

Comparative Effects of Chewing Gums in Oral Health: An Original Research

1. Dr **Farhat Jabeen**, Registrar, Institute of Dental Science, Seorah, Jammu, J&K, India.
 2. **Dr. Mahesh Shivaji Chavan**, MDS, Ph.D, Associate Professor, Dr. D Y Patil Dental College and Hospital, Dr DY Patil Vidyapeeth Pune.
 3. **Dr. Kameswari Kondreddy**, Senior Lecturer, Faculty of Dentistry, AIMST University, Semeling, Bedong, Kedah- 08100, Malaysia.
 4. **Dr. Rahul VC Tiwari**, OMFS, FOGS, PhD Scholar, Dept of OMFS, Narsinbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, India.
 5. **Dr. Heena Tiwari**, BDS, PGDHHM, MPH Student, Parul Univeristy, Limda, Waghodia, Vadodara, Gujrat, India.
 6. **Dr. Puneeta Vohra**, Associate Professor , Dept Of Oral Medicine And Radiology, Faculty Of Dental Sciences , SGT University, Gurgaon, Haryana, India.
- Corresponding Author: Dr Farhat Jabeen, Registrar, Institute of Dental Science, Seorah, Jammu, J&K, India. farhatraza27@gmail.com

Abstract

Aim

The purpose of our research was to assess the oral health status of patients while using sugar free chewing gums in comparison to those who were not using chewing gum.

Methodology

Forty patients included in the present study, were divided into two groups- one consuming sugar-free chewing gum and other one as a control. The chewing gum group was composed of twenty patients and control gum group was composed also of twenty patients. The subjects for the study were selected randomly and they were in a good general health and were not using any medications. Oral examination of patients were carried out using the plaque index (PI) and DMFT index of the study subjects.

Results

The study demonstrates significant differences between the chewing and control group in the amount of plaque accumulation in relation to plaque index score especially for the 1st two months of the study. Similar result was observed with respect to DMFT score, which showed less prevalence of caries in the study population.

Conclusion

As health care providers, we should include in our dental education programmes the role of chewing gum as an adjunct to individual self-care such as routine daily brushing, flossing and regular dental check.

Keywords Chewing gum, oral hygiene measures, plaque index, DMFT.

INTRODUCTION

Chewing gum has been used as a chewable plastic material which also contains flavours as well as sweetening agents. The history of chewing non-food items and gummy substance for pleasure dates back to Mayans, who accustomed chew chicle (sap from a sapodiila tree). Ancient Greeks routinely chewed tree resin ('mastiche') to sharpen their teeth and as a mouth

freshner. Native Americans chewed the sap from the spruce trees.¹ Modern chewing gums are made of a gum base, softeners, sweeteners, and flavouring agents. Glycerin and other edible fat products help to blend the ingredients and to stay the gum soft and versatile by retaining moisture. Sweeteners include beet sugar, corn syrup, and cane. However, sugar-free gum has become more popular in recent years. These products contain sugar alcohols (like mannitol, xylitol, sorbitol, etc) and artificial sweeteners (like saccharin, aspartame, acesulfame-K, cyclamate, etc).^{2,3} Several clinical studies have assessed the effect of the chewing of sugar-containing chewing gum on bacterial plaque. Sucrose gum was always related to enhanced plaque growth compared with sugar-free chewing gum. Eventhough there is excessive stimulation of saliva when using chewing gums, sucrose containing ones lower the oral cavity pH which causes more caries. A 36% higher caries increment in children who had consumed 2 pieces of sugar-containing chewing gum per day for two years when put next with matched controls who had not chewed any gum has been reported by Glass et al. Another study by Baron et al., reported a 24% higher DMFS increment in an exceedingly group of sucrose gum-chewers than within the no-gum control group. Thus, the employment of sugar-containing chewing gum lowers plaque pH and increases the number of plaque, and habitual use increases caries.⁴ Various drug companies have recognized the worth of such delivery systems and have continued to conduct extensive research to regulate the discharge and stabilization of the medicaments within the insoluble gum base matrix. Nicotine gum continues to be on the market today, likewise as analgesics such as Aspergum and Chooz, an antacid gum. the benefits of chewing gum as a carrier for drugs are obvious: Chewing gum is used without water, at any time, and everywhere. Product stability is nice, because the incorporated therapeutic agents are shielded from oxygen, light, and water. Chewing gum as a drug delivery system locally for various dental therapeutic agents has been repeatedly studied in regard to materials like fluoride, chlorhexidine, mineral furthermore as metal salts etc.^{4,5,6,7} Presence of polyphosphates lead to more charged chewing gums which leads to cleansing of bacterial stains due to weaker adhesion bond between these type of stains with polyphosphates and in turn enamel surface.^{8,9,10} Chewing of normal sugar-free gum dislodges loosely bound bacteria from the oral mucosa¹¹ and inhibits regrowth and maturation of oral biofilm on occlusal surfaces.¹² Nonetheless, there's no unanimous judgment on a chewing gum-induced reduction of biofilm regrowth on smooth lingual and buccal surfaces and a relation between biofilm removal directly after one gum chew has not been firmly established.¹³⁻¹⁵ Individuals, who are suffering from xerostomia or the subjective feeling of xerotes and have secretory capacity, can relieve their symptoms by the utilization of normal sugar-free chewing gum. Chewing gum is mostly preferred by xerotes patients over the employment of artificial saliva, although there's no evidence that either one is more practical than the opposite.^{16,17} In order to extend the results of the chewing of gum on remineralization, calcium has been added to chewing gums either within the variety of ionic calcium or casein-calcium conjugates. in place studies, with demineralized enamel slabs placed within the rima using specific intraoral appliances which were removed after the chewing of gum that was supplemented with calcium phosphates, demonstrated increased remineralization compared to chewing of standard sugar-free gum.^{18,19} So, mainly sugar-free chewing gums help in reducing the plaque formation which thereby decreases chances of periodontitis, furthermore as help in remineralization which decreases caries risk; however these facts need further validation.

AIM OF THE STUDY

The purpose of our research was to assess the oral health status of patients i.e. presence of periodontitis and caries events while using sugar free chewing gums as compared to those that weren't using chewing gum.

METHODOLOGY

40 patients were included in the present study, who were distributed into two different groups comprising of 20 patients each. The subjects who were using chewing gums; were assigned to group (A), and control patients who didn't utilize chewing gums were assigned to group (B). A careful oral examination of patients was carried out using the plaque index (PI) (Silness and Loe), and DMFT index. Patients were asked to use a sugar free chewing gum once daily for 20 minutes for 4 months. At specified intervals of 1 month each, regular oral check-up was done under good artificial light, periodontal probe, explorer and a mouth mirror, and data was recorded with the assistance of plaque index and DMFT index, on a case-sheet designed for this study. Consent was obtained from all the study participants were taken before starting examination procedure. We used SPSS 25.0 for statistical analysis. Descriptive statistical analysis was done with the assistance of frequency percentages, variance and individual comparison of variables were disbursed with the assistance of t-test and p- value.

RESULTS

In our study, scoring of the teeth were done periodically after each month till the end of the study period. It was observed that as compared to group B (control group), there was difference in plaque index score of patients and a decrease was noted. However, the difference was not remarkable after 2 months of using of sugar-free chewing gums as compared to control group, possibly due to loss of motivation in incorporating chewing gums daily. (Table 1) Similar results were evident when DMFT score was considered. Initially due to mechanical cleansing action, chewing gums helped dislodge food particles and helped in saliva stimulation which in turn decreased caries incidence, which became stagnated after regular usage of chewing gums. (Table 2) We observed that at the end of two months, utilizing chewing gums had a significant difference in maintenance of overall oral hygiene. Plaque index score also improved drastically ($p=0.032$) and there was less prevalence for caries ($p=0.0210$). (Table 3)

DISCUSSION

Sugar free chewing gum may be a very practical and acceptable saliva stimulant after intake of sugar containing foods. Many studies round the world have confirmed the effect from chewing sugar free chewing gums.^{20,21,22,23} because the chewing starts, the saliva secretion rate increases and therefore the stimulation of the saliva are highest during the primary 20 minutes.²⁴ When chewing stimulates saliva production, the composition of the saliva changes and therefore the concentration of bicarbonate, phosphate, and calcium increase. The increased volume of stimulated saliva increases the power to clear sugars and acids from the teeth there by regulating plaque and salivary pH. Xylitol may be a sugar that can't be fermented virtually by any bacterial species, including *Streptococcus mutans* (*S. mutans*), the most contributor to cavity. Ingesting specific concentrations of xylitol reduces *S. mutans* colonization and reduces plaque buildup. Makinen et al, reported that the plaque reducing effect of sugar free chewing gum seems to be more pronounced when the chewing gum contains xylitol because the sweetening agent.²⁵ Campus G et al, reported a discount in sugar metabolism of oral biofilm and a neutral plaque pH, at the top of three months use of xylitol gums.²⁶ There was no significant reduction in plaque accumulation with sugar-containing chewing gums within the present study. Such results are supported by other authors like Bratthall and Ainamo et al.^{27,28} The reduction in plaque reported could also be thanks to the mechanical forces that tiny amount of plaque is removed henceforth. Gum chewing elicits a rise in saliva rate of flow which increase the buffering capacity of saliva and concurrently results in an enhanced clearance of fermentable carbohydrates from the mouth.²⁹ This also

helps aggravating natural cleansing mechanisms of the eaten food stuffs and thus decrease the plaque scores especially on lingual surface of mandibular teeth and palatal surfaces of maxillary teeth as well.³⁰ Nevertheless, since no detrimental effects of chewing gum on the incidence of caries are reported within the present study and since sugar-free chewing gum may very well reduce the incidence of caries, the chewing of gum cannot at this point be considered a hazard to dental health. However, it's still tempting to concur with the suggestions of Ainamo et al. which recommend usage of sugar-free gums regularly. Such preparations can also act as suitable replacements for other confectionary of known cariogenic potential.²⁷ supported the available evidence, the chewing of sugar-free gum after meals has been recommended as how to forestall caries, whether or not no mechanical oral hygiene are often performed.

CONCLUSION

In conclusion, as health care providers, we must always include in our dental education programmes the role of chewing gum as an adjunct to individual self-care like routine daily brushing, flossing and regular dental check. With the assorted community-based preventive measures underway, it's likely that chewing sugar-free gum can play a crucial role within the improvement of oral health status of the country.

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TABLES

Table 1- Plaque index scores recorded in two groups.

Time interval	Group A	Group B
1 month	1.24 ± 0.76	1.44 ± 0.35
2 months	0.83 ± 0.76	0.88 ± 0.71
3 months	0.69 ± 0.67	0.73 ± 0.27
4 months	0.68±0.61	0.65 ±0.61

Table 2- DMFT scores recorded in two groups.

Time interval	Group A	Group B
1 month	2.3±1.41	2.08±0.93
2 months	1.95±1.22	1.76±0.91
3 months	0.99±0.56	0.8±0.3
4 months	0.97±0.49	0.84±0.38

Table 3- t-test recorded in the present study

Time interval	t-test		p-value	
	For PI of both groups	For DMFT of both groups	For PI of both groups	For DMFT of both groups
1 month	1.1818	1.033	0.04	0.043
2 months	1.92	1.54	0.032	0.0210
3 months	2.01	1.89	0.6	0.76
4 months	2.18	1.33	0.88	0.72

**p=<0.05 is significant*