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Association between dental fear and dental attendance among adults in Finland

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Abstract

Objective. Our aim was to evaluate the association between dental attendance and dental fear while considering the simultaneous effects of perceived oral health and treatment need, satisfaction with oral health services, age, gender, marital status, and attained level of education. ***Material and methods.*** The two-stage stratified cluster sample ($n=8028$) represented Finnish adults aged 30 years and older. The response rate to this nationwide sample was 88%. Dental fear was measured with the question: "How afraid are you of visiting a dentist?" Multiple logistic regression analyses were used to determine the association between dental fear and dental attendance, including the following independent variables: perceived oral health, perceived treatment need, satisfaction with oral health services, age, gender, marital status, and attained level of education. ***Results.*** Among all ages, except 30 to 34-year-olds, irregular attenders were more likely to be very afraid of visiting a dentist than regular attenders were. The association was stronger the older the age group. Only age modified the association between dental fear and attendance. Irregular dental attendance can be attributed to high dental fear (etiologic fraction among exposed) in 41% of cases. ***Conclusion.*** Reducing dental fear would increase the number of regular attenders, especially among older age groups. Individuals for whom oral health services have been provided regularly since childhood seem to continue to use these services regularly despite high dental fear.

Key Words: *Age, education, gender, oral health, treatment need*

Introduction

According to several studies, between 4% and 20% of adults report fear related to dentistry [1–6]. High levels of dental fear, anxiety, and phobia have been reported to correlate positively with long intervals between dental visits, episodic use of dental services, and frequent use of emergency care [1,6–10]. It has been suggested that dental fear and anxiety act as barriers to dental care and that social and environmental factors are predictors of dental attendance [8,11–15]. In some studies conducted among young adults with a long history of regular dental care, no association has been found between dental anxiety and utilization of dental services [3,16]. The association between dental fear and attendance thus seems to vary depending on age and provision of oral health services. According to the theoretical framework, the potential determinants for utilization of dental care are: background factors such as age, gender, and marital status; socio-economic factors such as education and perceived treatment need; individual factors such as perceived oral health, satisfaction, and dental anxiety; and factors related to the dental health service system [17,18]. Most of these factors have also been associated with dental fear and anxiety. People with dental fear are more likely to have poor perceived dental health and higher treatment need than those with no dental fear [1,2,9]. Satisfaction with dental visits correlates positively with use of services [19] and negatively with dental anxiety [19,20]. Young people have been reported to express dental fear more often and to be less satisfied with dental services than older people are [20]. Gender, education, and marital status have also been associated with dental fear [1,2,4–6,12].

Epidemiological studies on the relationship between dental fear and use of oral health services in

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nationally representative populations are rare [2,5]. Additionally, many of the large studies on dental anxiety have covered only specific age groups or a limited number of associated variables [6,9,12,16]. Aiming to evaluate the association between dental attendance and dental fear, our hypotheses were that dental fear is associated with dental attendance and that perceived oral health, treatment need, and satisfaction, as well as socio-demographic factors such as age, gender, education, and marital status, act as confounding and/or effect modifying factors in this association.

Material and methods

This cross-sectional study is part of a comprehensive nationwide Health 2000 survey carried out in Finland in 2000–2001 by the National Public Health Institute [21]. Permission for the study was given by the ethics committees of the University Hospital Region of Helsinki and Surroundings and by the National Public Health Institute. The two-stage stratified cluster sample ($n = 8028$) represented the population aged 30 years and older in Finland. The five university hospital regions (UHR) each formed a stratum, and, from each of these regions, 16 health-care districts (HCDs) were sampled as clusters, 80 in all. The 15 largest HCDs were all included in the sample, the rest being selected by systematic probability-proportional-to-size sampling within each UHR. The sampling fraction was doubled for subjects aged 80 years and older in order to ensure sufficient data. Detailed information on the sampling method has been published elsewhere [21].

Professional interviewers from the Statistical Centre of Finland interviewed 6986 subjects comprehensively on functional capacity and health, including oral health. Each interview lasted about 90 min, and the response rate was 88%. The space available for dental fear was limited, so multi-item indices could not be used in this national survey. In the interview, dental fear was covered by a single question: "How afraid are you of visiting a dentist?" The alternatives for replying were "not at all", "somewhat" and "very much". Frequency of dental visits was noted by the question, "Do you usually go to a dentist?" the reply alternatives being "regularly for check-up", "only when I have pain or other problems", and "never". The frequency of dental visits was also determined by the questions: "How many times during the past 12 months have you visited a dentist?" and "When did you last visit a dentist?" The replies to these questions correlated strongly with each other. The first question best described the regularity of attendance among the entire study group and was chosen for use in further analyses. The question on perceived oral health gave five reply alternatives, of which "good" and "rather good" were combined into the category good perceived oral health, and "moderate", "rather poor", and "poor" into the category poor perceived oral health. The question on perceived need of dental care gave reply alternatives "yes" and "no". The question about satisfaction with dental services during the previous treatment period gave five reply alternatives, of which "very satisfied" was kept as one category and the alternatives "rather satisfied", "not satisfied but not dissatisfied either", "rather dissatisfied", and "very dissatisfied" were combined within the category not satisfied. This was done because fewer than 4% of the subjects belonged to the last three categories. The details of the interview have been published elsewhere [21]. For this study, we selected subjects who, in the interview, reported having either their natural teeth or natural teeth and partial dentures. The number of subjects included in the analyses was 5187, which was 74% of the interviewed subjects.

For the present study, a subject's background was described by age, gender, marital status, and attained level of education. Age was rounded off to the nearest full year; for the analyses, age was categorized into five groups: 30–34, 35–44, 45–54, 55–64, and 65+ years. This categorization based on the distribution of dental fear was done in order to find age groups in which dental fear would not vary within the group, but between the groups. The categorization also reflected the history of the provision of dental services for different age groups in Finland during recent decades. Subjects among the various age groups numbered 673, 1388, 1473, 897, and 756, respectively, and those very afraid of visiting a dentist 91, 156, 153, 67, and 34, respectively. Of these age groups, the youngest have been entitled to free, comprehensive, and preventively oriented dental health care from childhood until age 19 years. After that, they have been entitled to subsidized private dental care or in some areas to preventively oriented public dental care. For subjects in the other age groups, subsidization of dental care has varied depending on year of birth. The three oldest age groups were not entitled to organized or subsidized dental care before school. During school years, they were entitled to school dental care, which was restoratively oriented, but there was a lack of dentists, especially in rural areas. After secondary school, these oldest age groups were not entitled to any form of subsidized dental care. Of the 35 to 44-year-olds, the younger were entitled to preventively oriented and the older to restoratively oriented school dental care. Subjects in this age group were later gradually included in the subsidization system according to age. Of five alternative answers to the question about marital status, "divorced or separated", "widowed", and "single" were later combined within the category single, and "married" or "cohabiting" within the category non-single. Level of education attained was assessed using information on formal schooling and

vocational training. For the analyses, level of education was categorized into three levels: basic, secondary, and higher education.

Statistics

We evaluated any bivariate association between dental fear and dental attendance and calculated etiologic fractions among exposed and among population [22] to estimate the magnitude of the relationship. Perceived treatment need, perceived oral health, satisfaction with dental services, age, and gender were also included in the bivariate analyses. Chi-square tests were used to evaluate the statistical significances of the bivariate associations between dental fear, dental attendance, and other variables. As several associations were found, the possible confounding and/or modifying effects of perceived oral health and treatment need, satisfaction, age, gender, marital status, and attained level of education were considered in the analyses of the association between dental fear and attendance by including these variables in multivariable models.

Multiple logistic regression analyses were conducted using dental fear as the dichotomized dependent variable: very afraid (=1) and somewhat or not at all afraid (=0). The following independent variables were used in the logistic regression models and were dichotomized to 0 and 1 as follows: dental attendance (irregular=1), perceived treatment need (yes=1), perceived oral health (poor=1), satisfaction with dental service (not satisfied=1), gender (woman=1), marital status (non-single=1), and level of education that was first included as a categorical variable (basic, secondary, high) dichotomized in two ways (basic=1; basic or secondary=1). Age was divided into five groups: 30–34, 35–44, 45–54, 55–64, and 65+ years. A manual backward elimination method was used, excluding first the interaction terms and the main effects for which the coefficient did not reach statistical significance at the $p<0.05$ level or was not part of a significant interaction term. In the initial model, statistically significant interaction coefficients were observed, indicating that age modified the effect of attendance and marital status on dental fear. As the 30–34 year groups and the 65+ year group differed from the other age groups, three age groups, 30–34, 35–64, and 65+ years, were used in the second stage of modeling. In addition, separate models were constructed for each age group. The aim was to obtain models that were parsimonious and fitted sufficiently well. Statistical methods for handling correlated data with unequal sampling probabilities were used to take account of two-stage cluster sampling. In the analyses, the parameter estimates and confidence intervals were adjusted using the svytab and svylogit procedures of STATA, version 8.0 [23].

Results

The percentages of subjects who were very afraid of visiting a dentist were higher among irregular attenders than among regular attenders in all age groups, and among all women and among men except those 30–34 and 65+ years ($p<0.001$, chi-square tests). The percentage of those who were very afraid of visiting a dentist was higher among younger than among older age groups, also among those who visited a dentist regularly and those who visited irregularly (Table I).

The percentage of irregular dental attenders that can be attributed to high dental fear (etiologic fraction among exposed) was 41, while the corresponding percentage attributed to being somewhat afraid of visiting a dentist was 13. Among the dentate Finnish population aged 30 years or more, the percentage of irregular attenders that can be attributed to high dental fear (etiologic fraction among population) was 7, while the corresponding percentage attributed to being somewhat afraid of visiting a dentist was 4.

Those who used dental services irregularly more often reported poor oral health and need for treatment and were less often satisfied with dental services than those who used dental services regularly (Table II). The subjects who were very afraid of visiting a dentist more often reported irregular use of dental services, poor oral health, and treatment need and were less satisfied with dental services than those who were not at all or only somewhat afraid of visiting a dentist (Table III).

Logistic regression analyses indicated that age modified the effect of dental attendance and marital status on dental fear. Irregular attenders were more likely to be very afraid of visiting a dentist than regular attenders were, and among 65+-year-olds the effect was much stronger than among 30 to 64-year-olds. Among 30 to 34-year-olds, single subjects were less likely to be very afraid of visiting a dentist than non-singles were, while among the other age groups marital status had no effect on dental fear. Perceived oral health, perceived treatment need, gender, and attained educational level had independent effects on dental fear. Poor perceived oral health and perceived treatment need were positively associated with dental fear. Women were more likely to be very afraid of visiting a dentist than men were, and those who had a high educational level were less likely to be very afraid than were those who had secondary or basic educational level (Table IV).

The age-specific models indicated that in this adult population covering all age groups older than 30 years, factors related to dental fear differed in the different groups. Among all ages except 30 to 34-year-olds, irregular attendance was associated with dental fear. Among 65+-year-olds, gender

Table I. Age-specific percentages of adults in Finland ($n=5187$) according to their self-reported dental attendance and dental fear (p-values for chi-square tests between regular and irregular attenders)

			Age group (years)					
	Dental attendance	Fear	30–34 $n=673$	35–44 $n=1388$	45–54 $n=1473$	55–64 $n=897$	65+ $n=756$	All $n=5187$
All	Regular	Very much	10	8	6	4	1	6
		Somewhat	33	32	29	24	15	28
		Not at all	57	60	65	72	84	66
	Irregular	Very much	17	16	16	13	9	15
		Somewhat	34	34	30	28	21	29
		Not at all	49	50	54	59	70	56
	p-value		0.020	<0.001	<0.001	<0.001	<0.001	<0.001
Men	Regular	Very much	5	3	3	2	1	3
		Somewhat	24	26	20	16	13	21
		Not at all	71	71	77	82	86	76
	Irregular	Very much	11	11	13	7	6	10
		Somewhat	29	33	26	28	12	27
		Not at all	60	56	61	65	82	63
	p-value		0.113	<0.001	<0.001	<0.001	0.104	<0.001
Women	Regular	Very much	14	11	9	5	1	8
		Somewhat	38	38	36	30	18	34
		Not at all	48	51	55	65	81	58
	Irregular	Very much	29	24	21	20	11	21
		Somewhat	43	37	36	27	29	34
		Not at all	28	39	43	53	60	45
	p-value		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

was not associated with dental fear. Among all other age groups, women were more likely than men to be very afraid. Among 35 to 44-year-olds, gender modified the effect of attained educational level on dental fear. Men with basic education were more likely than men with secondary or higher education to be very afraid of visiting a dentist. Among women, level of education did not have an effect on dental fear. Among 55 to 64-year-olds, subjects with basic or secondary educational attainment were more likely to be very afraid than were subjects with higher educational attainment. Marital status was not associated with dental fear among any age group except 30 to 34-year-olds (Table V).

Discussion

The study population in this investigation was nationally representative and covered a wide range of ages. The response rate was high, and the results can be generalized to the adult dentate Finnish population aged 30 years and older. The use of a single question to measure dental anxiety results in a higher prevalence than use of multi-item measures [24]. In the adult Norwegian population, however, a single item question has been shown to be valid and reliable [25]. In general, those who used oral health services irregularly were more likely to be very afraid of visiting a dentist than were those who used these services regularly.

Table II. Age-specific percentages of Finnish adults ($n=5187$) who reported treatment need or poor oral health or were not satisfied with oral health services according to their self-reported dental attendance

		Age group (years)					
Attendance		30–34 $n=673$	35–44 $n=1388$	45–54 $n=1473$	55–64 $n=897$	65+ $n=756$	All $n=5187$
Regular	Perceived treatment need	41	42	39	39	38	40
	Poor perceived oral health	13	17	20	24	30	20
	Not satisfied with oral health services	28	22	25	25	25	24
Irregular	Perceived treatment need	71	73	71	62	49	67
	Poor perceived oral health	42	49	58	58	60	54
	Not satisfied with oral health services	41	38	42	41	33	39

All differences between regular and irregular attenders were significant at the $p<0.05$ level (chi-square tests).

Table III. Age-specific percentage of Finnish adults ($n=5187$) with their dental attendance, perceived treatment need, perceived oral health, and satisfaction with oral health services according to their reported level of dental fear

Fear		Age group (years)					
		30–34 $n=637$	35–44 $n=1388$	45–54 $n=1473$	55–64 $n=897$	65+ $n=756$	All $n=5187$
Not at all	Irregular dental attendance	39	34	36	35	45	37
	Perceived treatment need	45	49	48	45	40	46
	Poor perceived oral health	21	25	32	34	41	31
	Not satisfied with oral health services	32[n.s.]	24	28	28[n.s]	26[n.s.]	27
Somewhat	Irregular dental attendance	43	39	41	43	56	43
	Perceived treatment need	59	57	54	51	54	55
	Poor perceived oral health	24	32	39	41	54	36
	Not satisfied with oral health services	33[n.s.]	30	31	34[n.s.]	34[n.s.]	32
Very much	Irregular dental attendance	56	56	65	70	89	63
	Perceived treatment need	76	66	71	65	67	69
	Poor perceived oral health	46	43	53	54	71	50
	Not satisfied with oral health services	37[n.s.]	37	43	41[n.s.]	40[n.s.]	40

All differences between different levels of dental fear were significant at the $p<0.05$ level except those marked with [n.s] (chi-square tests).

In a hypothetical situation where other factors remain the same, eliminating dental fear among those 30+ years old who were very afraid of visiting a dentist would mean that almost half (41%) of the irregular attenders would become regular attenders. Even though this is a cross-sectional study, it can be roughly estimated that in the dentate population of 30+-year-olds in Finland such a reduction would mean 145,000 new regular attenders. Increasing the number of regular attenders could also decrease the need for emergency care and improve the oral health related quality of life of these people. In Finland, the challenge is how to improve the ability of dentists to work with patients who are afraid of visiting the dentist in order to reduce dental fear.

In this study, dental attendance was related to dental fear as found in previous studies [7–10]. This association was considerably stronger in the two oldest age groups and was not found in the youngest age group. Thus, age modified the association between dental fear and attendance. When adults within a wide age range are studied, the factors associated with dental fear differ between age groups. In Finland, subjects in the youngest age group have been entitled to free dental care since childhood, including annual recalls for check-ups and preventive measures, until 19 years of age. These regular check-ups and preventive measures could have operated as latent inhibition [26]. For instance, these subjects might have learned to visit a dentist regularly, even if they were equally as afraid of visiting a dentist as subjects in other age groups. There have also been other studies conducted in Nordic countries in which young adults with a long history of regular dental care were studied, and where no association was found between dental anxiety and utilization of dental services [3,16]. In addition to latent inhibition, those who are dentally anxious and still visit a dentist regularly may have ways of coping with their anxiety, or they may

Table IV. Summary of the results of logistic regression analyses among adults in Finland ($n=5187$). Dental fear was the dependent variable (somewhat or not at all afraid=0, very afraid=1). Independent variables dichotomized as 0 and 1 were: dental attendance (irregular=1), perceived treatment need (yes=1), perceived oral health (poor=1), satisfaction with dental service (not satisfied=1), gender (woman=1), marital status (non-single=1) attained level of education that was dichotomized in two ways (high=1 and secondary or high=1) and age that was trichotomized (30- 34-, 35- 64- and 65+-year-olds)

Independent variables	Crude OR	OR	95% CI	p
Dental attendance				
Among age group 30–64	2.6	2.3	1.9–2.8	0.028
Among age group 65+	8.1	8.2	2.7–24.5	
Gender	2.1	2.7	2.2–3.3	<0.001
Marital status				
Among age group 30–34	0.5	0.5	0.3–0.8	
Among age group 35+	1.2	1.1	0.9–1.4	0.010
Perceived oral health	2.0	1.4	1.2–1.8	<0.001
Perceived treatment need	2.3	1.6	1.3–2.0	<0.001
Educational attainment (1=high educational attainment)	0.8	0.8	0.6–1.0	0.050
Goodness-of-fit test $F_{(10,\ 2124)}=29.62$, $p<0.001$				

Table V. Summary of the results of the final age-specific logistic regression analyses among adults in Finland ($n=5187$). Dental fear was the dependent variable (somewhat or not at all afraid = 0, very afraid = 1). Independent variables dichotomized as 0 and 1 were: dental attendance (irregular = 1), perceived treatment need (yes = 1), perceived oral health (poor = 1), satisfaction with dental service (not satisfied = 1), gender (woman = 1) and attained level of education that was dichotomized in two ways (basic = 1 and basic or secondary = 1)

Age group	Independent variables	Crude OR	OR	95% CI	*p*
30–34 years ($n=637$)	Perceived treatment need	3.1	2.8	1.6–4.8	<0.001
	Perceived oral health	3.0	2.5	1.5–4.2	<0.001
	Gender	2.4	2.9	1.7–4.8	<0.001
Goodness-of-fit test $F_{(4,\ 2132)}=14.43$, $p<0.001$					
35–44 years ($n=1388$)	Dental attendance	2.3	2.6	1.9–3.6	<0.001
	Educational attainment (1 = basic)				0.039
	Among men	3.2	2.7	1.3–5.3	
	Among women	1.3	1.1	0.6–1.9	
Goodness-of-fit test $F_{(4,\ 2157)}=18.58$, $p<0.001$					
45–54 years ($n=1473$)	Dental attendance	3.0	2.3	1.5–3.4	<0.001
	Perceived treatment need	2.4	1.9	1.2–2.9	0.003
	Gender	1.7	2.5	1.7–3.7	<0.001
	Satisfaction with dental service	1.9	1.5	1.0–2.3	0.043
Goodness-of-fit test $F_{(4,\ 1977)}=15.52$, $p<0.001$					
55–64 years ($n=897$)	Dental attendance	4.0	4.4	2.5–7.9	<0.001
	Gender	2.7	3.4	1.9–5.8	<0.001
	Educational attainment (1 = basic or secondary)	2.7	2.2	1.1–4.7	0.045
Goodness-of-fit test $F_{(3,\ 2158)}=16.86$, $p<0.001$					
65+years ($n=756$)	Dental attendance	8.8	8.6	2.9–25.6	<0.001
	Perceived treatment need	2.7	2.3	1.2–4.5	0.014
Goodness-of-fit test $F_{(2,\ 2142)}=9.22$, $p=0.001$					

experience social norms in favor of attending oral health services. On the other hand, it has been suggested that irregular attenders are more anxious than regular attenders because they believe that they require more extensive treatment and not because they have greater fear of dentistry *per se* [27]. The difference in the association between dental fear and attendance between younger and older age groups might reflect the availability or the subsidization of oral health care, i.e. the way people have learned to use oral health services. Sanders et al. [14] suggested that the "failure" of poor adults to seek dental care is probably more a reflection of the organization and subsidy of dental care services than an expression of individual need or values. Although we did not use income as a variable in this study, we assume that subsidies for dental care play an important role in dental attendance and partly explain the differences between age groups.

In this study, no other variables besides age acted as an effect modifier or a confounder between dental fear and attendance. Of the background factors, gender and marital status were independently associated with dental fear. As in many previous studies [1,5,6,12], women, except 65+-year-olds, were more likely than men to be very afraid of visiting a dentist, even though women have been found to be more regular attenders than men [8,28]. Those who were married or cohabiting were more likely to be very afraid of visiting a dentist than those who were single, divorced, or widowed among the youngest age group. In most previous studies, no such association has been found [1,6,12,13].

Of the socio-economic factors, attained level of education and perceived treatment need were associated with dental fear. Unlike some previous studies [1,5], we found an association between dental fear and education. Subjects with higher educational attainment were less likely to be very afraid of visiting a dentist than were subjects with basic or secondary educational attainment. This concords with the findings of some previous studies [4,12], but contradicts those of another study [2]. Age-specific analyses showed that the association between attained level of education and dental fear was modified by age and gender. Of the individual factors, perceived oral health and satisfaction were positively associated with dental fear, the latter only among 45 to 54-year-olds. In previous studies, poor oral health has also been shown to correlate positively with dental anxiety [1,2,9]. This might be due to the fact that dentally anxious people delay dental care, are ashamed of their poor perceived oral health and keep on delaying dental care despite treatment need. They fall into the vicious cycle of dental fear described by Berggren [29].

Conclusions

In general, our results confirm previous findings concerning the positive association between dental fear and irregular attendance at oral health services

[7–10]. No other variables besides age acted as an effect modifier or a confounder between dental fear and attendance. The difference between dental fear and attendance pattern between age groups might reflect the history of provision, the content, and the quality of oral health services. Among the youngest age group, no association between dental fear and attendance was observed, even though the prevalence of dental fear was highest among this group. Those who, since childhood, have enjoyed access to oral health services, including regular recall and preventive measures, seem to continue to visit oral health services regularly despite dental fear. It remains to be seen whether people in this youngest age group will continue their attendance pattern throughout life. Reducing dental fear would increase regular attendance and could decrease the need for emergency care, especially among the oldest age groups.

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