

Estimation in the Reduction of Streptococcus Mutans Count in Mouth by Using Chewing Gum Containing Xylitol

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INTRODUCTION:

Development of caries is a multistage process, the first stage involves the plaque built up and that eventually lead to demineralization of the enamel and the development of caries. Among the bacteria present in the mouth, Streptococcus mutans is implicated as a cause in the initiation of caries. The Developmental cycle is a multistage process. Many factors contribute to this. The major factors are the oral hygiene and the bacterial load in the mouth. Maintaining the oral hygiene and keeping the bacterial load in mouth is very important measures to be taken in order to prevent caries. The efficacy of many prophylactic measure were studied by the previous authors. Previous studies have shown considerable reduction in the risk of developing caries by chewing gums containing xylitol.

Xylitol is a sugar alcohol or polyalcohol. The chemical structure has the ability to stimulate the sweet taste receptors which are present on the tongue.

Xylitol is present in fruits and vegetables. It is available in the form of sugar free chewing gums, candies, mints, etc. It is diabetes friendly and oral care products. It's has a similar taste like the regular sugar but has lesser calories.

Dental caries is destruction and demineralisation of the tooth structure due to acid production by the fermentation of carbohydrates by bacteria.

If there is an increase in salivary secretion, chances of development of caries will be decreased. Retention of debris in mouth for a longer time will lead to plaque accumulation and in turn will facilitates caries activity. Gum chewing will increase salivation. Chewing gum containing xylitol will increase the salivary secretion and reduces the cariogenic activity in the mouth. Nearly 700 types of bacterial species are being isolated from the oral cavity. Many of them have cariogenic property and are proteolytic. Very few organisms are responsible for initiating caries activity. Among them the most important organism is streptococcus mutans. It utilises sucrose present in the food material and produces dextran and also reduces the salivary pH by production of acids.

These two factors compound to plaque build up and at the same time, increase the population of oral flora.

There are many attempts made to prevent caries in susceptible individuals. Many prophylactic measures were attempted to reduce the cariogenic activity in susceptible individuals. There are methods that physically removes the plaque accumulated in the tooth surface. Studies conducted

on oil pulling, dental floss etc were not beneficial for many people. Mouth washes containing chemicals, herbal products, antiseptic oral rinse, alcohol free mouth wash, oral moisturizer spray are alternatives to remove the plaque which is accumulated on the tooth surface. Xylitol is a five carbon sweetener which has beneficial effects in oral cavity. It is used as artificial sweetener in certain products. Xylitol are available in many form such as gums, mints, chewable-tablets, lozenges, toothpastes, mouthwashes, oral wipes, neutraeutral products. In controlled clinical trials, xylitol gives a better results than any other polyol. The source of xylitol is birch and hard wood trees. The sweetener sorbitol has lesser effect compare to xylitol.

Saliva is composed of organic molecules, inorganic ions and macromolecules. Since tooth enamel is made of calcium phosphate, those inorganic ions in saliva help repair the teeth and keep them in good condition. The pH of saliva is neutral and allows it to remineralize tooth enamel. When the pH of saliva falls below 5.5, it causes the saliva to demineralize the teeth. Reduced salivary flow rate is associated with increased caries since the buffering capability of saliva is not present to counterbalance the acidic environment created by certain foods. Reduced amount of saliva produced by salivary gland produces dry mouth and leads to widespread of dental caries.

MATERIALS AND METHOD:

This study included 18 individuals with the age range of 18-20. The subject were asked to chew xylitol containing chewing gum for 2 per day for 3 weeks.

During this period the subject were advised not to take any antibiotic and carbonated soft drinks. Saliva samples were collected before starting chewing gum as baseline. The collected saliva samples were inoculated into Mutans - sanguis agar (Hi Media: Code M977) which is an indicator media for streptococcus mutans. The sample was diluted in 1:20 times with sterile normal saline and 10 µl of the sample is added to the Mutan sanguis agar which is incubated for 24 hrs at 37°C aerobically. After the incubation for 24 hrs, the number of bacterial colonies were counted. The colonies with white frosted glass appearance confirms the streptococcus mutans. After 3 weeks of chewing gum consumption, second sample was collected and processed similarly. The number of mutants were counted and compared with mutants count of samples collected before starting chewing gum

TABLE I

SL.NO	BEFORE CHEWING GUM	AFTER CHEWING GUM	REDUCTION PERCENTAGE
1	100	12	88%
2	526	16	97%
3	1440	44	96.95%
4	68	48	29.50%
5	142	52	63.40%
6	76	104	-36.05%
7	404	112	72.28%
8	542	164	69.71%
9	192	196	-2.00%
10	280	200	28.60%
11	144	248	-72.00%
12	1248	388	69.00%
13	64	368	-475.00%
14	80	116	-45.00%
15	942	632	33.00%
16	144	640	-244.00%
17	880	536	39.10%
18	860	112	87.00%
TOTAL	8132	3988	
MEAN	451.77	221.55	

RESULTS:

Table 1 shows the variation in the mutans count in saliva in before and three weeks after having chewing xylitol containing gum

DISCUSSION

This study is conducted to find out the effect of xylitol chewing in reducing the risk of developing dental caries. 20 healthy human volunteers were selected after the careful examining the oral cavity for the presence of any lesions. Among the 20 volunteers 2 of them were removed for not complying with the protocol. Saliva samples were collected from the remaining 18 volunteers. After three weeks period of gum chewing, the salivary samples were subjected to microbiological examination specific to the streptococcus mutans load. Among the 18 volunteers examination only 6 of them have not shown reduction in the mutans count. The range of reduction is between 28% to 97%. In the absence of any other prophylactic measures in 44% cases, there is a reduction of up to 60% in the mutans count. Among the 18 volunteers in 4 of them there is reduction of more than 70% in the mutans load. Though there is no consistent reduction in the mutans count in more than 50% of the cases, the mode of frequencies suggest that there is a definite influence of xylitol in reducing the bacterial load. When compared with the salivary samples collected before and after chewing gum for a period of three weeks, the mean value of the frequencies shows a 50% reduction in Mutans count in the salivary samples collected after using chewing gum

The relationship between xylitol and its cariogenic effects was first established in the Turku sugar studies in 1969 with conclusion that consumption of xylitol decreased the chances of dental plaque by inhibiting its growth by preventing and colonization(1). There was another study that concludes xylitol has much more benefit when compared with various other sweeteners like sorbitol which proves that xylitol has more specific effect but it's is not obvious in

sorbitol(2). By removing cariogenic agent, we can reduce the occurrence of dental caries. There was another study based on effect of chewing gum containing xylitol and progression of dental caries. There was decrease in caries only on long term use(3). The mechanism behind it was due to increase in salivation which helps to buffer the pH of the oral cavity thereby neutralizing the acid released by the cariogenic agent which is the streptococcus mutant which decrease the incidence of dental caries. Ultimately the role of salivation is highlighted here.

Some studies state that there is increase in calcium level in dental plaque but instead of calculus formation, the extra calcium enhances remineralisation in mineral deficient enamel sites, therefore showing xylitol does not have cariogenic properties because Xylitol calcium complex is non acidic in oral cavity(4). Increases absorption of calcium in the digestive system, which is good for your teeth and may also protect against osteoporosis(5). Xylitol increases production of saliva. Saliva contains calcium and phosphate, which get picked up by the teeth and aid in remineralisation. Xylitol reduces the acidity of saliva, which helps to fight acid-driven degradation of tooth enamel.

CONCLUSION

Gum chewing habit is found in many people. Gums made by mixing xylitol can be advised to them as a prophylactic measure. This will definitely reduce the bacterial load by many ways. This will not be any direct benefit or relief in patients with active caries lesion. Chewing gum itself has its own benefit of removing the bacteria attached to the tooth surface. Adding xylitol will definitely enhance the process of reducing the bacterial load in the mutants. Preventing caries in susceptible individual is a multi prong task, the benefit of chewing gum and increased salivation is of definite benefit to patients. It should be borne in mind that any prophylaxis has its own limitation as it is influenced by other contributing factors in mouth.

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