Association of Smoking in Household and Dental Caries in Japan

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Abstract

Objectives: *The study investigated the relationship between smoking in the household and dental caries in Japanese children using nationally representative cross-sectional data.* ***Methods:*** *This study included 925 children aged 1-14 years. A child was considered to have decayed and/or filled teeth if a dentist diagnosed these conditions in deciduous or permanent teeth. Smoking in the household was defined as positive if someone in the household reported smoking cigarettes.* ***Results:*** *No statistically significant relationship was observed between household smoking and caries experience. However, smoking in the household was independently associated with an increased prevalence of decayed teeth. The adjusted mean of filled teeth among children exposed to household smoking was higher than that among non-exposed children.* ***Conclusions:*** *The results of the study failed to substantiate a positive association between passive smoking and caries experience in Japanese children.*

Key Words: Cross-sectional studies, dental caries, Japan, passive smoking

Introduction

Many studies have reported the adverse impact of cigarette smoking on dental health. Because both cigarette smoke and environmental tobacco smoke (ETS) contain numerous chemicals produced by burning tobacco, it is reasonable to assume that ETS exposure might also affect dental diseases.

To the knowledge of the authors, three cross-sectional studies have examined the relationship of ETS to oral health in children (1-3). Among UK pre-school children, maternal smoking was significantly associated with an increased prevalence of caries in deciduous teeth (1). A US study found a significant positive association between serum cotinine levels and caries in deciduous but not in permanent teeth of children from 4 to 11 years old (2). Another study demonstrated that US children from 4 to 7 years old residing with a smoker had a significantly higher prevalence of caries in primary dentition compared to those residing without a smoker (3).

The aim of this study was to investigate the association between smoking in the household and the prevalence of dental caries in Japanese children by using data from the National Nutrition Survey and National Survey of Dental Diseases.

Methods

Study population. Data for this study were obtained from the National Nutrition Survey (NNS) and National Survey of Dental Diseases (NSDD) conducted in 1999. The NNS has been conducted annually, and respondents were selected in a two-stage cluster sampling (5). In the first stage, 300 areas were selected randomly from a total of about 1,000 areas that were defined by the annual report of another national survey. In the second stage, households were selected within each regional area. A dietitian visited each selected household to collect information on dietary habits. Household members were given a physical examination at their local health center, which included anthropometric measurements of height and weight for individuals aged 1 year and older and an interview on lifestyle factors such as smoking habits for individuals aged 20 years and older.

The NSDD has been performed together with the physical examination associated with the NNS every 6 years. All participants_underwent a dental examination by direct inspection associated with an assessment of oral conditions, such as the number of treated and untreated teeth, and pocket depth, and an interview on tooth brushing habits. Experience with topical fluoride application in children aged 14 years or less was determined. Radiographs were not undertaken.

The data from the NNS and NSDD were stored independently, so we combined these records using the household identification number. Of the 12,763 individuals who participated in the NNS, 6,903 took part in the NSDD. This study was restricted to children aged 1 to 14 years who participated in both the NNS and NSDD and provided complete information on tooth brushing habits and topical fluoride application, leaving 925 individuals for analyses.

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Measurements. In the current study, available relevant information from the NNS were age, gender, region of residence, height, weight, and smoking in the household. If someone in the household reported smoking cigarettes at the time of the survey, smoking in the household was defined as positive. If a dentist diagnosed decayed (cavitated enamel, dentin, and access to dental pulp lesions) and/or filled deciduous and/or permanent teeth, the child was considered to have these conditions. Fluoride application was defined as positive if children reported at least one treatment with topical fluoride. Body mass index was calculated by body weight in kg by the square of height in m.

Statistical methods. Age, gender, region of residence, tooth brushing frequency, experience of topical fluoride application, and body mass index were selected as confounders. Multiple logistic regression analysis was used to control for potential confounders under study. We took into consideration clustering within families via the PROC GENMOD procedure. All computations were done by the PC-SAS version 9.1 (SAS Institute, Inc., Cary, NC).

Analysis of covariance was employed to calculate adjusted means of decayed and/or filled teeth (DFT), decayed teeth (DT), and filled teeth (FT) according to household smoking. As the number of children with deciduous teeth was relatively small (n=572) and there was no material difference in the association with household smoking between deciduous and permanent teeth, results were presented for deciduous and permanent teeth combined.

Table 1
Distribution of selected characteristics of Japanese children, age 1-14

Variables	n=925 (%) or mean (SD)
Smoking in household (%)	
No	57.5
Yes	42.5
Age (years) (%)	
1–6	47.9
7–14	52.1
Gender (%)	
Male	52.0
Female	48.0
Region of residence (%)	
East Japan	52.7
West Japan	47.3
Toothbrushing frequency (% times/day)	
1 or less	38.7
2+	61.3
Experience of fluoride application (%)	
No	48.5
Yes	51.5
Mean body mass index (kg/m^2)	16.7 (2.5)

Results

Among 925 Japanese children, the prevalence values for DFT, DT, and FT were 61.2%, 36.5%, and 49.3%, respectively. About 43% of children had at least one smoker in the household (Table 1).

After multivariate adjustment, no statistically significant relationship was observed between smoking in the household and the prevalence of DFT and FT (Table 2). However, household smoking was independently associated with an increased prevalence of DT (adjusted odds ratio=1.34, 95% CI=1.02–1.76). The adjusted geometric means of FT, but not DFT or DT, among children exposed to household smoking was significantly higher than that among non-exposed children.

Discussion

The authors have no immediate explanation for their observations. Active and passive smoking would affect oral health through the same mechanisms. The dose of smoke is lower with passive smoking than with active smoking, however. Alternatively, some unknown factors related to household smoking might produce spurious associations of smoking in the household with DT and FT in the current study. Among Japanese women aged 20-29 years, current smokers had more decayed and missing teeth and fewer FT than ex-smokers and non-smokers, although no significant relationship between smoking status and caries experience was observed (6). The results with regard to an association between household smoking and FT are not likely to be consistent with this observation.

The present investigation had methodological strengths that include use of a nationally representative sample (7) and clinical assessment outcome. This study has several limitations. The study design was cross-sectional; therefore the results do not necessarily indicate a causal relationship. Information on household smoking was crude. This would bias the estimates of association toward the null. Both the National Nutrition Survey (NNS) and National Survey of Dental Diseases (NSDD) did not include questions on active smoking among children and socio-economic status. Regarding socio-economic status in Japan, a cohort study showed that current smokers were likely to be more educated among Japanese men and women (8), whereas another study showed that there was an inverse association of high education and family income with active smok-

Table 2
Prevalence of and crude and adjusted odds ratios (ORs) and 95% confidence intervals (CIs) for decayed and/or filled teeth in relation to smoking in the household (yes or no) of 925 Japanese children, age 1-14

		Prevalence (%)	Crude OR (95% CI)	Adjusted OR (95% CI)*	Adjusted means of caries teeth (95% CI)†
Decayed and/or filled teeth					
Smoking in household	No	317/532 (59.6)	1.00	1.00	4.2 (3.9–4.6)
	Yes	249/393 (63.4)	1.17 (0.90–1.54)	1.26 (0.93–1.69)	4.5 (4.1–4.9)
	P for trend‡				0.37
Decayed teeth					
Smoking in household	No	179/532 (33.6)	1.00	1.00	2.5 (2.3–2.8)
	Yes	159/393 (40.5)	1.34 (1.02–1.76)	1.34 (1.02–1.76)	2.3 (2.1–2.6)
	P for trend‡				0.36
Filled teeth					
Smoking in household	No	263/532 (49.4)	1.00	1.00	3.3 (3.1–3.6)
	Yes	193/393 (49.1)	0.99 (0.76–1.28)	1.03 (0.76–1.40)	3.9 (3.6–4.3)
	P for trend‡				0.01

*Based on multiple logistic regression controlling for age (1–6 and 7–14 years), gender, region of residence (East and West Japan), tooth brushing frequency (1 or less and 2+ times/day), experience of fluoride application (yes and no), and body mass index as a continuous variable.
†Analysis of covariance was employed to calculate adjusted means of each outcome according to smoking in household with allowance for age (1–6 and 7–14 years), gender, region of residence (East and West Japan), tooth brushing frequency (1 or less and 2+ times/day), experience of fluoride application (yes and no), and body mass index as a continuous variable.
‡*P* for trend across two categories using multiple regression analysis controlling for age (1–6 and 7–14 years), gender, region of residence (East and West Japan), tooth brushing frequency (1 or less and 2+ times/day), experience of fluoride application (yes and no), and body mass index as a continuous variable.

ing in Japanese young adult women (9). To avoid reducing statistical power due to small sample size, the authors analyzed teeth without distinguishing deciduous and permanent teeth. Of individuals who participated in the NNS, only 6,903 took part in the NSDD, although it seems that they shared similarities in basic characteristics such as the prevalence of current smoking and age distribution (4).

Further investigations with more objective and detailed information on passive smoking status and confounding factors such as socioeconomic status are necessary to draw a conclusion regarding whether passive smoking is a risk factor for childhood oral diseases in Japan.

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