

## Actual Approaches in Prevention of Early Childhood Caries

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### ABSTRACT

**Objective:** The studies which based on preventive programs presented that promotion of the mother's oral health status and diet habits provide a simple, long-term and very important protection on the infant caries. Also, it is reported that oral health educations, preventive applications and dietary recommendations can prevent bacterial transmission from mothers to infants during the infectivity window. The aim of this paper is to explore actual preventive approaches in eliminating the occurrence of dental caries in early primary dentition period.

**Methods:** A comprehensive literature search of the basic and actual published studies in PubMed/MEDLINE regarding the efficacy of preventive methods and dental treatments aiming to prevent of early childhood caries was performed.

**Conclusion:** Preventive interventions in mothers may cause decline in the future caries experience of infants. Dental treatment of mothers with high numbers of MS by dietary and antimicrobial measures could reduce the risk of spreading cariogenic microorganisms to their infants and thus reduces the caries risk in the children.

**Keywords:** Dental caries, early childhood caries, mutans streptococci, primary prevention

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## **INTRODUCTION**

Dental caries is an infectious disease that is caused by demineralization of inorganic components of the dental hard tissues due to bacterial acids (1). Despite general advances in preventing therapies of dental caries, today it is still a public health problem. The disease is more widespread in the developed countries due to greater simple sugar consumption (2).

As dental caries results from interactions between teeth and acids produced by acidogenic bacteria (*Mutans streptococci* and *lactobacillus species*), there is a close relationship between dental caries and cariogenic bacteria (3). The bacterial acids cause pH decrease resulting in demineralisation of susceptible tooth tissue (4, 5). Pathological factors which include the presence of pathogenic bacteria, reduced salivary secretion, and increased frequency of fermentable carbohydrates consumption advance this process. On the other hand, protective factors which include protective salivary components, increased salivary flow, and fluoride or intake of other remineralization/antibacterial agents can balance, prevent, or reverse dental caries (6).

Tooth decay is among the most expensive infections experienced during life (1). The economic burden of tooth decay, which can progress into pulp infections if remains untreated, is expressed in million dollars (7). Nowadays, there has been a transition in management of dental caries from operative methods to a preservative approach (8). This article reviews knowledge of early childhood caries and preventive strategies of this multifactorial disease before any treatment requirement.

### **Pathology of dental caries**

Tooth decay is defined as a micro-level mineral loss on the tooth surface by acid production of acidic and acidogenic bacteria in the presence of increased fermented carbohydrate intake (9). It is emphasized that there is a significant relationship between the amount of the bacteria named Mutans streptococci, in particular *Streptococcus mutans* (*S. Mutans*) and incidence of

tooth decay (9, 10). As a result of its ability to colonize at the tooth surface, *S. Mutans* can cause a marked reduction in oral pH in the presence of a sugar substrate and thus induce demineralization of dental hard tissues (11). *Lactobacilli* associated with dentin caries and progress of caries lesion. Acid production of these cariogenic bacteria led to demineralization of dental tissues and cavity formation (9).

The dental plaque is described as a complex biofilm layer which is attached to the tooth surface and formed by microorganisms embedded in microbial originated extracellular matrix polymers (12). Susceptible tooth, caries-causing bacteria present in the dental plaque which formed on tooth surface and acidogenic diet main causative factors are dental caries. Early plaque accumulation in primary and mixed dentition is accepted a sign of caries risk in children (9).

### **Transmission of the disease**

The primary way to prevent tooth decay which is an infectious disease is to prevent the spread of the causative agent in the community. Mothers are considered to be the primary source of transmission of caries infection to new-borns and infants can be infected between 1.5 and 3 years of age (13). Early childhood caries (ECC) is defined as an infectious and transmissible disease. ECC is strongly associated and caused by the bacteria *S. Mutans* and it is known that infants receive *S. Mutans* from their mother or other family members (14).

The primary way to prevent ECC is to inhibit transmission of the dominant bacteria (14). *S. Mutans* colonization in new-born begins with the eruption of primary teeth and reaches the highest levels in months 19-31 in line with the increased number of erupted teeth. This period is also defined as “infectivity window”, and new-borns are at greater risk of becoming infected from their mothers and caregivers (9, 13, 14). Poor maternal oral health in pregnancy and postpartum period can contribute caries development in new-borns through infectious, genetic, social and behavioural factors (15). It is reported that *S. Mutans* binds to

human salivary components and cannot maintain its vitality outside the oral cavity (16). Thus, the most important factor in spread of *S. Mutans* infection is saliva transfer from infected individuals (9, 13, 14). Previous studies have reported that caries in mothers can transfer caries-causing oral bacteria to her child (vertical way) (17–19). Also, the bacteria can be transmitted if the siblings use same pacifier or utensils (horizontal way) (20). It has been reported that the transmission of MS to infants occurs later and that the acquisition of bacterial genotypes is prevented or delayed through parental education of preventive oral health practices and dietary suggestions (21–23).

### **Mother's role in management of dental caries**

The individual's future oral health is greatly influenced by early childhood hygiene procedures and habits. It is essential to improve oral hygiene practice of mothers and caregivers via preventive programs and treatment of their primer caries lesions (24). Maternal *S. Mutans* and *Lactobacilli* levels detected using the current diagnostic tests indicate the risks of maternal transmission and put caries preventive measures into practice for infants (9, 10, 19). Mother-child caries prevention programs are suggested as a very modern approach to inhibit bacteria transmission to infants and prevention of development of early childhood caries, especially in the areas of low socio-economic levels with limited access to dentists (25). The necessity of the mother's oral health programs which aim to reduce the number of caries in children has been proven at long-term studies (23, 24, 26).

The increasing awareness of mother about oral health facts and practices of the later generations are essentials of primary prevention concept. Furthermore, the earlier the preventive programs are applied in the patient, the less likely dental plaque originated diseases will develop (25). Breastfeeding or giving bottle at bedtime creates a suitable environment for the rapid growth of bacteria. Decreased release of saliva during night-time facilitates dissolution of dental hard tissues by acidogenic bacteria products (27). For this

reason, mothers should stop giving bottle during sleeping and be instructed to clean the primary teeth before putting the baby to sleep (28). The frequent intake of high-sugar foods and snacking habits has also been associated with early childhood caries in infants (28). Mothers should be given oral health care information during the ante- or postnatal periods and have active participation in oral preventive programs (29, 30). Also, the patients should believe that the program is essential for prevention of the oral diseases (23).

Nowak and Casamassimo (31) reported that preventive applications implemented with family physicians can increase the number of non-carious individuals in the community and may be useful in parents' oral health education. Pierce et al. (32) reported that after 2 hours of training, the paediatric primary care providers in their study achieved an adequate level of accuracy in identifying children with cavitated carious lesions and they were able to identify the children who need to see a dental treatment. Kagihara et al. (33) emphasized that preventive programs with primary health care provider-delivered guidance are highly effective in preventing ECC. Multiple studies have also documented that reduced amount of MS salivary levels in mothers have led to reduced MS colonization or caries activity in their infants (Table 1).

### **Determination caries risk status and oral hygiene procedures**

Caries risk may be defined as the probability that a specific number of new lesions will develop and/or a specific number of existing lesions will progress over a specified period of time. Determination of caries risk of society ensures early detection and diagnosis of caries lesions and periodontal diseases (38). The health authorities use a variety of index systems to determine the public oral health status. DMFT (Number of Decayed, Missing, Filling tooth) and DMFs (Number of Decayed, Missing, Filling tooth surface) which are used based on the proposal of World Health Organization (WHO) describe the tooth decay prevalence of populations. DMFT and DMFS stand for the most powerful predictor of all for caries

increment associated with high-risk patients and used to make a prediction about future caries risk of patients (38).

It is well documented that caries protection programs among high-risk individuals can prevent early colonization of *S. Mutans*, mainly during the first 2.5 years of age (29,35,37). Mother or caregiver has active caries, low salivary flow, high microbial count, defective restorations, special health care need or low socioeconomic status need caries progression and prevention program and regular monitoring (39). All these markers are important to determine precautions and minimal treatment methods about caries lesions and periodontal diseases in extremely high-risk mothers (39). Oral health education, dietary recommendations, treatment of caries lesions and periodontal tissues are basic methods used in these programs for suppression of bacterial growth in the oral cavity. Caries management also requires an antibacterial agent in combination with fluoride (25).

Dental plaque is a layer which is composed of salivary proteins and bacteria. It is the main cause of the periodontal diseases and tooth decay (12). High amount of plaque with poor oral hygiene means results in an elevated level of disease-causing bacteria adhered to the tooth surface and this plaque becomes more cariogenic in a synergistic way when nutritional sugar is added because this combination produces acids that begin the tooth demineralization (1, 7, 12). The most effective way of removing of dental plaque and control the plaque bacteria is regular toothbrushing, using dental floss, and mouthwashing habits (25). Toothbrushing with a fluoridated toothpaste is able to remove plaque sufficiently and is effective in reducing caries incidence (40). Also, flossing will remove interproximal plaque and control dental caries and periodontal diseases (41). Individuals who have good oral hygiene have a lower incidence of caries and systemic diseases (42).

It has been shown that regular toothbrushing with fluoride containing toothpaste, using dental floss and mouthwash, chewing xylitol gum, and treatment of dental caries and

periodontal diseases by dentists give rise to a lowered probability of transmitting maternal *S. Mutans* to their infants (43). According to available literature, mothers whose saliva levels of *S. Mutans* is at least  $10^5$  per ml, the probability of colonization is higher than others (44). The reduction in maternal *S. Mutans* levels minimizes the caries incidence, and the probability of transmission of *S. Mutans* from mothers to their infants (45).

## CONCLUSION

Dental caries requires active leadership and promotion by the dental professionals. In case preventive programs are started before pregnancy, plaque-originated oral diseases can be prevented. Preventive techniques can effectively control cariogenic bacteria and other pathogens, and can inhibit their transmission. This not only means prevention of tooth caries and periodontal diseases but also provides economic benefits. The mother should be aware of the fact that the oral hygiene and feeding habits she has developed during pregnancy and postpartum period will directly affect the oral health of the infant. They should also be reminded that sleeping with the bottle or breastfeeding at night poses a significant risk for ECC.

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Table: Studies that reported *S mutans* transmission mother to her child

Author, year	Mother-and-child pairs	Preventive measures to reduce the transfer	Follow-up period	Clinical relevance
Brambilla et al. 1998	Pregnant women and their babies (n=65)	0,05% NaF and 0,12% CHX mouthwash	30 months	Treatment significantly reduced salivary <i>S. Mutans</i> levels in mothers and delayed the colonization of bacteria.
Gomez and Weber 2001	Pregnant women and new mothers on their offspring (n=360)	Fluoride varnish and restoration of caries	3 years	The preventive dental program was effective in inhibiting caries in pre-school children
Gomez et al. 2001	Pregnant women and their babies (n=137)	Fluoride varnish and restoration of caries	5 and 6 years	The preventive dental program was effective for a long-term reduction of dental caries
Dasanayake et al. 2002	Mothers who have 6 months old infants (n=75)	10% Chlorhexidine varnish	42 months	This intervention did not significantly alter the <i>S. Mutans</i> colonization in children or the caries increment
Thorild et al. 2006	Women with new-born babies (n=173)	Chewing gums containing combinations of xylitol, sorbitol, chlorhexidine and fluoride	4 years	Less caries was observed in children of mothers who chewed gums with xylitol.
Güler and Köprülü, 2011	Pregnant women and their babies (n=60)	Fluoride varnish and restoration of active caries	24 months	The preventive program applied to the pregnant women reduced both the amount of plaque and <i>S. Mutans</i> colonization.
Köhler and Andreen 2012	Mothers who have 6 months old infants (n=66)	fluoride treatment and the treatment of open carious lesions.	19 years	Early-colonised children, irrespective of group identity, had higher salivary MS levels and DFS than later MS-colonised children