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Dental fear and anxiety and oral health behaviour in 12- to 14-year-olds born preterm

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Background. An enhanced frequency of cognitive and behavioural disturbances has been reported in preterm children. It is not known if this affects their perceptions of or behaviour in the dental care situation.

Hypothesis. The hypotheses were that preterm (PT) children aged 12–14 years more often exhibit dental fear and anxiety (DFA) than full-term controls (C), while no differences were expected regarding oral health behaviour.

Methods. One hundred and nine PT and 108 C children took part in the present questionnaire study. DFA was assessed using the Children's Fear Survey Schedule – Dental Subscale (CFSS-DS). In addition the questionnaire covered items including satisfaction with received dental care, oral health behaviour and medical health.

Results. The children's CFSS-DS scores revealed no differences between the PT and C groups. Regarding oral health behaviour there were no differences, except that PT children more often used dental floss and extra fluoride supplements. PT children reported more medical health problems than C children.

Conclusions. Preterm (PT) children 12- to 14-years-old, as well as C of same age group, seem to be satisfied with their dental care and display low prevalence of DFA. Still, a higher frequency of medical health problems in the PT children suggests that these children should be regarded as potential risk patients for oral health problems.

Introduction

The survival rate of children born preterm (PT) has increased in recent decades owing to improved intensive medical care[1]. Today, the majority of these children survive without major impairments. However, this has led to increased concern about the long-term outcome of their development and functioning. It is well established that PT children have an increased risk of developing cognitive and behavioural disturbances[2,3] including learning deficits[4,5] which influence both school and later academic achievements[6]. With their reported lower IQ and perceptual abilities[7,8] there is a risk that PT children will be exposed to too high demands[7], often persisting into adult life[6,9]. When children face too high demands they react with difficulties in focusing, hyperactivity and problems with analysing and responding to different situations. The dental situation is one example, where demands and expectations do not always agree with the child's capacity and maturity and in a study based on dental records (and thus the dentists' judgements)[10] it was shown that the PT children showed more dental behavioural management problems (BMP) than full-term controls during the preschool period. A follow up of the same group of children but with parents as informants confirmed these results for the preschool period[11]. The difference in BMP, however, decreased with increasing age with no statistically significant differences in the early school years, possibly reflecting a catch up effect. Still, the parents of the PT children reported more medical problems, more problems at school and greater need for extra

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teachers' support during the early school years. No significant differences in oral health behaviour (dietary and toothbrushing habits) were disclosed between the PT and full-term children.

According to Klingberg and Broberg[12] dental fear (DF) is a normal emotional reaction to one or more specific threatening stimuli in the dental situation. Dental anxiety (DA) denotes a state of apprehension that something dreadful is going to happen in relation to dental treatment and it is coupled with a sense of losing control. The term dental fear and anxiety (DFA) combines these entities[12]. In a systematic review, Klingberg *et al.*[12] reported that a pooled prevalence of DFA approximates 9% in children and adolescents. The prevalence figures for DFA, however, varied from 6% to 20% in the 12 studies from different countries included.

Dental fear and anxiety (DFA) is related to temperamental factors such as shyness and negative emotionality[12], characteristics also reported in preterm children[4,13]. For this reason, and in light of possible negative experiences of dental BMP earlier in life, it is likely that PT children have an increased risk of developing DFA, but there is not sufficient research in this area. In our previous studies we assessed the prevalence of dental BMP in preterm children from the perspective of dental care professionals and the parents[10,11]. However, the patient's own experience of the dental care, for example as expressed in terms of self-reported DFA, would also be relevant to assess, especially since agreement is not automatically to be expected between informants with regard to perception of dental experiences and level of dental anxiety[14]. Thus in the present study the prevalence and level of DFA and factors related to oral health were investigated in a group of 12- to 14-year-old children born PT and in full-term controls (C).

The following hypotheses were tested:

- 12- to 14-year-old children born preterm present higher levels of DFA than full-term controls;
- there is no differences in oral health behaviour between PT children and C.

Materials and methods

Subjects

The groups of participants consisted of PT children and matched C who had participated in two previous studies based on dental records[10] and parental interviews[11], respectively. The PT children were born ≤32 weeks of gestation between 1994 and 1996 in the catchment area of the University hospitals of Lund and Malmö in southern Sweden and for each PT child a control child, born full-term and matched for age, sex, ethnicity, dental clinic and dentist, was identified. The original study groups have been described elsewhere in detail[10,11]. In 2008, when the present study was carried out, the children had reached the ages of 12–14 years. The study was of cross-sectional design and approved by the Regional Ethical Review Board of Lund University.

The present target groups consisted of 154 PT and 154 C children whose parents had agreed to participate in our previous interview study. The PT group comprised 117 very PT children (VPT, born between 29 and 32 weeks of gestation[15,16]) and 37 extremely PT children (EPT, born between 23 and 28 weeks of gestation[15,16]). A letter with information about the aim of the study was sent by post to the parents and youngsters, including information about confidential and voluntary participation with the right to discontinue participation at any time. A written informed consent form was enclosed along with the questionnaires, instructions about how the adolescents should fill out the questionnaire and a stamped addressed envelope. A reminder with the same information and questionnaire was sent to those who did not respond within 3 weeks. An additional reminder with the same information was sent after another 3 weeks. After that, no further attempt was made to reach the families.

Questionnaires

The questionnaire was designed to be answered by the youngsters and took about 30 min to fill in. It was divided and structured into five

parts. The head items in the questionnaires are shown in Table 1. The first part included the Swedish version of Children's Fear Survey Schedule – Dental Subscale (CFSS-DS)[17,18] to measure the level of DFA. CFSS-DS is a self or parental report of a 15-item questionnaire. Each item is scored on a 5-grade scale from 1 (not afraid) to 5 (very afraid). Total scores range from 15 to 75, and children with a score ≥38 were categorized as having DFA according to Klingberg[18]. This part also included a question regarding satisfaction with their dental care, rated in four levels (very good, good, bad, very bad).

Part two covered items concerning oral health behaviour[19–21]. Dietary habits were covered by questions about frequencies of intake of food or beverages per day and questions about the frequency of eating sweets, crackers, buns, crisps/chips or soft drinks (nondiet). Other questions were frequency of toothbrushing and use of fluoridated toothpaste, extra fluoride supplements, dental floss or electric toothbrush and gingival condition (bleeding gingiva when brushing).

The third part of the questionnaire dealt with perceived frequency of oral health problems, such as the occurrence of tooth/mouth pain and eating disturbances. The questions were answered using a Likert scale with answers from 1 (never) to 5 (always).

Part four covered general items including chronic illness, general health problems and daily medication. Regarding chronic illness, the following definition according to Westbom and Kornfält[22] was used: (i) a disorder which is disabling and obviously chronic or incurable; or (ii) a disorder of at least 3 months during a 1-year period and interfering with daily life functioning and/or needing treatment or special aids during at least 3 months; or (iii) a disorder requiring hospitalization for at least 1 month or at least three periods during a 1-year period. General health problems were defined as having medical problems but of lesser severity or duration, e.g., allergies or minor respiratory disorders.

Part five consisted of questions about the school situation, frequency of free time activities and peer relationships. The questions were modified from Rise *et al.*[23]. The item of school situation was scored as very good, good, bad or very bad. The frequency of free time activities and peer relationships were scored as 0 times/week, once a week, 2–3 times/week, or ≥4 times/week.

Table 1. Items covered in the questionnaire.

Items
Dental fear and anxiety (DFA)
Children's Fear Survey Schedule-Dental Subscale (CFSS-DS)
Satisfaction with dental care
Oral health behaviours
Food and beverages
Sweets
Soft drinks
Toothbrushing habits
Dental floss
Fluoridated toothpaste
Extra fluoride supplements
Electric toothbrush
Oral health
Gingival condition
Tooth/mouth pain
Difficulty chewing foods
Medical health
Chronic illness
General health problems
Medication
School situation and social activities
School situation
Peer relationships
Free time activities

Statistical methods

The chi-square test was used for comparisons between the PT and C groups of total number of respondents, as well as for comparisons between sexes, between twins/triplets and singletons (within the PT and C groups, respectively) and between the VPT and EPT groups. McNemar's test was used for matched pair comparisons. Further, to test differences between the groups regarding CFSS-DS, variables of school situation, pain in teeth/mouth and difficulty chewing foods, the Mann–Whitney test was used for comparisons between the groups for all respondents and the Sign test for matched pair observations. For participant *versus* nonparticipant analysis, the chi-square test was used to study differences in immigrant background and maternal educational level, based on information from

the early school years (parental interview[11]) and dental BMP, based on information from the preschool period (dental records[10]). In addition, Student's *t*-test was used for analysis of differences in caries prevalence (dft) at the age of 6 years. The Statistical Package for the Social Sciences (SPSS), v. 13.0 and 16.0 was used for all analyses.

Results

Of the eligible 154 PT children, 109 (71%) agreed to participate. Eighty-two children satisfied the criteria for VPT and 27 for EPT. Of the 154 C children, 108 (70%) agreed to participate. Seventy-six matched pairs were available for paired analyses. Table 2 provides the characteristics of the study population. Participant *versus* nonparticipant analysis of the C group revealed no statistically significant differences in mother's educational level, immigrant background, dental BMP during the preschool period or dental caries at the age of 6 years. In the PT group no statistically significant differences were noted in mother's educational level or immigrant background, although immigrant children were somewhat over-represented among the nonparticipants. No statistically significant differences in dental BMP were found between participants and nonparticipants in the PT group. However, the nonparticipants in the PT group had had statistically significantly more dental caries (dft) at the age of 6 years than the participants.

In the comparisons between the groups of PT children and C children, the analyses including all participants (considering PT and C group as independent samples) showed comparable results as the matched pair analyses. Subsequently, only results based on analyses including all participants are presented as these comprised more individuals.

Dental fear and anxiety (DFA) (CFSS-DS score) and satisfaction with dental care

Comparisons of CFSS-DS score revealed no differences between the PT and C children (Table 3). Three percent of PT children and 2% of C children were classified having DFA (CFSS-DS score ≥38). Fig. 1 shows the distribution of CFSS-DS scores for PT and C children. There were no significant differences between the sexes within the PT and C groups, between VPT and EPT children or between twins/triplets and singletons within the PT group.

Both PT and C children reported high levels of satisfaction with dental care; 96% *vs* 97% classified their dental care as very good or good.

Table 2. Characteristics of the participating children. Preterm (PT) children divided into subgroups of VPT and EPT.

	PT children			
	Total	**VPT**	**EPT**	**C children**
	***n* = 109**	***n* = 82**	***n* = 27**	***n* = 108**
Sex				
Boys	59 (54%)	42 (51%)	17 (63%)	53 (49%)
Girls	50 (46%)	40 (49%)	10 (37%)	55 (51%)
Twins or triplets	30 (27.5%)	28 (34%)	2 (7.4%)	1 (0.5%)
Immigrant background				
Nordic	93 (85%)	73 (89%)	20 (74%)	91 (84%)
Immigrant	16 (15%)	9 (11%)	7 (26%)	17 (16%)
Mean gestational age in weeks (range)	29.6 (24–32)	30.7 (29–32)	26.5 (24–28)	≥37 ≥37
Mean birth weight in grams (range)	1436 615–2430	1603 840–2430	929.3 615–1390	3509 2590–4400

Table 3. Mean and SD and median value of CFSS-DS, tooth/mouth pain and difficulty chewing foods and proportion of children satisfied with their dental care in PT and C children.

	PT children	**C children**	
	***n* = 109**	***n* = 108**	**Significance**
CFSS			
Mean	21.89	21.57	*P* = 0.820*
SD	6.37	5.97	
Median	20.40	20.00	
Tooth/mouth pain			
Mean	1.468	1.407	*P* = 0.498*
SD	0.69	0.66	
Median	1.00	1.00	
Difficulty chewing foods			
Mean	1.404	1.343	*P* = 0.601*
SD	0.73	0.67	
Median	1.00	1.00	
Satisfaction with the dental care	105 (96%)	105 (97%)	*P* = 0.710**

*Mann–Whitney test; **Chi-square test.

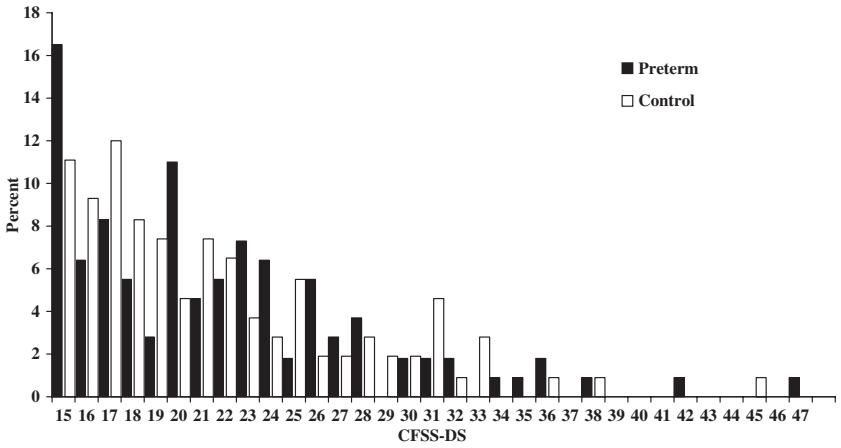

Fig. 1. Distribution of dental fear scores (CFSS-DS) in PT and C children.

Oral health behaviour and perceived oral health

Table 4 presents oral health behaviour in PT and C children. There were no statistically significant differences between the groups regarding toothbrushing habits, use of fluoridated toothpaste or use of electric toothbrush. Significantly more PT children reported daily use of dental floss and use of extra fluoride supplements. Further, there were no statistically significant differences between EPT and VPT children regarding any of these habits. In the PT group use of dental floss was more common in twins/triplets than singletons ($P = 0.002$), as was daily use of electric toothbrush ($P = 0.036$). Full-term girls reported more frequent use of dental floss than boys ($P = 0.045$).

Concerning dietary habits 51 (47%) of the PT children reported intake of food and drinks ≥5 times/day, as compared with 46 (43%) for the C children. Twenty (18%) PT children and 26 (24%) C children reported snacking (sweets, crackers, etc.) between meals ≥3 days/week. The differences were not statistically significant. Further, no differences in intake of nondiet soda, sweetened juices or other sugar containing drinks between meals were noted.

Items in the questionnaire concerning perceived oral health, such as bleeding gingiva when brushing teeth, tooth/mouth pain and difficulty chewing foods, revealed no differences between PT and C children (Tables 3 and 4).

Table 4. Oral health behaviours in PT and C children (chi-square test).

	PT children	C children	
	***n* = 109**	***n* = 108**	**Significance**
Always brushes teeth in the evening	95 (87%)	89 (82%)	$P = 0.330$
Always brushes teeth in the morning	92 (84%)	84 (78%)	$P = 0.213$
Always uses fluoridated toothpaste	100 (92%)	92 (85%)	$P = 0.130$
Extra fluoride supplements every day	16 (15%)	7 (6.5%)	$P = 0.050$
Use of dental floss every day	13 (12%)	4 (4%)	$P = 0.024$
Bleeding gingiva every day	2 (2%)	2 (2%)	$P = 0.993$
Electric toothbrush every day	15 (14%)	18 (17%)	$P = 0.220$

Medical health

The medical health of the PT and C children is presented in Table 5. Chronic illness, general health problems and daily medication were more frequently reported by PT children than C children. For general health problems the difference was statistically significant ($P = 0.047$). Only minor and nonsignificant differences were revealed between VPT and EPT children or between twins/triplets and singletons within the PT group. Boys reported more chronic illness, general health problems and daily medication than girls in both the PT and C groups and general health

Table 5. Medical health in PT and C children (chi-square test).

	PT children	C children	
	***n* = 109**	***n* = 108**	**Significance**
Chronic illness	11 (10%)	4 (4%)	$P = 0.064$
General health problems	34 (31%)	21 (19%)	$P = 0.047$
Daily medication	14 (13%)	7 (6.5%)	$P = 0.113$

problems were significantly more common in PT boys than in PT girls (61% *vs* 38%; $P = 0.017$). Daily medication was significantly more common in full-term boys than in full-term girls (11% *vs* 2%; $P = 0.045$).

School situation

No differences between PT and C children were found regarding school situation or frequency of peer relationships (Table 6). However, PT children reported statistically significantly fewer free time activities than full-term controls ($P = 0.021$). Comparisons between VPT and EPT children or between twins/triplets and singletons within the PT group revealed no statistically significant differences. The same also applied for comparisons between the sexes within the PT and C groups respectively.

Discussion

This study has shown that the level of DFA was similar in 12- to 14-year-old PT and C children. The PT group had more medical health problems and fewer free time activities. Despite this there were very few differences between the groups in relation to dental care or oral health related issues, indicating that the dental care system works well for PT children.

The present study was based on questionnaire data and specifically designed to explore PT children's own views and experiences from the dental care situation, as well as habits related to dental care. Two previous studies[10,11] were based on the same study population of PT children and C children and reported the perspective of the dental care professionals and parents, respectively. However, instead of using a proxy informant the ideal situation is to ask the child about his or her experiences of dental care. Involving children as active participants in research has been pointed out as important[24]. The children in the present study had reached an age when they are able to express their own views of the dental situation and give reliable answers about oral health related habits. In addition, by using the self rating version of CFSS-DS as in this study, the influence of the parent's own dental fear on the child's rating is to a large extent avoided[25]. On the other hand, PT children might underestimate their problems owing to cognitive deficits that may result in difficulties with memory recall[26], and for example, Dahl *et al.*[27] found that adolescents with very low birth weight self-reported fewer behavioural problems than their parents reported.

Table 6. School situation, frequency of peer relationships and free time activities in PT and C children (Mann–Whitney test).

	Distribution of answers							
	1	**2**	**3**	**4**	**Mean**	**SD**	**Median**	**Significance**
School situation*								
PT (*n* = 109)	56 (51%)	50 (46%)	3 (3%)	0 (0%)	1.51	0.56	1.0	$P = 0.385$
C (*n* = 108)	55 (51%)	51 (47%)	2 (2%)	0 (0%)	1.51	0.54	1.0	
Frequency of free time activities**								
PT (*n* = 109)	17 (16%)	19 (17%)	47 (43%)	26 (24%)	1.75	0.99	2.0	$P = 0.021$
C (*n* = 108)	5 (5%)	17 (16%)	51 (47%)	35 (32%)	2.07	0.82	2.0	
Frequency of peer relationships**								
PT (*n* = 109)	8 (7%)	18 (16.5%)	39 (36%)	44 (40%)	2.09	0.93	2.0	$P = 0.821$
C (*n* = 108)	3 (3%)	12 (11%)	56 (52%)	37 (34%)	2.18	0.73	2.0	

*1: Very good, 2: good, 3: bad, 4: very bad; **1: 0 times/week, 2: Once a week, 3: 2–3 times/week, 4: ≥ 4 times/week.

The CFSS-DS[17] is a well documented instrument, measuring the child dental fear and anxiety and covering several aspects of the dental situation[12]. The present study showed no difference between PT children and C children in CFSS-DS scores or in prevalence of DFA (CFSS-DS score ≥ 38). Few children reported DFA with the present cut-off score of ≥38, 3% in PT and 2% in C children, prevalence rates lower than most of the previously reported rates in children and adolescents[12,18]. However, there are several factors to consider when comparing the results of different studies, for example, differences in age, sex, culture, society, study design, different cut-off scores as definition of DFA, but also different informants (parent or child). The children's different experiences in the dental situation, especially from invasive treatments, may be another such factor. Experience of pain and discomfort, the child's lack of control as well as the dentist's behaviour – lack of empathy or caring – have been reported to be important factors for the development of DFA[28,29]. On the other hand, if the child has positive experience from different treatments this can promote stability and reduce stress, i.e., function as a vaccination for fear and anxiety, known as latent inhibition[30,31]. Many of the PT children had gone through numerous medical procedures that may have been potentially painful. However, great efforts have been made continuously over the years to reduce or prevent pain in the medical care for PT children. It is plausible that this could have an effect also on the dental treatment situation. This might be reflected in the finding of a low prevalence of DFA also in the PT group in the present study. Further, thanks to the generally good oral health among children in Sweden, where 60% of the 12-year-old children are caries free[32], it is possible to make the assumption that many of the participants (both PT and C children) in this study had only limited experience of invasive treatment, a fact that might explain the low prevalence of DFA in this study.

In a previous study[10] comprising the same patient material, we found that PT children displayed a higher prevalence of BMP during the preschool years. In a follow-up interview study, the parents confirmed a higher frequency of BMP in the PT children during the preschool period, but in the early school years the difference had decreased and was not statistically verified[11]. These findings support the idea that PT children are affected by cognitive and perceptual inabilities during the preschool years and that the child's ability to cope with stressful situations improves with increasing age, possibly reflecting a catch up effect. In the present study, when the children had reached 12–14 years of age, they seem to have adjusted to the dental treatment situation just as well as the C children, as judged on the basis of their satisfaction with their contact with the dental care services and the very few reports of DFA. However, although the participant/nonparticipant analysis revealed no differences in socio-economic status, expressed as the mother's educational level, the PT children who chose not to participate had had more dental caries during the preschool period than the participants. It thus cannot be excluded that the present results underestimate the variables DFA and satisfaction with dental care, as the nonparticipants as a group may have negative dental experiences of early invasive treatment.

No significant differences in toothbrushing habits or use of fluoridated toothpaste were seen between PT children and C children. Concerning toothbrushing, 82–87% of the children reported that they always brushed in the evening and 78–84% in the morning. In a Swedish study of 13-year-olds, toothbrushing frequencies of 82% in the evening and 75% in the morning were found in the healthy control group[21]. Further, 51% of that control group reported intake of food and beverages ≥5 times /day and 23% reported snacking between meals ≥3 days/week, also in accordance with the present results. In addition, the present findings of oral health behaviour generally corresponded with the parental reports of the same group of children covering the preschool and early school years[11]. However, the PT children seemed to have more problems with toothbrushing than the C children during the preschool years. In the present study, the PT children reported more frequent use of dental floss and extra fluoride supplements than the controls. These findings might reflect a supportive attitude on the part

of the parents, as well as good-health promoting strategies from the Public Dental Health Service for this group of children.

The study also showed that medical health problems, assessed as chronic illness, general health problems and daily medication were more common in PT children than in C children. For general health problems the difference was statistically significant. This is in accordance with other studies[4,33] and was also found in our previous study[11] where the parents reported significantly more general health problems and chronic illness in the PT children during preschool and early school years. Thus, medical health problems seem to persist in early adolescence, suggesting that PT children should be regarded as potential risk patients for oral health problems. In order to ensure early identification of these patients collaboration between medical and health professionals should be advocated and in order to minimize the risk of impaired oral health these children need dental risk evaluation at an early age.

Items concerning the school situation and frequency of peer relationships showed no differences between the groups. However, PT children reported fewer free time activities than C children. Similar observations were noted in another Swedish study where parents' reports revealed significantly less participation in sport activities in 11-year-old PT children[4]. Other studies have shown that preterm children are at risk of developing poor socialization skills[4,34,35], factors which may favour withdrawn behaviour and low self-confidence which, in turn, may restrict their participation in free time activities as noted in the present study.

It can be concluded that preterm children and full-term controls, at 12–14 years of age reported high levels of satisfaction with their received dental care. No significant differences in DFA were noted between the PT and C children, the children in both groups reporting low mean scores of CFSS-DS. Still, medical health problems were more commonly reported by the PT children than C children as was less participation in free time activities. A high frequency of medical and social problems indicates that PT children need special attention from the dental services. In addition, the results from the participant/nonparticipant analyses require special consideration, as an underestimation of problems related to dental care in PT children cannot be excluded.

What this paper adds

- This paper adds new information on DFA, satisfaction with received dental care, oral health behaviour and medical health among 12- to 14-year-old PT children.
- At 12–14 years of age, both PT and C children presented high levels of satisfaction with received dental care and few reported DFA.
- Preterm children displayed more medical health problems also at the age of 12–14 years.

Why this paper is important to paediatric dentists

- Children born preterm who have a history of risk factors for both dental behaviour management problems and impaired oral health during preschool and early school years continue to need attention from the dental services during adolescence. Medical health problems and social problems seem to be present at this age too, which need due consideration from the dental caregivers.

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