toothache were obtained from dental records, and data on dental anxiety from the Children's Fear Survey Schedule–Dental Subscale. Overall, 37.7% of children missed one or more dental appointments, while 17.7% missed two or more appointments. These proportions did not differ by age or gender. Among children with dental anxiety, the adjusted OR for an association with two or more missed dental appointments was 1.32 (95% CI: 0.72–2.40), and among children who had dental treatment due to toothache, the adjusted OR of two or more missed dental appointments was 2.61 (95% CI: 1.63–4.18).

**Key Words:** Broken dental appointments, children, population-based, prevalence, toothache

### Introduction

A common event in child dental care is the breaking of scheduled appointments without previous cancellation [1]. Apart from the economic and organizational drawbacks, missed dental appointments may compromise the oral health of the children.

In one study it was found that 16% of 4 to 11-year-old Swedish children broke dental appointments during the course of a year [1], and in two other investigations between 47% and 53% of the children and adolescents missed dental appointments during periods of 6 to 9 years [2,3].

Studies of risk factors have shown that avoidance of dental care among adults is often a result of dental anxiety and dental phobia [4]. One study has shown that missed dental appointments are associated with dental anxiety among adolescents as well [5]. However, among 110 Danish adolescents with missed dental appointments during the preceding 18 months, the level of self-reported dental anxiety—measured

using Corah's Dental Anxiety Scale—did not differ from the level among the controls [6]. Moreover, it has been shown that behavior management problems [1], self-reported painful dental experiences [5], and high caries experience are associated with missed dental appointments [2,6].

Despite the well-developed Danish child dental care system, which is free for all children younger than 18 years, the prevalence and the distribution of missed dental appointments have never been examined. Furthermore, apart from the study by Klingberg et al. [1], we are not aware of any studies on factors associated with the prevalence of missed dental appointments among young children who, in contrast to adolescents, are escorted to dental care by their parents. Previously, it has been found that dental anxiety and toothache are associated [7]. Because of the known association between dental anxiety and missed dental appointments [5], an association between toothache and missed dental appointments can be suspected, but this has never been examined.

We therefore examined the prevalence of missed dental appointments and the association between dental anxiety, dental treatment due to toothache, and missed dental appointments among young Danish children.

## Methods

For this analysis, we used data from a cross-sectional study of the prevalence of dental anxiety among Danish children between the ages of 6 and 8 years [8]. In Denmark, the municipalities manage the public dental service for children; it is tax-supported and free for all children up to 18 years of age, with a utilization rate of almost 100%. The public administration of 4 municipalities in the County of North Jutland, Denmark, provided a list of all 1707 children aged 6 to 8 years enrolled in the municipal dental service as of 1 August 2001. The parents of the eligible children participated in the study by filling out a questionnaire containing questions on dental anxiety. At completion of the questionnaire, we asked the parents for consent to access data from their child's dental record. Of the 1707 children, 41 were excluded (those who were orphans or children of dentists who did not use the municipal dental-care system regularly; those who had language problems, protected mail-address or abnormal psychological development; and those who had emigrated). The Danish Data Protection Agency and the Regional Ethical Research Committee approved the project.

Data on missed dental appointments were obtained from the dental records from the date the child was first seen in the dental service, usually between two and three years of age. In two of the municipalities the administrative routine included monitoring the number of missed dental appointments. We were therefore able to compare the prevalence of missed dental appointments in the response group with that in the non-response group.

Dental anxiety was measured by having parents answer the questions contained in the validated Children's Fear Survey Schedule-Dental Subscale (CFSS-DS) [9] and we defined dental anxiety as a CFSS-DS score of 38 or more. Data on age, gender, and toothache were obtained from the dental records. We defined toothache episodes as one or more treatment session in connection with toothache starting from the date the child was first seen in the dental service.

## Statistical methods

Data were analysed in Stata, version 8 (STATA, Tx., USA). We examined the association between dental anxiety and dental treatment due to toothache and missed dental appointments by obtaining contingency tables from which we calculated the prevalence ORs with 95% CI [10]. We made separate analyses for two outcomes: (i) one or more missed dental appointments, and (ii) two or more missed dental appointments. Next we performed two separate logistic regression analyses using the same two outcomes to estimate the association between missed dental appointments and dental treatment due to toothache and dental anxiety. In the logistic regression analyses we also adjusted for age and gender.

## Results

A total of 1235 parents (response rate 74.1%) responded to the questionnaire and gave consent to our obtaining data from their child's dental records. The number of appointments totalled 15,140 during the years the children had attended the municipal dental service. A total of 1013 (6.7%) of all appointments were missed without previous cancellation. Overall, 37.7% (95% CI: 35.0–40.4%) of children had one or more missed dental appointments (Table I). The 72 children (5.8%) with 4 or more missed dental

Table I. Distribution of children (proportion with 95% CI) according to age, gender, and number of missed dental appointments

		No. of missed appointments					Total N
		0	1	2	3	≥4	
Age	6 years	63.5% (58.7%–68.1%)	20.8% (17.1%–25.0%)	8.3% (5.9%–11.4%)	2.2% (1.2%–4.2%)	5.2% (3.5%–7.9%)	400
	7 years	60.8% (56.1%–65.4%)	19.2% (15.8%–23.3%)	10.2% (7.7%–13.5%)	4.5% (2.9%–6.9%)	5.2% (3.5%–7.8%)	421
	8 years	62.8% (58.0%–67.3%)	19.8% (16.3%–23.9%)	6.8% (4.7%–9.6%)	3.6% (2.2%–5.9%)	7.0% (4.9%–9.9%)	414
Gender	Boys	61.6% (57.8%–65.3%)	20.1% (17.2%–23.4%)	8.7% (6.8%–11.2%)	3.4% (2.3%–5.1%)	6.1% (4.5%–8.2%)	641
	Girls	63.1% (59.2%–66.9%)	19.7% (16.7%–23.1%)	8.1% (6.1%–10.6%)	3.5% (2.3%–5.3%)	5.6% (4.0%–7.7%)	594
Total <sup>1</sup>		62.3% (59.6%–65.0%)	19.9% (17.8%–22.2%)	8.4% (7.0%–10.1%)	3.5% (2.6%–4.7%)	5.8% (4.7%–7.3%)	1235
Non-respondents <sup>2</sup>		43.7% (37.0%–50.7%)	19.6% (14.7%–25.7%)	12.6% (8.7%–17.9%)	7.5% (4.6%–12.1%)	16.6% (12.1%–22.4%)	199

<sup>1</sup> Among the respondents.

<sup>2</sup> Among the non-respondents with administrative information on missed dental appointments.

Table II. Odds ratios (OR) for the association between one or more or two or more missed dental appointments in relation to dental treatment due to toothache and dental anxiety

		One or more missed dental appointments				Two or more missed dental appointments			
		Yes	No	Crude OR (95% CI)	Adjusted OR* (95% CI)	Yes	No	Crude OR (95% CI)	Adjusted OR* (95% CI)
Toothache	Yes	49	40	2.15 (1.39–3.32)	2.09 (1.35–3.24)	31	58	2.72 (1.71–4.33)	2.61 (1.63–4.18)
	No	416	730			188	958		
Dental anxiety	Yes	30	36	1.41 (0.85–2.32)	1.28 (0.77–2.12)	16	50	1.52 (0.85–2.73)	1.32 (0.72–2.40)
	No	435	734			203	966		

\* Also adjusted for the effect of age and gender.

appointments were responsible for 42.4% of the 1013 missed appointments. The proportion of children with one or more missed dental appointments did not differ by age or gender (Table I). In the two municipalities where examination of the non-respondents was possible, the proportion of children who had at least one missed dental appointment was 56.3% (95% CI: 49.3–63.0%) and the proportion of children with 4 or more missed dental appointments exceeded that among respondents. Dental treatment due to toothache was associated with missed appointments, the more so among children with two or more missed appointments (Table II). The association with dental anxiety was weaker, as the adjusted OR for the association between dental anxiety and (i) one or more missed dental appointments was 1.28 (95% CI: 0.77–2.12) and (ii) two or more missed dental appointments was 1.32 (95% CI: 0.72–2.40).

## Discussion

In this population-based study, we found that missed dental appointments were common among young Danish children. The prevalence of missed dental appointments was not related to age, a finding indicating that breaking of dental appointments is behavior that starts early in life. Furthermore, we found that dental treatment due to toothache was related to missed dental appointments.

The main weakness of our study is the cross-sectional design, which limits our ability to establish the proper temporal relation between dental treatment episodes due to toothache, dental anxiety, and missed dental appointments. The prevalence of missed dental appointments and the proportion of children with multiple missed dental appointments were higher among non-respondents than among those who participated in the study. As a result, it is likely that the prevalence of missed dental appointments in our study is underestimated. Similarly, the children with missed dental appointments in the non-respondents group might have more dental anxiety and toothache, and in that case we would also underestimate the ORs between missed dental appointments and dental anxiety

or toothache. The validity of our data on toothache and missed dental appointments is probably high, as they were collected from dental records, and both events are routinely recorded in the records of the public dental service. Previous studies have shown that parental reporting of dental anxiety by means of the CFSS-DS questionnaire is in agreement with dentists' ratings of dental anxiety [11,12].

The prevalence estimates in our study cannot be compared directly with the findings reported by Klingberg et al. [1] because of the different observation periods used. The prevalence of missed dental appointments observed by Skaret et al. [2] and Blomqvist et al. [3] was higher than in our investigation, probably because of cultural differences. According to common practice in the 4 municipalities, children below 10 years are accompanied by their parents to dental examination and dental treatment and the Danish dental service for children does not meet missed dental appointments with sanctions such as penalty or exclusion. The higher age of the subjects studied by Skaret et al. could be part of the explanation. Blomqvist et al. obtained data in Stockholm. In larger Danish cities, probably a higher prevalence of missed dental appointments could be expected.

Our observation of a higher prevalence of missed dental appointments among children with dental anxiety concurs with the findings of Klingberg et al. and Skaret et al. [1,5], but in our study this association was weak. Most of the children in those two studies were older than the children in our investigation, and our children were accompanied by parents to the dental clinic. Perhaps the decision to avoid dental care among older children is less dependent on parental influence and more influenced by factors such as anxiety. Thus Kleiman found that anxious adults were more likely than anxious children to avoid dental care [13]. On the other hand, the Danish study, which included adolescents, found no association between dental anxiety and missed dental appointments [6].

Skaret et al. found that self-reported painful previous dental experiences were related to missed dental appointments [5]. Our study showed a higher prevalence of missed dental appointments among children

who had had dental treatment in connection with toothache. By assuming that dental treatment in connection with toothache is often painful, our findings support those of Skaret et al. Previous studies have shown an association between experience of toothache and dental anxiety [8,14] and our findings suggest that painful dental experiences, dental anxiety, and missed dental appointments among some children may lead to the establishment of a vicious circle.

This study showed that missed dental appointments are a common problem and that children with missed dental appointments combined with dental anxiety and toothache should probably be regarded as a high-risk group in child dental care.

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