

# Association of parental smoking and dental caries in children – A Review

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## ABSTRACT

Dental caries involves the endogenous oral bacteria. There are several evidence for considering passive smoking as one of the etiologies in dental caries development. In children who are exposed to smoking environments, Vitamin C is found in low level, and low levels of Vitamin C are associated with decreased immune function and *Streptococcus mutans* growth. Decrease saliva and reduces buffering capacity in children are also associated with passive smoking. Passive smoking can also reduce remineralization, the rate of bacterial clearance, and enhance bacterial colonization and may result in dental caries. This article is to review on parental smoking and its association with dental caries in children.

**KEY WORDS:** Bacteria, Children, Dental caries, Smoking, *Streptococcus mutans*

## INTRODUCTION

Cigarette smoking and other tobacco uses impose a huge and growing burden for public health globally. Approximately 5 million people die annually by tobacco use and apparently the number seems to be significantly high with the current lifestyle.

Around 700 children were exposed to environmental tobacco smoke (ETS) or passive smoking which was reported in a study made in Prague. Frequent exposure to ETS induces serious diseases such as pneumonia, asthma, colic, reduction in pulmonary function, and high rate of malignancies in children. There is strong evidence that tobacco use has numerous negative effects on oral health as well as ETS is currently causing dental caries in children.

The principal objective of this review is to discuss one of the lesser explored areas, the influence of the ETS or passive smoking on dental caries development in children.<sup>[1]</sup>

The Third National Health and Nutrition Examination Survey (1988–1994) has provided strongest evidence

of increased risk of dental caries in the deciduous dentition of children who are 4–11 years of age and has been exposed to passive smoking or ETS. A study done in 2004 also confirmed that children residing in regularly smoking homes had significantly higher prevalence of caries compared to non-regular/non-smoking.

Research indicates that the bacteria responsible for caries formation are acquired in infancy from the saliva of mothers.<sup>[2]</sup>

Nicotine is shown to promote the growth of cariogenic *Streptococcus mutans* bacteria *in vitro* thereby transmitting these germs to children. It has also been proved that ETS can promote dental caries either directly by affecting the protective properties of the saliva or by indirectly causing dry mouth due to mouth breathing in cases of increased inflammation in the respiratory system. Although there are no consistent strong evidences to prove ETS causing dental caries in children.<sup>[3]</sup>

Another possible reason given is that colonization with the cariogenic *S. mutans* is thought to occur during a window of vulnerability around 1 year of age, and primary teeth are particularly susceptible to caries formation soon after their eruption. Maternal smoking being a principal risk factor for premature, low birth

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weight, and low immunity levels in infants, in turn, is all associated with generalized enamel hypoplasia in primary dentition.<sup>[4]</sup>

What is more puzzling is that it was observed that ETS had no effect on the permanent dentition. Moreover, the only possible explanation would be that the enamel in that of a deciduous dentition is much thinner than that of a permanent dentition. Unfortunately, very few studies have been done in this regard. Hence, findings are not sufficient enough and conclusive that ETS causes dental caries. Hence, further studies are required on this subject.<sup>[5]</sup>

## DISCUSSION

Dental caries occurs predominantly in younger children and various factors can influence the development of dental caries in children including parental smoking. Children are known as secondhand smokers (SHS) if they are exposed to parental smoking. The relation between SHS and dental caries in children can be direct or indirect. In the direct mechanism, tooth which is being affected by either exposure to nicotine or heavy metal such as cadmium may impair mineralization of tooth.<sup>[6]</sup>

Dental decay appears to be an infectious disease that involves colonization by *S. mutans*. Fermentation of carbohydrate causes production of lactic acid by these bacteria and the acid dissolves the surface structure of teeth.<sup>[7]</sup> Most important factor of SHS is microorganism which causes direct effect such as decreasing immune function and blood level of Vitamin C and thus increasing the colonization of cariogenic bacteria.<sup>[8]</sup> We hypothesized that ETS, a common cause of pediatric morbidity and mortality that disproportionately affects children in low socioeconomic status environments may be a risk factor for cavities. ETS is also associated with periodontal disease in adults.<sup>[9]</sup> Moreover, research indicates that the bacteria responsible for caries formation are acquired in infancy from the saliva of mothers (through kissing, breastfeeding, or even sharing plates and spoon).<sup>[1]</sup> Elsewhere, nicotine has been shown to promote the growth of cariogenic *S. mutans* bacteria *in vitro*. Thus, mothers who smoke may be more likely to transmit these germs to their children than non-smokers. ETS has immunosuppressive properties and is a known risk factor for infections of the cranial organs; thus, it is not surprising that it would be a risk factor for caries development, which is an oral infectious disease.<sup>[1,10]</sup> In addition, ETS is associated with decreased serum Vitamin C levels in children and which, in turn, is associated with growth of cariogenic bacteria. Furthermore, it is possible that ETS may reduce the protective properties of saliva that operates against caries.<sup>[10]</sup>

In smokers, buffering capacity of saliva decreases and there will be increased numbers of lactobacilli and *S. mutans* count and this happens to children who reside with smokers.<sup>[11-13]</sup> Low levels of saliva due to low salivary gland function will also enhance the colonization of cariogenic bacteria on rough tooth surfaces and interrupt clearance of fermentable carbohydrate from the mouth.<sup>[14]</sup> Decreased function of the salivary gland will also decrease remineralization of tooth surfaces. The tentative effects of SHS regarding tooth formation and salivary gland function would be altered during pregnancy as well as after delivery. The present review of related articles did not find sufficient evidence regarding maternal smoking during pregnancy. Further studies that focus on maternal smoking during pregnancy should be conducted to examine these hypotheses.

Children have many different ways of acquiring SHS. They may inhale SHS through the mouth if they have nasal congestion<sup>[15]</sup> and through breastfeeding from a smoker mother which will result in intoxication of heavy metals.<sup>[16]</sup> Recent research has found that tobacco smoking is associated with elevated levels of *S. mutans* and lactobacilli in saliva.<sup>[17]</sup> These findings may indicate increased susceptibility to dental caries in children who reside with smoking parents.<sup>[18,19]</sup> In a study conducted by Prabakar *et al.* on prevalence of dental caries and treatment needs among school-going children of Chandigarh, they concluded that there is high prevalence of dental caries in primary dentition than permanent dentition and most of the decayed teeth were untreated, this implies urgent need for awareness initiative for preventive dental health behavior and attitudes.<sup>[20]</sup>

## CONCLUSION

Parental smoking increases the risk of dental caries in children as there is an association between ETS and the development of caries. Therefore, reduction of passive smoking is not only important for the prevention of many medical problems but also for the preservation of children's dental health.

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