Oral health behavior of 6-year-old Danish children

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In Denmark the Public Dental Health Service (PDHS) is now in the process of evaluation and revision of oral health education programs. The purpose of the present survey was 1) to evaluate the pattern of oral health behavior among 6-year-old children in relation to family and social characteristics; 2) to describe the level of dental knowledge and attitudes among the parents; and 3) to estimate the relative effect on caries experience of social and behavioral risk factors. The study comprised 212 children (response, 73%), and the parents responded to self-administered questionnaires. Moreover, information on def-s and DMF-S was collected from the epidemiologic recording system for the PDHS. With regard to dental caries, 98% of the parents were aware of the harmful effect of sugar, and 88% knew about the role of bacteria. The causal effect of bacteria in relation to periodontal disease was stressed by 81%. Most of the parents (93%) believed that the dental diseases are preventable by means of proper oral hygiene habits, restriction of sugar and sweets, and the use of fluorides. The high level of dental knowledge among the parents was related to information given by the PDHS. Toothbrushing at least twice a day was performed by 88% of the children, and most used fluoridated toothpaste. Practical support to the children was given by 45% of the parents, and 55% checked the teeth. On a daily basis, the children had healthy foods like vegetables (59%), fruits (87%), and milk (89%), and orangeade was consumed by 53%; 45% of the children consumed sweets on a specific weekday ('Saturday sweets'). Dental knowledge, attitudes, and behavior were influenced by family income and education, whereas no differences in responses in accordance with urbanization were found. The mean caries experience was 2.1 def-s and 0.1 DMF-S. Dummy regression and logistic regression analyses showed that family income and education of parents were the most important independent variables. To conclude, the survey demonstrates substantive achievements for the PDHS with regard to the development of positive oral health behavior and health attitudes in the target population. □ *Dental knowledge; health attitudes; public dental health system; socioeconomic factors*

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In Denmark dental care to children and adolescents is offered by the Public Dental Health Service (PDHS), and the service is attended by nearly 100% of the target population. The PDHS is organized at the municipal level and includes regular dental examinations, comprehensive treatment, and preventive care free of charge. Community programs on oral health promotion and education have been implemented, based on the involvement of key persons like school teachers, school health nurses, and parents. To evaluate the PDHS, a standardized recording system has been established (1). The epidemiologic data have shown a general decrease in the prevalence of dental caries among children during recent years, and the distribution of dental caries has become even more skewed (2). This means that an increasing number of the children are free of caries whereas a limited number of the children still have a significant caries experience (3). The factors to be considered in relation to the changing disease pattern are the school-based preventive programs, use of fluorides, improved oral hygiene, modifications of dietary habits and consumption of sugar, and changes in living conditions, general lifestyle, and health-related behavior.

In many municipalities the PDHS is now in the process of evaluating and revising the oral health education programs. Tradition-

ally, the young children and parents represent important target groups. However, recent information on the health behavioral situation of young Danish children is rather scarce. The purpose of the present survey was 1) to evaluate the pattern of oral health behavior among 6-year-old children in relation to family and social characteristics, 2) to describe the level of dental knowledge and attitudes among the parents, and 3) to evaluate the relative effect of social and behavioral risk factors on caries experience.

Study population and methods

A simple random sample of 291 children at kindergarten level (6-year-olds) was drawn from two Danish municipalities, one rural (Töllöse) and one urban (Helsingör). The non-Danish children were excluded, and the final study population comprised 212 children (73% of selected individuals): 60% boys and 40% girls. Data on health behavior were collected in November 1988 by means of self-administered questionnaires to the parents (88% women, 12% men). The highly structured questionnaire included the following items: 1) the parents' knowledge about the causes and prevention of dental disease, 2) attitudes to teeth and dental care, 3) sources of dental health information, 4) the parents' assessment of the child's dental health, 5) the child's toothbrushing habits, 6) dietary habits, 7) consumption of sugar, and 8) family structure and living conditions. The measurement of dental health knowledge was also based on semistructured questions. Moreover, information on the caries experience (def-s and DMF-S) of each child was collected from the epidemiologic recording system of the PDHS (1). The data were transferred from the record forms to diskette and merged with the questionnaire data for analysis by means of the Statistical Analysis System at UNI.C, Lundtofte, Denmark. Frequency distributions were used to describe the data, whereas multiple dummy regression analysis and logistic regression analysis were applied to evaluate the relative effect of social and behavioral factors on the caries experience. In the present logistic model the dependent variable is represented by the dichotomy presence or absence of caries, and thereby the regression coefficient indicates the odds ratio (OR = P/1 − P) of caries. In the statistical evaluation of the regression coefficients the *t* test was used in the dummy regression, whereas the chi-square test was chosen in the logistic regression. To obtain valid measures of knowledge, attitudes, and behavior, several index variables were constructed: 1) knowledge about sugar and caries (score, 0–7); 2) knowledge about prevention (score, 0–3); 3) attitudes to prevention (score, 0–4); 4) consumption of sweets (score, 0–13); 5) consumption of sugary foods (score, 0–10); 6) consumption of sugary drinks (score, 0–10); and 7) consumption of healthy foods (score, 1–18). The scales were developed to fit with the Guttman scale model (4).

Results

Dental knowledge and attitudes

With regard to dental caries, 98% of the parents were aware of the harmful effect of sugar, and 88% knew about the role of bacteria. In the open-ended questions, 69% of the parents answered that dental caries is caused by improper oral hygiene, 33% mentioned excessive consumption of sweets, and unhealthy diet was stressed by 28%. A few of the parents indicated that dental caries was to be explained by nature/heridity (9%), medicine (3%), general illness (1%), or saliva factors (1%). The causal effect of bacteria in relation to periodontal disease was emphasized by 81%. Moreover, above two-thirds (67%) answered that bleeding gums can be explained by incorrect toothcleaning, 7% mentioned unhealthy diet, 7% calculus, and 6% nature/heridity. Most of the parents (93%) believed that dental diseases are preventable; 83% held the opinion that caries is prevented by proper toothbrushing, 43% reported healthy dietary habits, and 27% stressed the restriction of sugar. As to fluoride, 72% believed that fluoride prevents tooth decay, 78% answered that fluoride should be used in caries prevention for chil-

Table 1. The percentages of parents who reported having obtained dental health information from specific sources

Public Dental Health Service	81
Own experiences	60
Health magazines, pamphlets, brochures	60
Private dentist	55
Mother	32
Newspapers	26
Television	23
Father	21
Health nurse	14
Radio	13
Wife/husband	10
Books	10
Friends/relatives	8
Schoolteacher	7

dren, and 82% responded that fluoridated toothpaste is a good idea. With regard to the prevention of bleeding gums, 66% indicated the importance of toothcleaning, 25% the use of toothpicks or dental floss, 10% a healthy diet, and another 10% stressed the regular scaling of teeth. Table 1 shows the sources of dental health information among the parents. The attitudes to the PDHS was highly positive, as illustrated in Table 2.

Self-assessment of dental health and behavior

No significant differences were found between boys and girls in self-reported dental health or behavior. Among the parents, 40% reported their child's teeth to be very good, 45% were good, and 15% were fairly good or bad. Actual need for dental treatment of the child was indicated by 6% of the parents, and another 6% claimed that their child had experienced more trouble with his/her teeth than most other children. Twenty-three per cent of children brushed their teeth three times a day or more often, 65% twice a day, and 12% once a day. Most of the children brushed after breakfast (80%) and before bedtime (92%). Fluoridated toothpaste was used by 98% of the children. Three-fourths of the parents answered that children less than 10 years old need help in toothbrushing from adults. The degree of support in toothbrushing given by the parents is illustrated in Table 3, and, as shown in Table 4, practical assistance was relatively often given to the first-born child. Ninety-three per cent of the children had been to the dentist within the last 6 months, while 7% had visited the dentist within 6 to 12 months. The reasons for the visits to the PDHS were regular dental check-ups, 89%; specific instruction in oral hygiene or dietary advice, 12%; acute dental symptoms, 6%; and filling of the teeth, 7%.

The consumption of healthy foods is illustrated in Table 5, whereas Table 6 demonstrates the consumption of sugary foods. Sweets at least once a week were offered to the children by half the parents, whereas grandparents, older siblings, or playmates were mentioned less often. About 40% of

Table 2. The percentages of respondents who agreed to statements on communication between parents and Public Dental Health Service (PDHS)

Parents always get sufficient information from the dentist about the child's dental health status	82
Parents are well informed by the PDHS about the kind of dental care given to the child	88
Parents get sufficient information about the prevention of dental diseases	86
The dental personnel always have time to discuss problems about the child's teeth	89
The dentist always explains to the child what is going to happen during treatment	91
The dentist always seeks to avoid pain or discomfort during treatment	78
The dentist care for children who are nervous or afraid	89

Table 3. Parents distributed (%) by how often they supported their child in toothbrushing

	Every day	Weekly	Sometimes	Seldom/never
Parents brush the child's teeth	45	17	29	9
Parents check the child's teeth	55	16	28	2
Parents talk about toothbrushing	30	17	51	2

the children spent some pocket money on sweets every week (less than DKR 5), 30% had a moderate level (DKR 5–10), whereas 15% spent a relatively large amount of pocket money for sweets (more than DKR 10). Nearly half the children (45%) consumed sweets on a specific weekday, mostly Saturdays (38%). As to sugar and sweets, 87% of the parents held the attitude that sweets are harmful to teeth; 88% answered that parents should restrict sugar, but only 2% indicated that sugar should be forbidden.

No significant differences in responses in accordance with urbanization were observed. Tables 7 and 8 document associations between dental knowledge, attitudes, and dental health behavior, on the one hand, and level of education of the parents and family income, on the other hand. The attitude to the PDHS was not related to the socioeconomic variables. Except for the variable consumption of sweets, the presented associations were significant at the 5% level.

Determinants of caries

The prevalence rate of dental caries was 39% in the primary teeth and 5% in the permanent teeth, with a mean caries experience of 2.1 def-s and 0.1 DMF-S. No differences in the prevalence of caries were found between boys and girls. Table 9 presents the findings of the multiple regression analyses; the most important factors were education and family income. In the dummy regression analysis, 19% of the variance was explained by the independent variables. No significant effects of the interaction terms were observed.

Table 4. The percentage of parents who gave support to their child every day, in relation to birth number

	1	2	3+
Parents brush the child's teeth every day	53	35	42
Parents check the child's teeth every day	67	47	38
Parents talk about toothbrushing every day	31	28	23

Discussion

The present data were obtained from two Danish municipalities, one urban and one rural. Although the sample was not representative in strictly statistical terms, the data may provide information of relevance to the PDHS in many municipalities throughout the country. For practical and economical reasons the behavioral data were collected by means of self-administered questionnaires. In accordance with tradition, mothers responded more often than fathers. An acceptable response rate was obtained, but the method has certain limits. With regard to dental knowledge, oral hygiene habits, and consumption of healthy foods, overreporting has to be assumed, whereas underreporting has to be considered with regard to the consumption of sugar, sweets, or candy.

Children at the kindergarten level are one important target group for the PDHS owing to the great potential for influencing oral health behavior at a stage of life when health habits are being formed. The impact of the parents is still strong, and parents are therefore highly relevant partners for oral health. The responses to the open-ended questions demonstrated that the public understanding of oral diseases was often considered in behavioral rather than in biological terms.

Table 5. The 6-year-old children distributed (%) by how often they consumed healthy foods

Frequency	Eggs	Cheese	Fruit	Vegetables	Yoghurt	Milk	Water
Several times a day	—	11	39	16	3	73	46
Once a day	5	19	48	43	21	16	19
Several times a week	44	31	12	30	28	7	15
Once a week	35	11	1	6	21	1	6
Seldom	16	30	1	5	26	3	14

Most of the parents emphasized the importance of proper oral hygiene habits, restriction of sugar and sweets, consumption of healthy foods, and the relevance of fluorides. All in all, both the qualitative and the quantitative measurements indicated a relatively high level of dental knowledge among the parents. The parents' knowledge about the causes and prevention of dental diseases seems to be related to the information given by the PDHS, since the public dentists were most frequently indicated as the source of dental health information. According to the survey, health communication based on personal instruction and advice to parents and children and the use of health magazines and pamphlets is highly recommendable, whereas mass media in terms of TV, radio, or newspapers seem less important. The private dentist was also stressed as a dental health informant by a substantial proportion of respondents, since most of the parents visited the dentist regularly themselves. The services delivered by the PDHS was first of all preventive-oriented. A general public acceptance of the PDHS program was outlined, with no differences with regard to socioeconomic factors or urbanization.

Consistent with previous findings (5, 6), the positive dental attitudes and knowledge among the parents were reflected in the pattern of health habits. Compared with recent European data on schoolchildren (7), regular oral hygiene habits among the kindergarten children were frequent. Nine of 10 children brushed their teeth at least twice a day, and family support in dental health was given on a daily basis: either the parents brushed their child's teeth or the oral hygiene standard was checked. From a sociologic point of view, it is noteworthy that the first-born child seemed to receive support from the parents relatively more often than other children in the family.

Table 6. The 6-year-old children distributed (%) by how often they consumed sugary foods

	Once or several times a day	Twice or several times a week	Once a week	Seldom
Cakes/pastry	1	14	50	35
Biscuit	1	11	25	62
Jam	18	28	21	33
Sugary breakfast cereals	18	21	17	44
Raisins	7	25	33	36
Chocolate	2	15	65	18
Ice cream	5	14	58	23
Caramel	—	4	24	72
Liquorice	—	7	43	50
Wine gum	1	12	57	30
Chewing gum (+ sugar)	—	11	19	70
Sugar-free sweets	2	8	26	65
Soft drinks	2	9	43	46
Orangeade/syrup	53	31	10	6

Table 7. The percentages of parents with high levels of dental knowledge, positive attitude to prevention, and dental health-related behaviors in relation to parent's level of education

	Education			
	Primary school, grade 7–9	Primary school, grade 10	Secondary school	High school
High level of knowledge about sugar and caries (score 6–7)	83	69	88	93
High level of knowledge about prevention of dental diseases (score 3)	52	66	71	88
Positive attitude to prevention (score 4)	56	69	73	80
Frequent consumption of sweets (score 12–13)	39	49	36	33
Frequent consumption of healthy foods (score 15–18)	24	46	54	63
Toothbrushing at least three times a day	15	23	16	36
Parents brush the child's teeth every day	39	27	39	65

The survey showed that the children often had healthy foods in terms of vegetables, fruits, or milk. Being the dominant source of sweets to the children, the parents in general controlled the consumption of sugar, and rather positive attitudes to sugar restriction for children were also observed. This is in agreement with similar studies on young Danish schoolchildren (8–10). A specific weekday for the consumption of sweets (that is, 'Saturday sweets') had been instituted by many of the parents, and this proportion seems to have improved since the 1970s (11, 12). The consumption of soft drinks among the children in kindergarten was mostly restricted to once a week and thereby somewhat lower than found in previous Danish studies (13–14) and European data (7) on schoolchildren and adolescents. Against this, the intake of other sugary drinks like orangeade was remarkably high among the young children.

On the basis of a great number of structured questions, various indices on knowledge, attitudes, and behavior were constructed to provide valid analyses of the influence of socioeconomic factors (4). In accordance with previous findings (15–20), a clear social gradient was outlined. The multicausal nature of dental caries was confirmed by the analyses. Controlling for confounding components, the most important determinants were family income, education of parents, and consumption of sweets, whereas the relative effect of toothbrushing habits on the occurrence of caries tended to be lower (21). The sociopolitical background of the establishment of the PDHS was to offer systematic dental care free of charge to children and thereby to reduce social in-

Table 8. The percentages of parents with high levels of dental knowledge, positive attitude to prevention, and dental health-related behaviors in relation to family income

	Family income		
	Low	Medium	High
High level of knowledge about sugar and caries (score 6–7)	73	87	88
High level of knowledge about prevention of dental diseases (score 3)	58	65	81
Positive attitude to prevention (score 4)	63	68	80
Frequent consumption of sweets (score 12–13)	40	33	40
Frequent consumption of healthy foods (score 15–18)	35	42	54
Toothbrushing at least three times a day	8	14	32
Parents brush the child's teeth every day	48	38	52

Table 9. Multiple dummy regression analysis of caries experience (def-s + DMF-S) and logsitic regression analysis of odds for dental caries among 6-year-old Danish children (n = 197)

Independent variable	Dummy variable	Regression coefficient	Odds ratio
Frequency of daily toothbrushing	Three times or more often	0.22	1.42
	Twice	0.19	1.17
	Once	—	—
Consumption of sweets	High	0.38*	2.08*
	Moderate	0.29	2.51**
	Low	—	—
Pocket money for sweets	High	0.54*	1.55*
	Moderate	0.28	1.14
	Low	—	—
Consumption of sugary drinks	High	0.44*	1.58
	Moderate	0.13	1.01
	Low	—	—
Parent's education	Primary school		
	Grade 7–9	2.63**	2.46**
	Grade 10	1.46*	1.32
	Secondary school	−0.24	0.91
	High school	—	—
Family income	<DKR200,000	0.87*	2.14*
	DKR200,000–299,999	0.06	1.28
	≥DKR300,000	—	—

Dummy regression: intercept = 0.65.
* $P < 0.05$.
** $P < 0.01$.

equalities in dental health. Apparently, this objective has not yet been achieved successfully, and effective screening procedures and risk programs have to be developed and tested.

In the recently implemented Act on Dental Health in Denmark the major focus is life-style and self-care. The dental service should aim at developing positive oral health behavior and attitudes in the population. Despite the limitations of the study design the present survey of young children and parents indicates substantive achievements in this respect. At present, the Danish health care sector is in the process of a changeover. The present health policy involves unity in health and the interdisciplinary approach. It would be of great interest to evaluate whether the experience in dental health education may be of relevance to primary health care work in general.

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