Original Article

Parental Smoking and Dental Caries in Children Aged 6-14 Years

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Abstract

Background: Smoking is one of the major factors that threatens human health. There is a controversy regarding the relationship between family members' smoking behaviour and dental caries in children.

The purpose of this study was to evaluate the relationship between parents' smoking behaviour and incidence of dental caries in their children who are considered passive smokers.

Methods: This study was conducted as a case-control method. 800 students within the age of 6 and 14 years old were randomly selected by sex and educational level. All the students were assessed in terms of the following factors: age; gender; educational level; school type; diet; frequency of tooth-brushing; frequency of parents' smoking behaviour; number of smoker parents; number of teeth and general oral habits. This information was obtained through the questionnaires completed by parents. According to the World Health Organization (WHO) criteria, the Decayed, Missing and Filled Teeth index (DMFT/dmft) of the students were recorded by clinical examination through a disposable explorer and mirror without radiography. The relationship between the studied variables was examined by Logistic regression method.

Results: Data of this research show that there is a significant relationship between the exposure time to the smoke and the dmft/DMFT. It has been found that the longer exposure time since birth resulted in more DMFT / dmft changes (p=0.000).

Conclusion: The results of this study showed that parental smoking significantly affects the caries of deciduous and permanent teeth in their children.

Keywords: Children, Dental Caries, Parents, Passive Smoking, Teeth

Introduction

Smoking is one of the major factors threatening human health across the world[1-6]. It negatively affects lifestyle[7], mental health[8], lung's function[9] and causes respiratory disorders[10] and infections[9,11]. In addition, smoking influences oral health[8,12,13].

Several studies have reported the relationship between parental smoking behaviours and oral pigmentation[14], buffering capacity of saliva[15] and dental caries in their children[13,16,17,18]. Aligne *et al* showed an association between serum cotinine levels and the prevalence of caries in deciduous but not permanent teeth in children aged between 4 to 11 years in the US[16]. A cross-sectional study in Belgium demonstrated that the effects of family smoking status were not significant in 3-year-old children but there was a significant relationship between parental smoking and caries in their 5 years old children[17].

The results of the study carried out by Tanaka *et al* on Japanese children aged between 1 to 14 showed no significant relationship between passive smoking and caries[19], however another research indicated that parental smoking significantly affects dental caries in 3 years old children[20].

The results of another study showed that exposure to tobacco smoke at the age of 4 months was associated with an approximately twofold increased risk of caries in deciduous teeth[21]. Also, parental smoking significantly increases the risk of microorganisms, such as *Streptococcus mutans (S. mutans)* and Lactobacilli[22].

Given the importance of dental caries in children's health status and the causation effect of parental smoking on children's dental caries, investigating the relationship between these parameters is highly important in terms of oral hygiene. It is believed that by identifying and then eliminating the risk factors of dental caries, children's oral health can be improved.

Epidemiologic evidence of an association between passive smoking and dental caries in children is inconsistent, therefore, the aim of this study was to examine such a relationship.

Materials and Methods

This study was conducted using a cross-sectional method. NCSS-PASS version 11 and considering a 0.12 correlation between DMF and plaque index and pilot study was used to identify, the number of required samples, which was 800. The significant relationship was considered to be 92%.

800 students (400 female and 400 male) in the age of 6 and 14 years were randomly selected by sex and educational level (school grade).

Samples were selected from male and female students in elementary and middle schools, and from public and private schools in municipal district 6 of Tehran. Samples comprised an equal share from each school grade and students from each school were randomly selected. Exclusion criteria were any history of systemic diseases such as diabetes mellitus.

All the 800 students were assessed in terms of age; gender; educational level; school type; diet; frequency of tooth-brushing; frequency of parental smoking; number of smoker parents; number of existing teeth and oral habits. This information was obtained through the predesigned questionnaire, which was completed by the parents. According to the WHO criteria, the Decayed, Missing and Filled Teeth index (DMFT) of the students were recorded by clinical examination using disposable explorers and mirror in ambient natural light without radiography, inside school. The students were then divided into three groups of 6-8, 9-11 and 12-14 years, based on their age.:.

The daily frequency of tooth-brushing was divided into four categories of less than one time, 2 times, 3 times and more. The frequency of smoking was grouped as: never; sometimes; less than 10 times; 10 times and more. Smoking parents were divided into 4 groups of no smoker parents; only father smokes; only mother smokes; both parents smoke.

The status of the oral habits and consumption of sugar-containing foods was divided into two groups of Code 1: Having oral habits and sugar consumption; Code 2: Without oral habits and non-sugar consumption.

The school types (public and private) were used as the indicating factor of socio-economic status. DMFT of 5 was regarded as the cut-off.

The relationship between variables and DMFT was analyzed using SPSS version 22. In this study, descriptive statistics methods including tables and graphs and data analysis, was carried out in two ways. The first showed a quantitative correlation between oral health index with plaque index and in the second way showed the regression logistics for evaluation of the relationship between DMF index (binary) and the studied variables. Data was analysed using SPSS software version 22.

Results

Of the 800 students who were selected, 789 questionnaires were completed for. The Pearson correlation coefficient test showed a positive correlation between plaque index, so DMFT increased with an increase in the plaque index accordingly (Pearson's correlation coefficient was 0.147 and p-value was<0.05). The results of this study showed that dmft/DMFT was significantly higher among passive smoker children (p=0.000; Table 1).

Table 1. Relation between smoking and dental caries

	Smoking	No smoking
DMFT	4.90	3.32
DFT	2.43	1.73
FT	2.11	1.87
DT	2.76	1.60

DMFT: Decay, Missing, Filled Teeth
DFT: Decay, Filled Teeth
FT: Filled Teeth
DT: Decay Teeth

There was directly a significant relationship between the exposure time to cigarette smoke and the dmft/DMFT with a p-value of 0.000 indicating a longer exposure time since birth resulted in more DMFT/ dmft.

In addition, based on the results of the fitness of regression logistic model, consumption of sugary snacks during the day showed the same relationship with DMFT. This means that children who consumed more sugary snacks had higher values of DMFT (p=0.000).

There was a significant relationship between DMFT and health status and tooth-brushing (p=0.021).

Furthermore, oral habits were significantly related to DMFT with a p-value equal to 0.008. The final analysis of dmft/DMFT parameter and the school type showed that students from public schools had a higher mean DMFT than students from private schools (p=0.012)

Of all participants, 38 (8.4%) brushed their teeth less than once a day; 545 (69.1%) once; 199 (25.2%) 2 times; and 7 (9.0%) 3 or more times per day (Table 2).

The frequency of tooth-brushing per day was inversely associated with the DMFT (β=0.420); that shows an increase in the frequency of brushing reduces dmft/DMFT changes and vice versa (p=0.021).

Several subgroups were also checked to evaluate the effect of smoking on children's oral health:

1. Children's exposure to cigarette smoke and its duration.
2. The number of cigarettes smoked by the parents.
3. The number of smoker parents at home including no-smoker parent; only a father smoker; only a mother smoker; and two smoking parents.

The lowest and highest durations of exposure to cigarette smoke were 0 and 14 years, respectively.

The minimum and maximum number of cigarettes smoked by parents were recorded as 0 and 10.

387 children (49%) had non-smoker parents; 373 children (47.3%) had smoker fathers (group 1); 15 children (1.9%) had smoker mothers (group 2); and 14 children (1.8%) had two smoker parents (group 3).

If the children with non-smoker parents were considered as the basis to measure against the other groups, then Group 1 (with β of 1.360) shows a higher DMFT than the base group; Group 2 (with β of 0.907) has a higher DMFT than the base group, but with less ratio.

Group 3 (with β of 1.0401) had a higher DMFT compared to the base group and Group 2, but was less than Group 1. Group 3 (with β=1.0401) had more dmft/DMFT compared to the base group and Group 2, but less than Group 1 (Table 1).

Table 2. Relationship between dental caries and related factors

Variable	p-value	Exp (B)	95% C.I. for EXP(B)	
			Lower	Upper
Sex(1)	0.078	1.367	0.966	1.935
school	0.012	1.045	0.462	0.909
Toothbrush	0.021	1.657	0.460	0.939
Tooth_number	0.101	0.867	0.732	1.028
Tooth_habit(1)	0.008	1.098	0.153	0.750
Snack(1)	0.000	1/913	0.111	0.348
Family_number	0.356	1.120	0.881	1.423
Age_categorize	0.632			
Age_categorize(1)	0.360	0.834	0.565	1.231
Age_categorize(2)	0.514	0.766	0.345	1.704
Smoke_exposure	0.000	1.963	1.037	1.059
Constant	0.022	119.365		

Discussion

It is necessary to identify and remove the risk factors for preventing dental caries, especially in children. Deleterious effects of smoking on people's health and lifestyle are already proven. Also the effects of toxic substances in cigarette smoke on oral health are well known such as discoloration of teeth, gum diseases and cancers of oral cavity in smokers[1-8,23,24].

The aim of this study was to investigate the relationship between passive smoking and dental caries in children.

The results showed that parental smoking increases dental caries in children.

Cigarette smoke decreases oxygenation and saliva concentration, ending up in a reduced washing effect of saliva and increased rate of decay[22]. Therefore, a longer duration of exposure to cigarette smoke increases nicotine absorption and intensifies the decay process[25]. One cigarette imports around 2 *mg* of nicotine into the blood, which causes chemical and biological changes in the brain[26].

Variables such as gender, age, health care, number of cigarettes smoked, duration of exposure, oral habits, number of teeth, number of family members and school type can be considered as effective factors when examining the dental caries[27].

In this study, the relationships between each variable and DMFT were firstly evaluated and those with a $p<0.2$ were selected for the final analysis. In order to enhance the test sensitivity, the second stage relationships were calculated with $p<0.05$ and the logistic regression analysis was used for interpretation.

According to Tanaka's study, no significant relationship was found between family members' smoking behaviours and incidence of dental caries in their children[19]. The age range was too wide in their study. In addition, other factors affecting the decay have not been studied that may explain the differences between the results of these two studies.

Haji Fattahi *et al* suggested that the polycyclic amines, such as nicotine and benzopyrene, stimulate the production of melanin products and the melanocytes of the gingiva are sensitive to cigarette smoke[14].

Cigarette smoke contains more than 4000 various toxic substances including aldehydes, acids, phenolic compounds, alkaloids and hydrogenated compounds. Nicotine belongs to the alkaloids with a half-life of one hour in the body so it takes one hour for nicotine to lose half of its content in the body. However, smoking-related toxins are still presenting in the exhalation air for up to three hours. Exposure to nicotinic processes is suppose to change the demineralization and remineralization patterns of the teeth[25].

In a study by Avsar and his colleagues on passive smoking, tooth decay and saliva biomarkers in children, which is found in smokers' exhalation air and can be absorbed by the mucous, increases in saliva and serum and results in a reduction of vitamin C levels. This is directly related to growth of cariogenic bacteria of *S. mutans*[22].

In a study on the effect of parental smoking on Early Childhood Caries (ECC) among 3 years old children, Hanioka found a significant increase in the risk of developing decay[20]. This is consistent with our results, however, the present study addresses the effect of parental smoking on dental caries in both deciduous and permanent teeth.

In our study, the effects of parents' smoking on the decay of deciduous and permanent teeth in children aged between 6 and 14 years were also assessed. One of the limitations of this study was to obtain information about parents' smoking behaviours. The questionnaire was taken home by children and filled in by the parents, but some parents did not give accurate information about their smoking habits. The other limitation was not taking oral radiography, which might explain why some proximal caries were underestimated.

The results of our study cannot be generally applicable to populations of other countries with different environmental factors such as fluoride exposure. This is because fluoridation of water is currently carried out in Tehran, but not in many other cities around the world.

Conclusion

The results of this study have showed that parental smoking significantly affected the incidence of caries in both deciduous and permanent teeth of the children.

Conflict of Interest

We have no conflict of interest.

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