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Effect of Sugar-Free Chewing Gum on Salivary Flow Rate and Dental Plaque Levels: An Observational Study

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ABSTRACT

Background: Saliva plays a crucial role in maintaining oral health by neutralizing acids, providing antimicrobial action, and aiding in mechanical cleaning. Chewing sugar-free gum has been suggested to stimulate salivary flow and reduce plaque accumulation, but clinical evidence remains limited.

Aim: To evaluate the effect of sugar-free chewing gum on salivary flow rate and dental plaque levels in healthy adults.

Materials and Methods: A Clinical trial was conducted on 40 healthy adult volunteers. Participants were instructed to chew sugar-free gum for 10 minutes, three times daily, after meals for 7 days. Unstimulated and stimulated salivary flow rates were measured at baseline and after the intervention. Plaque levels were assessed using the Plaque Index (Silness & Löe) at baseline and post-intervention. Data were analyzed using paired t-tests, with significance set at $p < 0.05$.

Results: Chewing sugar-free gum significantly increased stimulated salivary flow rates ($p < 0.01$) and led to a significant reduction in plaque scores ($p < 0.05$) compared to baseline.

Conclusion: Sugar-free chewing gum effectively stimulates salivary flow and reduces plaque accumulation. It can be recommended as an adjunct to routine oral hygiene, particularly in individuals with low salivary flow or at high risk of dental caries.

Introduction

Saliva plays a vital role in maintaining oral health. It helps in mechanical cleansing of teeth, buffering acids, providing antimicrobial activity, and aiding in the remineralization of enamel.[1] Reduced salivary flow can lead to increased plaque accumulation, dental caries, and gingival inflammation, making saliva stimulation an important preventive measure.[2,3]

Chewing gum, especially sugar-free varieties, has been shown to stimulate salivary flow due to masticatory activity.[4] Ingredients like xylitol in sugar-free gum can also reduce bacterial adherence and plaque formation, thereby contributing to oral health. Several studies have suggested that regular chewing of sugar-free gum after meals may help in plaque control, caries prevention, and maintenance of oral hygiene, particularly in individuals with low salivary flow or high caries risk.[5-7]

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Despite these benefits, there is limited evidence regarding the short-term effects of sugar-free gum on both salivary flow and plaque levels in healthy adults. Evaluating this effect can help dental professionals recommend sugar-free gum as a simple, cost-effective adjunct to routine oral hygiene practices.

Material and Methods

This randomized controlled clinical trial was conducted to evaluate the effect of sugar-free chewing gum on salivary flow and plaque levels in healthy adults. A total of 40 subjects, aged between 18 and 30 years, were recruited from the outpatient department. Participants with good general health, normal salivary flow, no active caries, periodontal disease, systemic illness, or medications affecting saliva were included in the study. Individuals with xerostomia, ongoing oral infections, orthodontic appliances, or allergy to gum ingredients were excluded.

Baseline assessments were performed prior to the intervention. Unstimulated whole saliva was collected using the spitting method over a 5-minute period, and the flow rate was measured in mL/min. Dental plaque levels were recorded using the Silness & Löe Plaque Index. Participants were then instructed to chew Orbit Sugar-Free Gum (Wrigley, USA) for 10 minutes, three times daily, immediately after breakfast, lunch, and dinner, for a total duration of 7 days. Care was taken to standardize the chewing process and timing, and participants were asked to maintain their usual oral hygiene practices apart from the gum intervention.

At the end of the 7-day period, salivary flow and plaque index were re-evaluated using the same methods to ensure consistency. The primary outcome measured was the change in salivary flow (both unstimulated and stimulated), while the secondary outcome was the change in plaque scores. Data were statistically analyzed using SPSS software. Paired t-tests were performed to compare pre- and post-intervention values, and a p-value of <0.05 was considered statistically significant.

Result

All 40 participants completed the 7-day intervention without any adverse effects. At baseline, the mean unstimulated salivary flow rate was 0.30 ± 0.08 mL/min, and the mean plaque index score was 1.45 ± 0.21. Following 7 days of chewing Orbit Sugar-Free Gum for 10 minutes after each meal, a significant increase in salivary flow was observed. The mean stimulated salivary flow rate increased to 0.65 ± 0.10 mL/min, representing a significant difference from baseline ($p < 0.01$). (Table 1)

Similarly, plaque levels showed a statistically significant reduction. The mean plaque index decreased from 1.45 ± 0.21 at baseline to 1.10 ± 0.18 post-intervention ($p < 0.05$). This demonstrates that regular chewing of sugar-free gum not only stimulates salivary flow but also contributes to plaque reduction.

The results indicate that chewing sugar-free gum significantly increases salivary secretion, which likely contributes to the observed reduction in plaque accumulation. No adverse events, such as jaw discomfort or gastrointestinal disturbances, were reported during the study period, confirming the safety and feasibility of this simple oral hygiene adjunct.

Table 1: Salivary Flow Rate and Plaque Index Before and After Intervention

Parameter	Baseline Mean ± SD	Post-Intervention Mean ± SD	p-value
Unstimulated Salivary Flow (mL/min)	0.30 ± 0.08	0.65 ± 0.10	<0.01*
Plaque Index (Silness & Löe)	1.45 ± 0.21	1.10 ± 0.18	<0.05*

*Significant

Discussion

Maintaining adequate salivary flow is essential for oral health, as saliva plays a key role in buffering acids, clearing food debris, providing antimicrobial activity, and aiding in remineralization of enamel.[8] The results of this study demonstrate that chewing sugar-free gum significantly increases salivary flow and reduces plaque accumulation, supporting its role as a beneficial adjunct to routine oral hygiene.

The observed increase in salivary flow aligns with previous studies. Edgar et al. (2004) reported that masticatory stimulation from sugar-free gum increases both the volume and rate of saliva secretion, contributing to enhanced oral clearance. Similarly, Dodds M et al. (2023) found that regular chewing of sugar-free gum elevated stimulated salivary flow and improved oral lubrication, particularly in individuals with low baseline salivary output.[10]

The significant reduction in plaque index after 7 days of chewing sugar-free gum can be attributed to two main mechanisms: mechanical removal of plaque through mastication and chemical inhibition of bacterial adherence by sweeteners such as xylitol. Studies had demonstrated that sugar-free gums containing xylitol reduce plaque accumulation and cariogenic bacterial load, supporting the findings of the present study.[11-13]

While conventional oral hygiene methods, such as toothbrushing and flossing, remain primary for plaque

control, sugar-free gum can serve as a convenient, supplementary method, especially in situations where brushing is not possible immediately after meals. The results of this study reinforce the recommendations of the American Dental Association (ADA), which endorses sugar-free gum as an adjunctive tool for oral health maintenance.

Limitations

This study had a short duration (7 days) and was limited to healthy adults with normal salivary function. Long-term studies with a larger sample size, including participants with reduced salivary flow or high caries risk, would provide more comprehensive data. Additionally, the study did not evaluate changes in oral pH or microbial counts, which could further explain the plaque-reducing effect.

Clinical Implications

Chewing sugar-free gum after meals can be recommended as a safe, simple, and effective method to stimulate saliva and reduce plaque accumulation. It is particularly useful in educational programs promoting preventive oral care in communities and individuals with limited access to conventional oral hygiene practices.

Conclusion

The findings of the present study indicate that regular use of sugar-free chewing gum significantly increases salivary flow rate and reduces dental plaque levels in healthy adults. Enhanced salivary secretion contributes to improved oral clearance and plaque control, thereby supporting oral health maintenance. Sugar-free chewing gum can be recommended as a simple, safe, and effective adjunct to routine oral hygiene practices, especially after meals when toothbrushing may not be immediately feasible. Further long-term studies with larger sample sizes and diverse populations are recommended to validate these findings and to explore additional benefits related to caries prevention and gingival health.

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