

Xylitol and Maternal Transmission of Cariogenic Bacteria- A Review

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Abstract:

Dental caries is a infectious microbiologic disease of the tooth that results in localized dissolution and destruction of calcified tissues. Diet is a major etiologic factor for dental caries. So as an alternate to control dental caries sorbitol-sweetened gum evolved which had low carcinogenicity when chewed more than three times per day. Where as Xylitol-sweetened gum was non cariogenic. There is a good evidence that when mother of infants and young children chew xylitol-sweetened gum, it will block transmission of mutans streptococci from mother to child. This review article discuss about dental caries and how xylitol is effective against maternal transmission of cariogenic bacteria.

INTRODUCTION:

Dental caries is a disease that dentist deals more than 90% of the time. According to the acidogenic theory, dental decay is caused by microbial enzymatic action on ingested carbohydrate. These acids will decalcify the inorganic portion of the tooth: then with the organic portion is disintegrated creating cavities. The proteolysis theory on the other hand, claims that the organic portion is affected first with certain lytic enzymes. This leaves the inorganic portion without a matrix support, causing it to be washed away, creating cavities. In a third theory, microbiotic secretions, or metabolic products of microorganisms, have the ability to chelate calcium from tooth substances, leaving the organic part to be disintegrated. Each of these theories fails to explain all ramifications of the disease, but all three agree on the followings [1]. For the decay to progress there must be:

1. Host(tooth)
2. Parasite(plaque microorganisms)
3. Medium(carbohydrates in the diet)
4. Time

XYLITOL:

Xylitol is a natural five carbon sugar obtained from a birch tree [2]. It is a non-nutritive sweetener that has demonstrated effectiveness for preventing dental caries [3]. It has been introduced in different foods for children including gum, candies, gelatin, sorbets, syrups and other products including multivitamins, lozenges, tooth paste, and oral rinses. Studies have demonstrated that daily 5g of xylitol in different form reduces the dental caries. Reduction of dental caries can be explained by the effect of xylitol on cariogenic bacteria [4]. Xylitol has the same sweetness and bulk of sucrose but with fewer calories [5]. Snacks made with xylitol are well accepted [6].

HOW XYLITOL IN CHEWING GUMS WORKS TO INHIBIT CARIES DEVELOPMENT :

1. Xylitol is not fermented by cariogenic plaque bacteria and, thus, does not lower the pH of plaque. Because plaque pH does not decrease, enamel demineralization is prevented, and plaque bacteria do not proliferate.
2. Xylitol reduces the accumulation of plaque on tooth surface.
3. Since plaque pH does not drop when xylitol-sweetened gum is chewed, remineralization is enhanced.
4. Regular chewing of xylitol-sweetened gum has specific inhibiting effects on growth of MS in the mouth. This suggests that there may be permanent reductions in oral MS level from this practice.
5. Chewing any gum stimulates the flow of saliva, which enhances the buffering effect in plaque. This property is not unique to xylitol- sweetened gum, the chewing effect by itself is seen as as beneficial.

XYLITOL AND MATERNAL TRANSMISSION OF CARIOGENIC BACTERIA:

It has been shown in many studies that infants are commonly infected with mutans streptococci through oral transmission from their mothers [7, 8]. Since xylitol-sweetened chewing gum has been shown to reduce mutans streptococcus counts, a question that arose was whether when xylitol-sweetened gum chewed by mothers of infants would prevent the maternal transmission of cariogenic bacteria. Early evidence is promising, [9-12] though only one study to date has used caries experience in the children as the outcome measure. [9] A study in Finland recruited in 195 mother-infant pairs in which all of the womans had high risk of salivary mutans streptococci. [9]

A statistically significant reduction in colonization of mutans streptococci was observed in the teeth of the childrens whose mothers regularly chewed xylitol- sweetened gum compared with those of children whose mother received fluoride or chlorhexidine varnish treatment. The children themselves received no preventive treatment and were examined annually for caries until 5 years of age. In children aged 5, the caries rate for those in xylitol group was about 70 percent lower than for those in the fluoride or chlorhexidine group. Mutans streptococcus colonization in children aged 2 years was related significantly to each child's age at the first caries in the primary dentition.

A Swedish study of similar design followed 169 mother-child pairs over a two-year period.[10] all mothers showed high salivary levels of mutans streptococci during pregnancy. The 106 mothers in the xylitol group chewed xylitol-sweetened gum at least two or three times per day, starting three months after they delivered their infants. In the two control groups, the remaining 63 mothers received chlorhexidine or fluoride varnish treatments at six, 12 and 18 months after delivery. The childrens themselves did not chew gum or receive varnish treatments. When the children were 2 years of age, those whose mothers had chewed xylitol-sweetened gum had significantly lower salivary mutans streptococcus counts. In a follow up study, the children's mutans streptococcus counts were assessed one year and four years after the mother's gum-chewing had been discontinued.[11] Even in childrens aged 6 years, the salivary mutans streptococcus were significantly lower in those in the xylitol group.

Another study with 173 mother-child pairs with high salivary mutans streptococcus counts used the protocol of chewing a stick of gums for 5 minutes, 3 times per day.[12] The protocol was initiated when childrens were six months old, and it was terminated one year later. As in the previous studies, those in the xylitol group showed significantly lower salivary mutans streptococcus counts than did those in control group.

Collectively, these four clinical studies provide evidence of the effectiveness of xylitol- sweetened gum in reducing maternal transmission of cariogenic bacteria.

CONCLUSION:

Data increasingly support the regimen of chewing xylitol-sweetened gums inhibits plaque accumulation and enamel demineralization, enhance remineralization of early lesions and reduce mutans streptococci. It also evidenced that xylitol helps in blocking the maternal transmission of cariogenic bacteria. Further researches have to be carried out to demonstrate the impact of xylitol on the maternal transmission of cariogenic bacteria.

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