

ORIGINAL ARTICLE

Oral health-related knowledge, attitudes, and beliefs among 11 to 12-year-old Finnish schoolchildren with different oral health behaviors

RAIJA POUTANEN^{1,2}, SATU LAHTI¹ & HANNU HAUSEN¹

¹*Institute of Dentistry, University of Oulu, Oulu, Finland, ²Oral Health Services, Health Center of Seinäjoki, Seinäjoki, Finland*

Abstract

The aim of this study was to explore oral health-related knowledge, attitudes, and beliefs among 11 to 12-year-old schoolchildren with favorable, moderate, or poor behavior related to oral health. The data were gathered by questionnaire. Recommendations commonly used in Finland in oral health education were chosen as the criteria for selection of groups of children with favorable, moderate, and poor oral health behavior. Differences between groups were analyzed using cross-tabulations and factors related to unfavorable behavior using logistic regression analysis. The percentage of children with appropriate knowledge was higher in the good behavior group (GB) than in the other groups. The groups differed most in the children's knowledge of the recommendation to use fluoride toothpaste at least twice a day. Most children in the GB group considered it important to brush their teeth for the fresh feeling this gave. The majority of children in all groups considered it important to brush their teeth when going to the dentist. The majority also considered brushing important for avoiding tooth decay and tooth discoloration as well as for having fresh breath. Unfavorable knowledge, attitudes, beliefs, and behavior tended to accumulate in the same children. Factors associated with unfavorable behavior were male sex, mother's low skill occupation level, and child's poor knowledge of oral health-related facts.

Key Words: *Adolescent, attitude, health behavior, knowledge*

Introduction

In Finland, children and adolescents under 18 years of age are entitled to free dental care, including individual oral health counseling. Health education has also been given to groups. In the 1970s and 1980s, the health authorities issued detailed directives about the content of oral health counseling and group health education. In the early 1990s, however, binding directives were withdrawn, and since then only non-binding recommendations have been given.

The Primary Health Care Act of 1972 emphasizes the promotion of oral health and a population approach. At first, prevention was based on oral health-related lessons and fluoride rinsing arranged in schools as well as on annual dental check-ups, and in the 1970s and 1980s the oral health of Finnish children improved markedly. In the middle of the 1980s, the health authorities began to favor an individually based high-risk approach, recommending that intervals between dental check-ups should be based on individual needs

and that prevention should be based on the individual risk of oral disease. As a result, the frequency of dental check-ups and of the number of preventive measures has decreased [1]. There is evidence, however, that the preventive procedures still in place have not been targeted at those individuals at highest risk of developing decay [2–5].

In the 1990s, the declining trend in the occurrence of caries leveled off [6]. At the same time, with the exception of xylitol chewing gum use [7], oral health-related behaviors were found not to be improving. In 2001, only one-third of Finnish boys brushed their teeth twice-a-day, even though a small increase between 1977 and 2001 was reported [8]. Among 16 to 18-year-old girls, a consistent declining trend in twice-a-day brushing has been observed since 1985 [8,9], but girls have consistently reported brushing their teeth more often than boys do [8–10]. Daily consumption of sweets was reported by one-fifth of Finnish 11-year-olds in 1985/1986 [10]. The percentage of daily sweet consumers among adolescents was at the same level in

Vantaa in the 1990s [11], but results from a World Health Organisation Cross-National Survey in 1993/1994 showed a slightly lower percentage of daily sweet users [12]. However, the amount of candies and chocolate consumed yearly per person in Finland has increased from 7.2 kg in 1985 to 12.5 kg in 2001 [13]. At the same time, the consumption of soft drinks has increased, too [13].

The fact that there is no longer a declining trend in the occurrence of dental caries, and no further improvement in oral health-related behaviors, indicates that new approaches for health promotion are needed. The Ottawa Charter [14] outlines five key areas: building healthy public policy, creating supportive environments, strengthening community action, developing personal skills, and reorienting health services. In Finland, the emphasis has been on developing personal skills and reorienting health services, but there is a need to develop the other areas, too. By strengthening the actions of different communities it is possible to empower them in strategy planning, prioritization, decision-making, and implementation in health promotion. Before new strategies are planned, however, it is important to explore the health-related knowledge, attitudes, beliefs, and habits of the target population [15]. It is also important to explore these features among different groups, because both favorable and poor health habits seem to accumulate [11,16]. This study is part of a research project aimed at evaluating the effectiveness of a social reinforcement and social norms type of school program aimed at promoting oral health. The main messages of the program are twice-a-day toothbrushing with fluoride toothpaste, twice-a-day use of xylitol products, and avoidance of frequent consumption of sweet snacks and soft drinks. The specific aim of this baseline study is to explore oral health-related knowledge, attitudes, and beliefs among 11 to 12-year-old schoolchildren with favorable, moderate, and poor oral health behavior before the school health campaign. In addition, the aim is to find factors associated with unfavorable oral health behavior.

Material and methods

Study sample and measurements

The study was conducted in two west-coast towns in Finland, Pori and Rauma, which are situated 50 km from each other and similar with regard to distribution of sources of livelihood. The population of Pori is double that of Rauma [17]. The census-based sample comprised all 5th and 6th graders, with the exception of mentally disabled and handicapped children attending special schools in either town. The participants were 11–12 years of age. The data were gathered using a questionnaire containing structured and open-ended questions concerning oral health-related knowledge, attitudes, beliefs, and behaviors. Knowledge, attitudes, and beliefs were measured against 4-point Likert-scale

questions with alternatives “strongly agree”, “partly agree”, “partly disagree”, “strongly disagree”. Behaviors were measured against 7-point questions with alternatives 3–4 times per day, twice a day, once a day, 2–3 times per week, once a week, twice per month, and less often or never. The questions concerning knowledge, attitudes, beliefs, and brushing were pilot-tested among 53 children of the same age in Seinäjoki. The missing value analysis revealed that the pilot questionnaire could be completed; and when tested for internal consistency by Cronbach’s alpha was found to be reliable. The questions concerning dietary habits were chosen from questionnaires used in previous studies [6,11]. The final questionnaire used in this study was found to be reliable for knowledge, attitudes, and behaviors, Cronbach’s alpha being 0.70, 0.75, and 0.85, respectively.

Oral health personnel administered the questionnaires for pupils to fill out while at school in November 2001. To emphasize to the pupils the confidentiality of their answers, the completed questionnaires were collected in sealed envelopes. There were 2383 participants in total (1649 (69%) from Pori and 734 (31%) from Rauma). In Pori, the percentage of boys was 51 and of girls 49. The sex is not known for three of the respondents in Pori and for all of the participants in Rauma. Data on parents’ occupation were available in the parents’ questionnaire survey conducted at the same time.

The recommendations commonly used in Finland in oral health education were chosen as the criteria for selection of groups of children with favorable, moderate, and poor behavior. The recommended behavior consisted of brushing the teeth with fluoride toothpaste at least twice a day, using xylitol chewing gum at least twice a day [18], snacking sweets not more than once a week, and drinking soft drinks not more than 2–3 times a week [19]. The children whose behaviors in all four areas were favorable formed a “good behavior group” (GB). A “moderate behavior group” (MB) comprised children whose behavior was poorer than recommended in one, two, or three areas. If all four habits were poorer than recommended, the child was assigned to a “poor behaviour group” (PB). A total of 2250 pupils completed their questionnaire adequately and their distribution among the three groups was: 113 (5%) in the GB group, 1993 (89%) in the MB group, and 144 (6%) in the PB group. Those who did not answer one or more of the entry criteria questions were excluded from the group analysis ($n = 133$).

Statistical analyses

Table I presents the knowledge, attitude, belief, and behavior variables selected for the analyses in this study. In addition, the percentages of children who consumed sweets daily and those who brushed their teeth with fluoride toothpaste no more than once-a-day were calculated.

Table I. Percentages of children who strongly agreed with the statements about oral health-related knowledge, attitudes, and beliefs or who had the stated habit in Autumn 2001

STATEMENT		Pori (%)	Rauma (%)
KNOWLEDGE	A person can prevent caries by using fluoride toothpaste	70	71
	A person can prevent caries by using xylitol products after meals	58	57
	To ensure a sufficient fluoride supply, one has to brush the teeth at least twice a day	52	54
	A person can reduce the risk of caries by omitting one sweet snack daily.	44	42
ATTITUDE	I would be distressed if I got caries	60	59
	Brushing the teeth is very important to me when I go to:		
	– a dentist	78	79
	– meet my girlfriend/boyfriend	63	59
	– a disco	52	50
	– school	31	30
	– meet my best friend	17	18
	– sports, hobbies, etc.	9	9
	Brushing the teeth is very important for me because then		
	– I would not get caries	89	88
	– my breath is fresh	83	81
	– I avoid tooth discoloration	74	74
	– I feel fresh	62	59
	– my gingiva is healthy	67	64
	– my parents are happy	51	50
	– my appearance is better	48	50
– my friends are happy	24	24	
BELIEF	I believe I can keep my own teeth for my entire life	54	53
	I believe I cannot prevent dental decay without professional help	18	18
BEHAVIOR	I brush my teeth with fluoride toothpaste at least twice a day	51	50
	I use xylitol chewing gum at least twice a day	28	29
	I eat candies not more often than once a week	46	45
	I drink soft drinks not more often than 2–3 times per week	73	74

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 (twice-a-day=0, once a day or more seldom=1), sweet use (once a week=0, 2–3 times per week or more often=1), soft drink use (2–3 times per week=0, daily=1).

The percentages of children according to reported oral health-related knowledge, attitudes, beliefs, and behaviors were calculated for both towns separately using the complete set of data. An explorative factor analysis with varimax rotation was done for the questions on attitudes. Factors were extracted using principal component analysis, with eigenvalue > 1 as a cut-off point. The four factors revealed were called “Social situations”, “Health and appearance”, “Parents and friends”, and “Authorities”, explaining 17.7%, 17.4%, 11.9%, and 11.6% of the common variance, respectively. Sum scores for the items loading > 0.49 on each factor were counted. For analyses, sum scores were dichotomized as 0 for the situation where the subject had 1 or no negative attitudes and 1 where the subject had 2 or more negative attitudes. Corresponding sum scores were calculated for the items on knowledge. Differences in knowledge, attitudes, and beliefs between the GB and MB groups and between the GB and PB groups were analyzed by cross-tabulations for both study sites. Statistical significances

were evaluated by chi-square tests. *P*-values lower than 0.05 were considered significant.

The next step was a multiple logistic regression analysis, with the child’s behavior group (GB=0, MB and PB=1) as the dependent variable. The independent variables were sex (girl=0, boy=1), mother’s occupation (high skill occupation level=0, low skill occupation level=1), father’s occupation (high skill occupation level=0, low skill occupation level=1), sum score “knowledge” (good=0, poor=1), sum scores for attitudes “Social situations” (favorable=0, unfavorable=1), “Health and appearance” (favorable=0, unfavorable=1), “Parents and friends” (favorable=0, unfavorable=1), and “Authorities” (favorable=0, unfavorable=1). The final model was constructed by a manual backward method including the first-order interaction terms. *P*-values lower than 0.05 were considered significant. The children living in Rauma were excluded because their sex was not known. All statistical analyses were conducted using the statistical package SPSS 12.0. The ethics committees of Oulu University Hospital and the Pori Board of Health approved the study.

Results

The percentages of children according to town, mother’s occupation, father’s occupation, behavior group, and sex for those living in Pori are presented in Table II. In Pori, the percentage of mothers on the high skill occupation level was slightly higher than the

Table II. Percentages of 5th and 6th grade pupils in Pori and Rauma, Finland, according to town, mother's occupation, father's occupation and oral health behavior group. Distribution according to sex is known only for children living in Pori

Town (no. of participants)	%
Pori (1649)	69
Girls	49
Boys	51
Mother's occupation high skill level	33
Mother's occupation low skill level	67
Father's occupation high skill level	31
Father's occupation low skill level	69
GB group	5
MB group	89
PB group	6
Rauma (734)	31
Mother's occupation high skill level	29
Mother's occupation low skill level	71
Father's occupation high skill level	32
Father's occupation low skill level	68
GB group	4
MB group	89
PB group	7

corresponding percentage in Rauma (Table II). In the GB group, more than two-thirds of children living in Pori were girls, while in the PB group almost three-fourths were boys. Table I presents the percentages of children who had good knowledge and favorable attitudes and behaviors related to oral health. The differences in oral health-related knowledge, attitudes, beliefs, and behaviors between children in Pori and in Rauma were small and not statistically significant (Table I).

Table III presents the percentages of children living in Pori and Table IV those in Rauma who strongly agreed with the statements concerning oral health-related knowledge, attitudes, and beliefs, in the three groups with different oral health behavior. Items are grouped according to the results of the factor analysis. The percentages of children with zero sum scores for knowledge and the four attitude factors are also presented. For all of the above-mentioned topics, the percentage of children with appropriate knowledge was higher in the GB group than in the other groups, but

Table III. Percentages of children living in Pori who strongly agreed with the statements or whose sum score was zero concerning oral health-related knowledge, attitudes, and beliefs in the three groups with different oral health behavior: good behavior (GB), moderate behavior (MB), and poor behavior (PB)

	GB n = 81 (%)	MB n = 1367 (%)	PB n = 97 (%)	p-value ¹	p-value ²
<i>Sum score "Knowledge"</i>	75	46	18	<0.001	<0.001
A person can prevent caries by using fluoride toothpaste	91	70	49	<0.001	<0.001
To ensure sufficient fluoride supply, one has to brush the teeth at least twice a day	80	52	27	<0.001	<0.001
A person can prevent caries by using xylitol products after meals	78	57	41	<0.001	<0.001
A person can reduce the risk of caries by omitting one sweet snack daily	58	44	23	0.011	<0.001
<i>Sum score "Attitude; Social situations"</i>	26	16	6	0.031	<0.001
Brushing the teeth is very important for me when going to:					
– a disco	61	53	44	0.152	0.030
– meet my girlfriend/boyfriend	64	63	65	0.922	0.872
– meet my best friend	25	17	9	0.081	0.005
– sports, hobbies, etc.	15	9	6	0.078	0.060
<i>Sum score "Attitude; Health and appearance"</i>	64	54	38	0.070	0.001
Brushing the teeth is very important for me because then:					
– I avoid tooth discoloration	81	74	64	0.172	0.012
– my breath is fresh	88	84	74	0.394	0.025
– I do not get caries	95	89	80	0.093	0.004
– my gingiva is healthy	77	68	47	0.083	<0.001
– my appearance is better	54	48	46	0.233	0.286
– I feel fresh	78	62	50	0.004	<0.001
<i>Sum score "Attitude; Parents and friends"</i>	56	56	46	0.945	0.190
Brushing the teeth is very important for me because then:					
– my parents are happy	54	52	43	0.703	0.162
– my friends are happy	28	24	15	0.476	0.037
<i>Sum score "Attitude; Authorities"</i>	75	60	44	0.009	<0.001
Brushing the teeth is very important for me when going to:					
– a dentist	90	79	67	0.013	<0.001
– school	46	31	12	0.005	<0.001
I would be distressed, if I got caries	69	61	48	0.146	0.007
<i>Beliefs</i>					
I believe I can keep my own teeth for my entire life	65	55	39	0.071	0.001
I believe I cannot prevent dental decay without professional help	15	18	18	0.596	0.634

p-value¹ for the comparisons between GB and MB groups.

p-value² for the comparisons between GB and PB groups.

Table IV. Percentages of children living in Rauma who strongly agreed with the statements or whose sum score was zero concerning oral health-related knowledge, attitudes, and beliefs in the three groups with different oral health behavior: good behavior (GB), moderate behavior (MB), and poor behavior (PB)

	GB n=32 (%)	MB n=626 (%)	PB n=47 (%)	p-value ¹	p-value ²
<i>Sum score "Knowledge"</i>	65	48	30	0.064	0.002
A person can prevent caries by using fluoride toothpaste	81	73	55	0.278	0.017
To ensure sufficient fluoride supply, one has to brush the teeth at least twice a day	77	55	36	0.014	<0.001
A person can prevent caries by using xylitol products after meals	74	57	47	0.060	0.017
A person can reduce the risk of caries by omitting one sweet snack daily	47	41	38	0.539	0.448
<i>Sum score "Attitude; Social situations"</i>	13	17	5	0.553	0.211
Brushing the teeth is very important for me when going to:					
– a disco	44	52	29	0.388	0.178
– meet my girlfriend/boyfriend	71	59	47	0.175	0.036
– meet my best friend	16	19	11	0.640	0.513
– sports, hobbies, etc.	6	9	0	0.583	0.083
<i>Sum score "Attitude; Health and appearance"</i>	65	52	30	0.180	0.003
Brushing the teeth is very important for me because then:					
– I avoid tooth discoloration	80	74	66	0.485	0.183
– my breath is fresh	83	81	70	0.772	0.193
– I do not get caries	100	89	79	0.048	0.006
– my gingiva is healthy	71	65	47	0.495	0.038
– my appearance is better	55	51	36	0.661	0.104
– I feel fresh	77	60	38	0.046	0.001
<i>Sum score "Attitude; Parents and friends"</i>	65	55	52	0.309	0.283
Brushing the teeth is very important for me because then:					
– my parents are happy	61	50	47	0.213	0.210
– my friends are happy	26	24	20	0.846	0.517
<i>Sum score "Attitude; Authorities"</i>	71	61	41	0.256	0.011
Brushing the teeth is very important for me when going to:					
– a dentist	88	79	72	0.265	0.107
– school	50	31	7	0.022	<0.001
I would be distressed, if I got caries	68	59	45	0.344	0.046
Beliefs					
I believe I can keep my own teeth for my entire life	65	55	39	0.071	0.001
I believe I cannot prevent dental decay without professional help	15	18	18	0.596	0.634

p-value¹ for the comparisons between GB and MB groups.

p-value² for the comparisons between GB and PB groups.

in Rauma the difference between the knowledge of the children in the GB and MB groups was not statistically significant (Table IV). However, for both towns, the importance of ensuring an adequate supply of fluoride by using toothpaste at least twice a day was known by the majority of the children in the GB and MB groups and unknown by the majority of the children in the PB group (Tables III and IV).

The results presented in Tables III and IV also indicate that in many areas the attitudes of the children in the GB group were more positive than those of children in the other groups. Most children in the GB group considered toothbrushing important for the fresh feeling this gave them (Tables III and IV). In all groups, the majority of children considered it important to brush their teeth when going to the dentist. The majority of the children also considered brushing important for avoiding tooth decay and tooth discoloration as well as for having fresh breath. The majority in the GB and MB groups believed it would be possible to keep their teeth for life (Tables III and IV).

The percentages of daily sweet users were highest in the PB group at both study sites, i.e. 59% in Pori and 47% in Rauma. In the MB group, the corresponding percentages were 20 and 19. Children in the MB and PB groups reported toothbrushing with fluoride toothpaste once a day as follows: MB 85% and PB 66% in Pori and MB 86% and PB 66% in Rauma.

The results of the logistic regression analysis for children living in Pori are presented in Table V. Boys,

Table V. Relationship between children's oral health behavior group (0=good behavior, 1=moderate or poor behavior) and factors remaining in the final model of logistic regression analysis among participants living in Pori

Variable and coding	Odds ratio	95% CI
Sex (0=girl, 1=boy)	2.2	1.3–3.7
Mother's occupation (0=high skill level, 1=low skill level)	2.1	1.3–3.4
Sum score knowledge (0=0–1, 1=2–4)	3.8	2.2–6.5

Goodness-of-fit test, chi-square=8.276, d.f.=6, p=0.219, Nagelkerke R²=0.096.

children whose mother had a low skill occupation level and children with poor knowledge were more likely to belong to the moderate and poor behavior groups than girls, children whose mother had a high skill occupation level, and children with good knowledge.

Discussion

In Finland, practically all children attend municipal comprehensive schools. The school-based approach used to collect data for this study therefore contributed to the high response rates: over 90% in Pori and over 85% and Rauma. It was not possible to calculate the exact percentages because the census-based registers of pupils are updated only once a year.

Twice-a-day brushing was reported by only half of the children. This percentage is slightly higher than results among 12-year-olds in Vantaa in 1994 [11] and among Finnish 11-year-olds in 1993/1994 [20]. However, brushing frequency was clearly lower than in Sweden (83%) and Denmark (82%) in 1993/1994 [20] and Norway (96%) in 1997 [21]. In all groups, however, the perceived importance of brushing for prevention of caries was high. Thus, when planning the content of oral health counseling and education among adolescents it has to be emphasized that it is essential to brush the teeth at least twice-a-day with fluoride toothpaste.

In terms of intake frequency, daily consumption of sweets was at the same level as reported in 1990 and in 2000 [10,11]. However, the increase in the amount of candies and chocolate consumed yearly per person reflects a possible change in eating habits. Daily amounts of sweets consumed may be higher and length of time for "once daily" consumption may be longer than previously. The percentage of daily xylitol chewing gum users was slightly lower than among Finnish children in the HBSC Study in 1998 [7].

The results of this study indicate that there are deficiencies in the children's knowledge of oral health, especially among boys. Kärkkäinen [22] and Varsio et al. [3,4] have reported that prevention treatment given at Finnish public dental clinics does not meet the individual needs of patients. In particular, dietary counseling is seldom given even when the patient is thought to be at risk of tooth decay. On the other hand, Laiho et al. [23] have reported that peer oral-health education is considered the most interesting way by which pupils learn, but this method has not been widely used in Finland. In the present study, good knowledge, favorable attitudes, beliefs, and behaviors, as well as poor knowledge, unfavorable attitudes, beliefs, and behaviors seemed to accumulate. According to a systematic review of the effectiveness of oral health promotion, health education has been effective in increasing levels of knowledge and altering attitudes and beliefs. This review suggested, however, that alterations in knowledge, attitudes, and beliefs were not related to a change in oral health habits [24]. In their

PRECEDE framework, Green et al. [15] mentioned factors that influence a change in health behavior. In addition to the knowledge, attitudes, and beliefs of the individual, there are enabling and reinforcing factors: the structure of the community, the opportunity of the individual, and social support. According to the Ottawa Charter [14], it is important to create supportive environments and to strengthen community action. It is necessary to empower the entire social network in the environment of children in the work toward good health. The results of this study indicate that we have to encourage twice-a-day toothbrushing when planning school health promotion interventions. Essentially, we have to encourage boys towards healthier behavior. In campaigns, it is important to arrange diverse possibilities to get knowledge across to all children about the factors important for oral health [24] and to reinforce social skills for healthy behavior. It is therefore important to encourage the active participation of pupils in campaigns [25,26].

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