

# Tobacco use and dental fear among 15-16 year-old adolescents in Finland

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**Objective:** The aim of this cross-sectional study was to evaluate the association between tobacco use and dental fear when adjusting for gender, parent's level of education and oral health habits. **Material and methods:** This secondary analysis used questionnaire data from 15- and 16-year-old adolescents and their parents (n=2486). Ninety-four percent of the adolescents and 73% of the parents responded. For logistic regression analysis, variables were categorized as follows: dental fear (dependent) 0=not at all to somewhat afraid, 1=quite or very afraid; tobacco use (independent) 0=never, 1=occasionally or more often; and for confounders: tooth-brushing 0=at least twice a day, 1=once a day or less often; xylitol products 0=at least three times a day, 1=two times a day or less often; and parents' occupation: 0=both low, 1=high+low, and 2=both high. **Results:** 2223 adolescents were included in the final analyses resulting in a 89% response rate. Those using tobacco at least occasionally were more likely to have dental fear than those who reported they had never used tobacco, also when adjusting for oral health habits, gender and parents' occupation (OR=1.74, 95% CI=1.31–2.33). **Conclusions:** Adolescent tobacco users were more likely to have dental fear than non-users. Dental teams should consider this when meeting adolescents who have dental fear and/or are using tobacco. The possible common vulnerability factors for dental fear and tobacco use needs further study.

**Keywords:** Adolescent, dental anxiety, smoking, toothbrushing

## Introduction

Smoking and nicotine dependence have effects on general and oral health (Leite *et al.*, 2018; Warnakulasuriya *et al.*, 2010) and have been associated with psychological well-being, e.g. anxiety in general (Moylan *et al.*, 2012). Smokers have reported anxiety more commonly than non-smokers (Moylan *et al.*, 2012); as has also been found among young adults (Cranford *et al.*, 2009). Adult smokers have reported dental fear more frequently than non-smokers (Armfield, 2013; Pohjola *et al.*, 2016). However, this association between smoking and dental fear has not been studied among adolescents. Adolescence is a critical period when young people are vulnerable for the initiation of tobacco smoking (Lanza and Vasilenko, 2015). Smoking, nicotine dependence and dental fear have been associated with vulnerability to psychopathology (Locker *et al.*, 2001; Breslau *et al.*, 1993) suggesting that smoking and dental fear may have common underlying vulnerability factors. The cognitive vulnerability model provides ways of understanding these factors that contribute to the onset and maintenance of psychological problems (Riskind and Alloy, 2006).

The association between dental fear and smoking may also be affected by age, gender, socio-economic situation and oral self-care. Smoking is more common among groups of low socio-economic status (Schaap and Kunst, 2009). Women, younger age groups and individuals with low levels of educational attainment have more commonly reported dental fear compared with men, older age-groups, and

individuals with higher levels of education (Locker *et al.*, 2001; Klingberg and Broberg, 2007; Carlsson *et al.*, 2015; Pohjola *et al.*, 2016). Smokers report brushing their teeth less frequently than non-smokers (Hellqvist *et al.*, 2009). Additionally, people with high levels of dental fear have reported poorer oral hygiene habits than people with low dental fear (Pohjola *et al.*, 2016). However, not all studies support these findings (Carlsson *et al.*, 2015).

The aim of this study was to evaluate the association between smoking and dental fear, when controlling for oral health habits (tooth brushing and xylitol use), gender and parent's level of education among 15-16 year-old adolescents in Finland. Our hypothesis was that tobacco users are more likely to report dental fear than non-smokers.

## Materials and Methods

This is a secondary analysis of data collected in the towns of Pori and Rauma, Finland in 2005 as a part of a study for controlling caries (Hausen *et al.*, 2007). The Ethics Committee of the Northern Ostrobothnia Hospital District and the City of Pori gave their approval for the study.

The study population consisted of all (n=2486) 8<sup>th</sup> and 9<sup>th</sup> graders (15- and 16-yr-olds) from all schools in the towns of Pori and Rauma, except for mentally and physically disabled adolescents attending special schools. Data were gathered with questionnaires from children and one of their parents. Completed questionnaires were received from 2347 (94%) adolescents and 1815 (73%) parents.

The adolescent participants completed the questionnaires at school. The questionnaires included questions on gender, dental fear, tobacco use and oral health-related habits. One of the parents completed the questionnaire at home and reported the occupations of both parents. The questions included in this study have been found to be reliable and valid (Poutanen *et al.*, 2007).

Dental fear was measured using a single question with six response categories: “not afraid”, “a little afraid”, “afraid to some degree”, “quite afraid”, “very afraid” and “I don’t know”. Those answering “quite” or “very afraid” were considered to have dental fear, and those answering “I don’t know” were omitted from the analyses. For tobacco use (smoking cigarettes or using snuff), eight response categories were provided: “3-4 times per day”, “twice a day”, “once a day”, “2-3 times per week”, “once a week”, “twice per month”, “less often” and “never” were dichotomized as 0=never and 1=occasionally or more often. Those who did not answer the question on tobacco use or answered “I don’t know” were omitted from the analyses.

Of the available information on oral health habits, data on tooth brushing with fluoride toothpaste and use of xylitol products were chosen as they form the advice in the Current Care Guidelines in Finland (Caries, 2014). Oral health habits were measured with questions using 7-point reply 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”. Oral health habit variables were dichotomized as 0=good or 1=poor based on the in the Current Care Guidelines in Finland. ‘Good’ habits were brushing one’s teeth with fluoride toothpaste at least twice a day, using xylitol products at least three times a day, and never having used tobacco. Parents’ occupational levels were trichotomized to 0=both low, 1=high+low, and 2= both high.

Associations between gender, oral health habits, dental fear and parents’ occupational level were evaluated using crosstabulations and chi square tests among all adolescents and separately by gender, tobacco use and dental fear. Logistic regression analysis was then conducted with the dependent variable being dental fear and the independent variable tobacco use. Gender, tooth brushing, use of xylitol products and parent’s occupational level were included in the model as confounders. Statistical analyses were conducted using IBM SPSS version 22.0.

## Results

Of the adolescents 2223 were included in the final analyses, resulting in a 89% response rate. Dental fear was more prevalent among girls than among boys (Table 1). Girls also brushed their teeth twice a day and used xylitol products at least three times a day more often than boys. No significant gender difference was observed in tobacco use.

Among participants with high levels of dental fear, the prevalence of tobacco use at least occasionally, using xylitol products at least 3 times a day, or those whose parents had a low occupation level was higher than among participants with lower levels of dental fear (Table 2). Tobacco users reported less frequent tooth brushing and more frequent xylitol use and were more likely to have parents with low occupational level than non-users. When divided into groups according to both dental fear and tobacco use, among non-users those with high dental fear used xylitol products more frequently than those with no or low levels of dental fear (Table 3). Girls were more fearful than boys among both tobacco users and non-users.

The multivariate logistic regression analysis revealed that tobacco users were more likely to have dental fear than non-users even when adjusting for oral health habits, gender and parents’ occupation (Table 4).

## Discussion

Adolescents reporting tobacco use were more likely to have dental fear than non-users, even when adjusting for oral health habits, gender and parents’ occupation. Similar findings have been reported among university students (Pohjola *et al.*, 2016) and adults (Armfield, 2013).

Smoking and nicotine dependence have been associated with anxiety disorders in general (Moylan *et al.*, 2012). The association between smoking, nicotine dependence and anxiety disorders could be explained by three relationships; smoking and nicotine dependence leads to increased anxiety disorders, the reverse association, or a shared vulnerability model (a factor or group of factors increasing smoking, nicotine dependence and anxiety disorders) (Moylan *et al.*, 2012). In this study those categorized as tobacco users included those using tobacco daily, as well as once a week, twice per month

**Table 1.** Distribution of dental fear, tobacco use, tooth brushing, use of xylitol products and parents’ occupation separately among 1133 girls and 1090 boys.

	All	Girls	Boys	p
	%	%	%	$\chi^2$ test
Dental fear, quite or very afraid	14.5	20.4	8.3	<0.001
Tobacco use at least occasionally	29.0	30.2	27.9	0.223
Tooth brushing at least twice a day	56.8	72.6	41.2	<0.001
Using xylitol products at least three times a day	29.1	36.6	21.7	<0.001
<i>Parents’ occupation</i>				
Both low level	48.8	49.8	47.9	0.728
One at high level	32.8	32.2	33.4	
Both high level	18.4	18.0	18.7	

**Table 2.** Distribution of dental fear, tobacco use, tooth brushing, use of xylitol products, parents' occupation and gender by dental fear and tobacco use.

	<i>Dental fear</i>			<i>Tobacco use</i>		
	<i>Yes</i>	<i>No</i>	<i>p</i>	<i>Yes</i>	<i>No</i>	<i>p</i>
	<i>%</i>	<i>%</i>	<i>χ<sup>2</sup> test</i>	<i>%</i>	<i>%</i>	<i>χ<sup>2</sup> test</i>
n	322	1901		636	1587	
Dental fear, quite or very afraid				19.2	12.6	<0.001
Tobacco use at least occasionally	37.9	27.0	<0.001			
Tooth brushing at least twice a day	56.3	57.4	0.703	52.5	58.6	0.007
Using xylitol products at least 3 times a day	35.4	27.8	0.006	32.9	27.6	0.012
<i>Parents' occupation</i>						
Both low level	56.7	47.3	0.019	60.1	44.7	<0.001
One at high level	29.0	33.6		26.4	35.2	
Both high level	14.3	19.1		13.5	20.1	
Gender = Male	28.3	52.3	<0.001	48.2	51.0	0.223

**Table 3.** Distribution of tooth brushing, xylitol product use, parents' occupation and gender according to dental fear among tobacco users and never-users.

	<i>Smoking</i>			<i>No smoking</i>		
	<i>Fear</i>	<i>No fear</i>	<i>p</i>	<i>Fear</i>	<i>No fear</i>	<i>p</i>
			<i>χ<sup>2</sup> test</i>			<i>χ<sup>2</sup> test</i>
n	122	514		200	1387	
Tooth brushing at least twice a day	45.5	54.9	0.062	62.8	58.3	0.228
Using xylitol products at least 3 times a day	36.7	31.9	0.322	34.7	26.3	0.014
<i>Parents' occupation</i>						
Both low level	68.0	58.7	0.153	49.7	43.7	0.369
One at high level	23.7	26.7		32.3	35.8	
Both high level	8.2	14.7		18.1	20.5	
Gender = Male	30.3	49.8	<0.001	27.0	53.6	<0.001

**Table 4.** Logistic regression model of the effect of tobacco use on dental fear

		<i>B</i>	<i>SE</i>	<i>p</i>	<i>OR</i>	<i>95% CI</i>
Tobacco use	Occasionally or more often	0.56	0.15	<0.001	1.74	1.31–2.33
Gender	Male	-1.10	0.16	<0.001	0.33	0.24–0.46
Tooth brushing	Less than twice a day	0.32	0.15	0.035	1.38	1.02–1.86
Xylitol	Less than 3 times a day	0.16	0.15	0.278	1.18	0.88–1.58
Parents' occupation	Both low level			0.144	1	
	One at high level	-0.23	0.16	0.145	0.79	0.58–1.08
	Both high level	-0.35	0.21	0.091	0.71	0.47–1.06

Fit of the model: R<sup>2</sup>=0.080

or occasionally. Not all of those categorized as tobacco users in this study had a long history of smoking or nicotine dependence. As psychological disorders may share common vulnerability factors (Riskind and Alloy, 2006), some adolescents might have constitutional vulnerability to developing the habit of using tobacco, nicotine dependence and anxiety disorders e.g. dental fear. Additionally, there is some evidence of genetic influence in the aetiology of dental fear (Randall *et al.*, 2017) and genetic variation is associated also with a number of smoking behaviours (Ray *et al.*, 2009). There might be also some common genetic markers behind tobacco use and dental fear that might be represented as a common vulnerability. However, further longitudinal studies are needed to assess the causal pathways between tobacco

use and dental anxiety. In these studies, the effect of the general anxiety should also be considered. For example, large birth cohort studies could provide an opportunity to assess which of the three different associative mechanisms prevails.

In this study, tobacco users used xylitol products more frequently than non-users. Tobacco users might use e.g. xylitol chewing gum to hide the smell of tobacco from their teachers and parents. Also, adolescents with high levels of dental fear used xylitol products more frequently than less fearful adolescents. It is possible that they may have tried to compensate irregular tooth brushing by using xylitol products, even though both tooth brushing and xylitol use are recommended in the Current Care Guidelines in Finland (Caries 2014).

One strength of the present study was its use of a large representative sample. Finland has compulsory publicly funded education, with children attending the school linked to their area of residence. Thus, the sample represented a heterogeneous social intake of practically all children in these towns. Because the questionnaires were completed during school classes, the response rates were very high, and only those children who were not at school that day, or for some reason did not volunteer, are missing from the data. Our tooth brushing data were self-reported, which is often considered to be less reliable. However, self-reported brushing correlated with visible plaque and gingivitis, thus supporting the validity of the question (Poutanen *et al.*, 2007). Dental fear was measured with a single item that has been shown to be valid and reliable in the Finnish adult population (Viinikangas *et al.*, 2007). Tobacco use was self-reported, which may lead to under-reporting. Also, parental occupations were reported by only one parent. In addition, because the study is cross-sectional, no causal interpretations can be made. However, the association between dental fear and tobacco use can be generalized with some caution to adolescent Finns at the time of the study.

In conclusion, as among adults, adolescent tobacco users were also more likely to have dental fear than non-users. During adolescents' oral health care, dental teams should ask about dental fear and tobacco use. Those reporting dental fear should be provided treatment for their dental fear and brief tobacco intervention (Leite *et al.*, 2018) should be given to those using tobacco. The possible common vulnerability factors for dental fear and tobacco use need further research.

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