

ORIGINAL ARTICLE

Parental influence on children's oral health-related behavior

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Abstract

Objective. The aim of this study was to determine whether there are differences between oral health-related knowledge, attitudes, beliefs and behaviors of children and their parents, and to identify the family-related factors associated with children's poor or good oral health-related behavior. **Material and Methods.** The data were gathered by means of questionnaires from 11–12-year-old schoolchildren and their parents who replied without having knowledge of the answers of the others. Differences between subgroups of children were analyzed by cross-tabulation, and the factors related to children's good or poor oral health-related behavior by logistic regression analyses. **Results.** Parents of children who reported good oral health-related behavior had better knowledge and more favorable behaviors than those of other parents. Predictors for a child's poor oral health-related behavior were the child's poor knowledge, male gender, the parent's frequent consumption of sweets, and the parent's infrequent use of xylitol gum. When a less strict threshold for the child's poor oral health-related behavior was used, more predictors entered the model: the parent's unfavorable use of fluoride toothpaste; among girls, the parent's lack of knowledge; and among children whose mother's occupation level was high, the parent's infrequent use of xylitol gum. The parents of children whose oral health behavior was favorable were more likely to have a high level occupation and favorable oral health-related behaviors. **Conclusions.** Oral health-related knowledge of children and their parents seems to be associated with children's oral health-related behavior. Parents' behaviors, but not attitudes, were associated with children's oral health behavior.

Key Words: Attitude, children, knowledge, oral health behavior, parents

Introduction

Health-related practices of family members are derived through the norms, values, and goals of the family [1]. Through primary socialization a growing child learns the norms, values, and behaviors of the group in which he/she is raised, usually from his/her parents [2]. Parents' smoking habits, alcohol consumption, and fat intake seem to be associated with the corresponding behavior of their children [3]. In terms of oral health habits, the associations between parents and their children also seem to be positive [4]. In the 1990s in Norway, adolescents' toothbrushing, dental flossing and consumption of non-sugared mineral water were associated with their parents' corresponding habits [5,6]. The parental effect on child's health behavior does not seem to decrease with increasing age of adolescents [3], although peers also influence a young person's habits. In late adolescence, parents' disapproval of risky behaviors seems to contribute to their chil-

dren's healthy lifestyles, and peer approval of risky behaviors seems to contribute to unhealthy lifestyles [7].

Studies on the association between oral health-related knowledge, and the attitudes and beliefs of children and their parents are rare. Adair et al. [8] found that the most significant predictors of children's favorable habits were parents' favorable attitudes towards controlling their children's toothbrushing and sugar-snacking habits. According to a systematic review of the effectiveness of oral health promotion, health education has proven effective in increasing the level of knowledge and in altering attitudes and beliefs. However, there was no clear evidence to show that changes in knowledge, attitudes and beliefs were related to a change in oral health habits [9]. In 2001 in Finland, schoolchildren with favorable self-reported oral health-related behavior had better knowledge of and a more favorable attitude toward oral health-related issues than children with poor self-reported behavior [10].

Adair et al. [8] suggest that parental attitudes significantly affect the establishment of their children's favorable habits. Even though it is essential to study the oral health-related behavior of children and their parents, it is also important to examine the knowledge, attitudes, and beliefs of both groups [1]. The aim here was to determine whether there are associations between oral health-related knowledge, attitudes, beliefs, and behaviors of children and their parents. An additional aim was to identify the family-related factors associated with children's poor or good oral health-related behavior.

Material and methods

Study sample and measurements

This study was conducted in Pori, Finland, as part of a research project with the aim of evaluating the effectiveness of a social reinforcement and social norms type of school program for promoting oral health. The census-based sample consisted of all 5th and 6th graders (except mentally disabled and handicapped children attending special schools) and their parents. The number of eligible children at the beginning of the school year was 1,691 (aged 11–12 years). The data were gathered by means of a questionnaire that included structured and open-ended questions concerning oral health-related knowledge, attitudes, beliefs, and behaviors. Knowledge, attitudes, and beliefs were measured on a 4-point Likert scale, with the options: strongly agree, partly agree, partly disagree, strongly disagree. Behaviors were measured on a 7-point Likert scale with question alternatives describing the frequency of the behavior. The questions concerning dietary habits were chosen from questionnaires used in previous studies [11,12]. The questions concerning knowledge, attitudes, beliefs, and brushing were pilot-tested among 53 children of the same age in Seinäjoki. The parents' questionnaire, which included questions on habits and beliefs, and some of the questions concerning attitudes, was pilot-tested among 212 parents in Loimaa. To enhance the comparability between child-parent pairs, we included similar questions pertaining to knowledge, attitudes, beliefs, and habits as in the children's questionnaire in the final version of the parents' questionnaire. The questions used in this study were found to be reliable. Cronbach's alphas for the parents' knowledge, attitude factors, and behaviors were 0.74, 0.70–0.84, and 0.72, respectively. The Cronbach's alphas for children's knowledge and behavior were 0.70 and 0.85, respectively [10]. Of the two questions concerning beliefs, we excluded the statement "I believe I can't prevent dental decay without professional help" from the analyses because it was found to be difficult to understand.

In November 2001, oral health personnel administered the questionnaires for 1,691 pupils to be filled out at schools. The pupils took a questionnaire to one of their parents to be filled out at home and returned the completed questionnaire at school. The details of the study design have been described previously [10]. Completed questionnaires were received from 1,649 children and 1,523 parents. In this study the data on parent-child pairs were used. The number of eligible pairs was 1,516.

Statistical analyses

For statistical analyses, the variables concerning knowledge, attitudes, and beliefs were dichotomized (strongly agree = 0, partly agree, partly disagree, strongly disagree = 1). Variables concerning behaviors were dichotomized as follows: toothbrushing (twice a day = 0, once a day or more seldom = 1), xylitol products use (parents: twice a day = 0, once a day or more seldom = 1; children: at least once a day = 0, not daily = 1), sweet consumption (once a week = 0, 2–3 times per week or more often = 1), soft drink use (2–3 times per week = 0, daily = 1).

At the first stage, differences between knowledge, attitudes, beliefs, and behaviors of the children and their parents were analyzed by cross-tabulation. Statistical significances were evaluated by McNemar tests for detecting differences in responses of the child and the parent from the same family. At the second stage, the percentages of parents with favorable knowledge, attitudes, beliefs, and behaviors were calculated for the groups of children with good, moderate, and poor behavior [10]. The recommended behavior consisted of brushing teeth with fluoride toothpaste at least twice a day, using xylitol chewing gum at least once a day, snacking on sweets not more than once a week, and drinking soft drinks not more than 2–3 times per week. The children whose behaviors in all four areas were favorable formed a "good behavior group" (GB). Those children whose behavior was poorer than recommended in one, two, or three areas formed a "moderate behavior group" (MB). If all four behaviors were poorer than recommended, the child was assigned to a "poor behavior group" (PB).

To reduce the number of variables for further analyses and to determine the underlying patterns of attitudes, an explorative factor analysis with varimax rotation was performed for questions concerning the attitudes of the parents. Factors were extracted using principal component analysis with eigenvalue > 1 as the cut-off point. Four factors were revealed; these were called "Social situations", "Distress about getting caries", "Health and appearance", and "Family" explaining 15.1%, 14.5%, 14.1%, and 11.2% of the common variance, respectively (Table I). Sum scores for the items loading > 0.45 on each factor were counted. An explorative factor

Table I. Summary of the results of the factor analysis on parents' attitudes

Percentage of common variance explained	Factor loading	Factor variables
15.1		FACTOR 1. SOCIAL SITUATIONS
	0.777	Brushing teeth is very important for me when going to meet my friend
	0.762	Brushing teeth is very important for me when going to a party
	0.687	Brushing teeth is very important for me when going to sports/hobbies, etc.
	0.685	Brushing teeth is very important for me when going to work
	0.445	Brushing teeth is very important for me when going to a dentist
14.5		FACTOR 2. DISTRESS ABOUT GETTING CARIES
	0.829	Distress about caries on mate's teeth
	0.767	Distress about caries on child's teeth
	0.752	Distress about caries on own teeth
	0.709	Distress about caries on a good friend's teeth
14.1		FACTOR 3. HEALTH AND APPEARANCE
	0.745	Brushing teeth is very important for me because then I avoid tooth discoloration
	0.689	Brushing teeth is very important for me because then my breath is fresh
	0.659	Brushing teeth is very important for me because then I would not get caries
	0.635	Brushing teeth is very important for me because then my gingiva is healthy
	0.548	Brushing teeth is very important for me because then my appearance is better
11.2		FACTOR 4. FAMILY
	0.860	Brushing teeth is very important for me because then my mate is contented
	0.858	Brushing teeth is very important for me because then my child is contented

analysis for parents' knowledge variables resulted in a single factor. The sum score for knowledge was calculated and dichotomization was identical to that for attitude sum scores.

As the effects of knowledge, attitudes, and beliefs on oral health behavior are not clear, we used multivariable analyses to investigate the independent effects and possible effect modifications of parental factors on child's oral health behavior. Of the child-related factors, only the child's poor knowledge was associated with his/her unfavorable self-reported behavior [10]. Consequently, this factor was included in the analyses.

Multiple logistic regression analyses were conducted using the child's oral health behavior as the dependent variable at different thresholds. In the first model the child's behavior was the dependent variable on the threshold very poor (1 = four unfavorable behaviors) versus moderate or good (0 = one to four favorable behaviors) behavior. In the second model the threshold was poor (1 = three unfavorable behaviors) versus moderate or good behavior (0 = two to four favorable behaviors). For the analyses, the sum scores for parents' attitudes were dichotomized as positive (=0) if the subject had one or no negative attitudes, and negative (=1) if he/she had two or more negative attitudes. The parent's and child's sum scores for knowledge were dichotomized similarly as good (=0) and poor (=1). The other independent variables were dichotomized as follows: parents' behaviors as 1 = poor, 0 = good; parents' occupation as 1 = low level, 0 = high level; and gender as 1 = boy, 0 = girl.

In the third model the threshold was good (1 = four favorable behaviors) versus poor (0 = one

to four unfavorable behaviors) behavior, and the dichotomization of the independent variables was reversed. To arrive at a parsimonious and sufficiently fitting model, a manual backward method was used for selection of variables. At the first stage, all independent variables and their first-order interactions were entered in the model. Thereafter, the interaction terms that did not reach the significance level of $p < 0.04$ were eliminated. The main effects that did not reach $p < 0.04$ or were not part of an interaction term included in the model were then eliminated. Statistical analyses were conducted using SPSS 12.0 and SAS 9.1. The Ethics Committee of Oulu University Hospital and the Pori Board of Health approved the study.

Results

The response rates among children and parents were over 90%. It was not possible to calculate the exact percentages because the registers of pupils are updated only once a year. Among the respondents, the percentage of boys was 51. Among the parents, most of the respondents were mothers (88%), the percentages being 11 and 1 for fathers and other caregivers, respectively.

Among the items asked on the questionnaire, both the child and the parent usually knew that it is possible to reduce the risk of caries by using fluoride toothpaste. Only among one-third of the pairs did both the child and the parent know that for a sufficient supply of fluoride toothbrushing at least twice a day is recommended. In three-quarters of the pairs, both parties considered toothbrushing to be important when going to the dentist and for

Table II. Numbers and percentages of child-parent pairs according to their oral health-related knowledge, attitudes, belief and behaviors (Child + Parent + =both favorable, Child - Parent + =child not favorable and parent favorable, Child + Parent - =child favorable and parent not favorable, Child - Parent- =both not favorable)

	Statement	P+C+ n (%)	P+C- n (%)	P-C+ n (%)	P-C- n (%)	p-value
KNOWLEDGE	A person can reduce the risk of caries by using fluoride toothpaste	887 (61)	388 (26)	131 (9)	59 (4)	<0.001
	A person can reduce the risk of caries by using xylitol products after meals	577 (40)	361 (25)	267 (18)	251 (17)	<0.001
	For sufficient fluoride supply one has to brush teeth at least twice a day	491 (34)	407 (28)	266 (18)	288 (20)	<0.001
	A person can reduce the risk of caries by omitting one sweet snack a day	357 (24)	375 (26)	284 (19)	821 (31)	<0.001
ATTITUDE	Brushing teeth is very important for me because then I would not get caries	1192 (80)	155 (11)	125 (8)	12 (1)	0.083
	Brushing teeth is very important for me when going to a dentist	1130 (76)	291 (20)	48 (3)	21 (1)	<0.001
	Brushing teeth is very important for me because then my breath is fresh	1124 (76)	221 (15)	114 (8)	23 (1)	<0.001
	Brushing teeth is very important for me because then I feel fresh	872 (59)	533 (36)	38 (2)	41 (3)	<0.001
	Brushing teeth is very important for me because then my gingiva is healthy	810 (56)	372 (25)	172 (12)	105 (7)	<0.001
	Brushing teeth is very important for me because then I avoid tooth discoloration	807 (55)	247 (17)	281 (19)	129 (9)	0.151
	I would be distressed if I got caries	739 (50)	461 (31)	160 (11)	118 (8)	<0.001
	Brushing teeth is very important for me when going to a party/disco	691 (47)	588 (40)	80 (6)	97 (7)	<0.001
	Brushing teeth is very important for me because then my appearance is better	527 (36)	531 (36)	173 (12)	230 (16)	<0.001
	Brushing teeth is very important for me when going to school/work	418 (28)	810 (55)	39 (3)	212 (14)	<0.001
	Brushing teeth is very important for me when going to meet my friend	182 (12)	726 (50)	65 (4)	495 (34)	<0.001
	Brushing teeth is very important for me when going to sports/hobbies, etc.	48 (3)	405 (28)	79 (5)	930 (64)	<0.001
	BELIEF	I believe I can keep my own teeth for my whole life	564 (39)	399 (27)	233 (16)	261 (18)
BEHAVIOR	I drink soft drinks 2-3 times per week or more seldom	991 (72)	322 (23)	18 (1)	56 (4)	<0.001
	I brush teeth with fluoride toothpaste at least twice a day	626 (43)	471 (32)	128 (9)	242 (16)	<0.001
	I eat sweets once a week or more seldom	447 (32)	441 (31)	195 (14)	319 (23)	<0.001
	Favorable xylitol gum use	174 (13)	89 (6)	519 (37)	611 (44)	<0.001

P-value for McNemar's test for the differences between child-parent pairs.

fresh breath. Other areas where both the parent and the child often had favorable attitudes were the importance of brushing teeth in order to avoid dental decay, to have healthy gingiva, and to avoid tooth discoloration. Among less than half of the parent-child pairs, both parties reported brushing their teeth with fluoride toothpaste at least twice a day. (Table II)

Parents whose children belonged to the good behavior group had better knowledge and more favorable reported behaviors compared with the other parents. A high percentage of them knew that it is possible to reduce the risk of caries by using fluoride toothpaste. With regard to the attitudes of the parents, differences between groups were rare and slight. (Table III)

Predictors for the child's poor oral health-related behavior were the child's poor knowledge, male

gender, the parent's frequent consumption of sweets, and the parent's infrequent use of xylitol gum. (Table IV). When a less strict threshold for the child's poor oral health-related behavior was used, the following predictors entered the model: the parent's unfavorable use of fluoride toothpaste; among girls, the parent's poor knowledge; and among children whose mother's occupational level was high, the parent's infrequent use of xylitol gum (Table V).

When the child's good behavior was the dependent variable, most of the variables entering the model were the same as those for poor behavior. Parent's favorable behaviors and the high-level occupation of the mother and father were predictive of the child's good behavior. The effect of the parent's favorable behavior persisted even if the parent's attitude was negative, and the child's good knowledge reinforced this effect (Table VI).

Table III. Percentages of parents with favorable knowledge, attitudes, beliefs, or behavior among the groups of children with good, moderate, and poor oral health behavior

	Children's good behavior group (GB) %	Children's moderate behavior group (MB) %	Children's poor behavior group (PB) %	<i>p</i> -value*
A person can reduce the risk of caries by using fluoride toothpaste	93	87	82	0.023
A person can reduce the risk of caries by using xylitol products after meals	80	63	59	<0.001
For sufficient fluoride supply one has to brush teeth at least twice a day	70	61	55	0.037
A person can reduce the risk of caries by omitting one sweet snack a day	59	49	49	0.043
Brushing teeth is very important for me because then I feel fresh	96	95	89	0.044
Brushing teeth is very important for me when going to a dentist	96	95	95	0.987
Brushing teeth is very important for me because then I would not get caries	94	90	93	0.292
Brushing teeth is very important for me when going to a party/disco	90	88	83	0.241
Brushing teeth is very important for me because then my breath is fresh	88	91	93	0.408
Brushing teeth is very important for me when going to school/work	86	84	69	0.002
I would be distressed if I got caries	84	81	80	0.537
Brushing teeth is very important for me because then my gingiva is healthy	82	81	83	0.896
Brushing teeth is very important for me because then my appearance is better	79	72	71	0.149
Brushing teeth is very important for me because then I avoid tooth discoloration	75	72	74	0.692
Brushing teeth is very important for me when going to meet my friend	64	61	62	0.804
Brushing teeth is very important for me when going to sports/hobbies, etc.	31	31	36	0.645
I believe I can keep my own teeth for my whole life	71	65	64	0.390
I brush teeth with fluoride toothpaste at least twice a day	83	74	67	0.013
I eat sweets once a week or more seldom	71	63	49	0.004
I use xylitol gum at least twice a day	31	18	10	<0.001
I drink soft drinks 2–3 times per week or more seldom	100	95	88	<0.001

*Chi-square test.

Discussion

All pupils in the fifth and sixth grades were given questionnaires and the response rates of children and their parents were high. In Finland, practically all children attend municipal comprehensive schools. The main reason for missing questionnaires was children's absence from school, and these were

equally distributed among schools. No clustering of non-responses in particular areas, schools, or classes was found. The children and the adults replied without knowledge of the answers of the others. Thus, systematic measurement errors are less likely than if respondents had reported health-related attitudes, knowledge, beliefs, and behaviors simultaneously or if they had been reported for other family

Table IV. Summary of the results of the final logistic regression analysis on predictors of children's oral health behavior (1 = very poor oral health behavior*) as evaluated by a stepwise backward method including gender of child, child's knowledge, parent's occupation and parent's knowledge, attitude factors, belief and behaviors as independent variables

Variable and coding	Crude OR	OR	95% Confidence interval
Sum score of child's knowledge (1 = poor)	3.22	3.48	1.95–6.20
Parent's use of xylitol gum (1 = once a day or more seldom)	2.13	2.22	1.00–4.92
Gender (1 = boy)	2.33	2.06	1.25–3.40
Parent's consumption of sweets (1 = more often than once a week)	1.89	1.88	1.18–3.01

*Brushing teeth with fluoride toothpaste once a day or more seldom, using xylitol chewing gum less frequently than daily, snacking on sweets more than once a week, and drinking soft drinks daily.

Table V. Summary of the results of the final logistic regression analysis on predictors of children's oral health behavior (1 =poor oral health behavior*) as evaluated by a stepwise backward method including child's gender, child's knowledge, parent's occupation, parent's knowledge, attitude factors, beliefs, and behaviors as independent variables

Variable and coding	Crude OR	OR	95% Confidence interval
Sum score of child's knowledge (1 =poor)	2.23	2.09	1.58–2.75
Parent's consumption of sweets (1 =more often than once a week)	1.73	1.65	1.26–2.15
Parent's use of fluoride toothpaste (1 =once a day or more seldom)	1.73	1.50	1.12–2.01
Parent's use of xylitol gum (1 =once a day or more seldom)	1.40		
Among children whose mother's occupation level is	1.36		
High	3.85	3.28	1.45–7.44
Low	1.00	0.95	0.63–1.44
Sum score of parent's knowledge (1 =poor)	1.24		
Among children whose gender is	1.52		
Girl	1.75	1.64	1.10–2.45
Boy	0.95	0.79	0.55–1.13

*Child has three of the next four behaviors: brushing teeth with fluoride toothpaste once a day or more seldom; using xylitol chewing gum less frequently than daily; snacking on sweets more often than once a week and drinking soft drinks daily.

members. The high percentage of mothers among the responding parents may have influenced the results because women's health habits have been reported to be more favorable than those of men [13,14].

Factor analysis for parents' attitudes revealed factors very similar to those we have found earlier in the analysis on children's attitudes [10]. Among children, the importance of toothbrushing when going to school and to a dentist loaded on a factor called "Authorities". Among parents, the importance of brushing when going to work and to a dentist loaded on the factor "Social situations".

Based on children's oral health-related behavior, most of the parental attitudes were similar in the three groups. In all groups of parents more than 90% reported they would be distressed if their child got caries; there were no statistically significant differences between groups. However, there were differences in level of knowledge. Parents of children in the good behavior group were better informed about oral health-related items than were the other parents.

The child's poor knowledge was a stronger predictor of poor and very poor behavior than any of the parent-related factors. However, in questionnaire-based studies, reported behavior is likely to reflect knowledge, attitudes, and beliefs rather than enforced behavior. This might partly explain the association between children's knowledge and reported behavior. Even though the reported importance of knowledge has been different in different studies [9], these results strengthen our earlier findings about its importance [10]. In this study, parents and children gave their responses independently, which reduces the previously mentioned response bias between reported behavior and knowledge, attitudes and beliefs.

Among the parental factors, parents' reported behaviors were more strongly associated with their children's reported behavior than were parents' knowledge and attitudes. Our results support the findings that a child learns behavior from his/her parents [2,3]. Compared to the importance of parental attitudes [8], we found that the parent's

Table VI. Summary of the results of the final logistic regression analysis on predictors of children's oral health-related behavior (1 =good oral health behavior*) as evaluated by a stepwise backward method including child's gender, child's knowledge, parent's occupation, parent's knowledge, attitude factors, beliefs, and behaviors as independent variables

Variable and coding	Crude OR	Odds ratio	95% Confidence interval
Gender (1 =girl)	2.24	2.50	1.72–3.70
Father's occupation (1 =high skill level)	1.68	1.69	1.15–2.50
Mother's occupation (1 =high skill level)	1.55	1.56	1.06–2.27
Sum score of parent's knowledge (1 =good)	1.92	1.55	1.03–2.32
Parent's use of xylitol gum at least twice a day	2.15		
Among children whose parents consider brushing teeth for "Health and appearance" (Factor 3)	1.34		
Important	1.51	1.39	0.86–2.25
Not important	5.39	6.72	3.07–14.69
Parent's sweet consumption (1 =once a week or more seldom)	1.46		
Among children whose knowledge about oral health-related items	3.01		
Good	2.10	2.76	1.59–4.80
Poor	0.75	0.76	0.41–1.41

*Brushing teeth with fluoride toothpaste at least twice a day, using xylitol chewing gum daily, snacking on sweets once a week or more seldom, and drinking soft drinks 2–3 times per week or more seldom.

behavior rather than attitudes was predictive of the child's behavior. The importance of role models seemed to be stronger for predicting poor behaviors, whereas other parental factors were more important in predicting good behavior. This supports the previous findings that parents' influence on their children's lifestyle, health beliefs, and behavior is significant [15]. Parental influences have also been shown to vary according to socio-economic factors and gender [15]. The results of our study support this finding, as parents' occupation and child's gender modified the effect of parents' knowledge and behavior on their children's behavior.

In conclusion, the oral health-related knowledge of both children and their parents seems to be associated with children's oral health-related behavior. Parents' poor knowledge is predictive of poor oral health behavior among girls. Parents' reported behaviors, but not attitudes, seem to be associated with children's reported oral health behavior.

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