



## ORIGINAL RESEARCH

### Efficiency of Commercially Available Sugar-free and Sugared Chewing Gums in Plaque Control- A Randomized Control Trial

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**ABSTRACT:** *Background:* Chewing gum has been proven to have benefits towards reducing plaque accumulation in oral cavity by mechanical action. The newer sugar- free chewing gums claim additional chemical action towards plaque control. Hence this study was conducted to find out the efficiency of two commercially available xylitol/ mannitol containing sugar-free chewing gums in plaque control. *Methodology:* A single blind randomized control trial was done among twenty patients between 20 to 40 years of age. Two sugar free chewing gums, Protex- Happy Dent and Orbit were used in the study. Quigley–Hein plaque index (QHPI) was used to record plaque score before and after chewing the gums. Post-hoc test and one-way ANOVA was done to find out the statistical significance ( $p < 0.05$ ) in plaque reduction within and between the groups. *Result:* The mean QHPI prior to chewing for Group 1(Protex) was 2.9 and for Group 2 (Orbit) was 2.99. After twenty minutes of chewing the gums the QHPI for Group 1(Protex) were 2.4 and for Group 2 (Orbit) were 2.6. The mean QHPI prior to chewing for two control groups were 2.29 and 2.32. After twenty minutes of chewing mean QHPI was 2.32 and 2.23 respectively. The mean reduction in plaque score between and within the group were statistically significant based on post hoc and one way ANOVA test. *Conclusion:* The efficiency of plaque reduction in Protex and orbit sugar free chewing gums is 2 to 4 times more when compared to sugared chewing gums. Sugar free chewing gum containing xylitol is more efficient in reducing plaque accumulation when compared to sugared chewing gums.

**Key words:** chewing gum, plaque control, Quigley- Hein plaque index, randomized control trial

Chewing gum has its origin in ancient Egypt in mid 1800's. The currently available chewing gums are a combination of five main ingredients: powdered cane or beet sugar (50-65%), chewing gum base (18-30%), corn syrup (12- 20%), color and flavoring agents (1-2%) and softeners (0.3-3.0%).<sup>[1]</sup>

The habit of chewing gums is very common in younger generation, much to the trepidation of the parents and teachers. But the role of chewing gums on oral health has been controversial among the professionals. Though there is a school of thought that chewing gums increase the salivary flow to facilitate oral clearance, reduce the acidic pH of plaque and reach the inaccessible posterior areas of mouth, another school of thought exists that it poses cariogenic challenge due to the sucrose content. Sugar-free chewing gums or gums with alternate sugar are considered as least cariogenic. The Turku sugar study suggested that xylitol containing chewing gums, chewed regularly between meals, had an "anticariogenic" effect<sup>[2]</sup>

and also had an inhibitory effect on dental plaque formation<sup>[3]</sup>. In reviewing the literatures there were only few studies done to assess the plaque reduction efficiency of sugar containing and sugar-free chewing. Most of the clinical studies were based on the principle ingredient Xylitol or Sorbitol.

The aim of the present study was to compare the plaque reduction efficiency between commercially available, sugar containing and sugar-free chewing gums.

#### MATERIALS AND METHODS

A Single blind randomized controlled trial was done among 20 patients between the age group of 20 to 40 years with balance in gender. They were equally divided in 4 groups. The following inclusion and exclusion criteria had been used:

1. The study subjects should be willing to participate in the study
2. No previous or present history of periodontitis, or any systemic conditions that could negatively influence oral

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**Fig 1: Materials used**

health should be present.

3. The study subjects should have minimum of 20 functional teeth

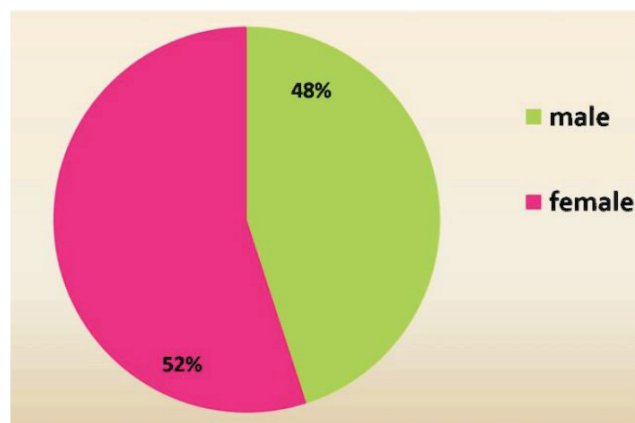
A market study was done to identify the most commonly available commercial sugar containing and sugar-free chewing gums. Based on this, four chewing gums were selected; namely, Group 1 (PROTEX), Group 2 (ORBIT), Group 3 (CHLORMINT) and Group 4 (BOOMER) (Fig-1 & 2). The Group 1 & 2 were in Sugar-free category and group 3 & 4 were in sugared category.

A single examiner assessed the plaque scores before and after chewing gums using type 2 examinations in all the four groups. The Plaque scores were recorded using Quigley- Hein Plaque Index (QHPI).<sup>[4-7]</sup> A pilot study was done and necessary ethical clearance was obtained from Institutional review board.

Patients were selected according to the inclusion and exclusion criteria and an informed consent was obtained. The patients were blinded to the procedure by uniformly wrapping the gums in aluminum foils. The plaque scores were obtained. The patients were then asked to chew the gum for 20 minutes under supervision. They were asked to chew the gums in both the sides of the oral cavity. The plaque scores were recorded again after a wash out period of 5 minutes.

## STATISTICAL ANALYSIS

The mean plaque score, before and after chewing the gums were calculated from the datum. Post hoc test and one way ANOVA analysis were done to find out the statistical significance of difference in plaque scores between the groups and within the group by taking P value <0.05. All the statistical analysis was done using



**Fig 2: Patient gender distribution**

SPSS 15.0 for windows.

## RESULT:

### Before and After Plaque score:

The Mean plaque scores before chewing gums in group 1 was 2.9, group 2 was 2.99, group 3 was 2.2 and group 4 was 2.32. (Fig -3).

After chewing gums the mean score in group 1 & 2 was 2.4 and 2.66 respectively and in group 3 & 4 was 2.2 and 2.23 respectively. The mean difference in plaque scores before and after chewing gums in group 1 & 2 was 0.4 and .032 respectively and the mean difference in group 3 & 4 was 0.09 and 0.08 respectively. The mean reduction in plaque scores in group 3 and 4 were very marginal when compared to group 1 & 2.

### One way ANOVA and Post Hoc test:

Multiple comparison between the groups and within the group shows that the mean difference in plaque score reported among the groups before and after chewing gums are statically highly significant with a P value <0.05. (Table -4,5)

## DISCUSSION

The accumulation of plaque in the oral cavity is well removed by mechanical plaque control methods. Most of the researchers have confirmed that the method of tooth brushing plays an active role in plaque removal. However, tooth brushing cannot reach all the surfaces of the tooth. On the other hand, when the gum is chewed it removes the plaque from the tooth surfaces and also stimulates the gingiva. The efficiency of plaque removal between sugared and sugar free chewing gums were not yet clearly identified.

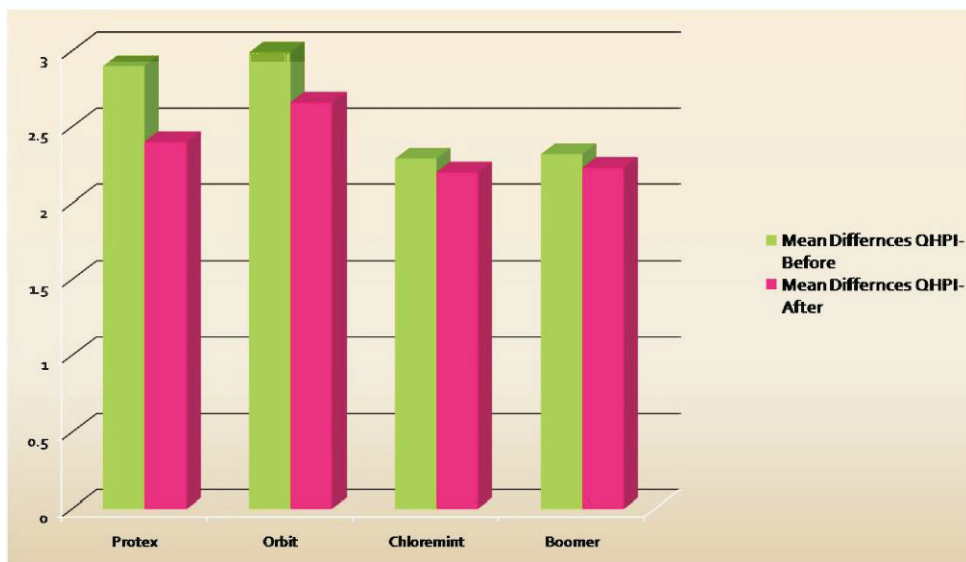


Fig 3: Bar diagram depicting Mean difference OHPI before and after chewing

	Sum of Squares	df	Mean Square	F	Sig.
<b>Between Groups</b>	<b>.440</b>	<b>3</b>	<b>.147</b>	<b>29.561</b>	<b>.000</b>
<b>Within Groups</b>	<b>7.940E-02</b>	<b>16</b>	<b>4.963E-03</b>		
<b>Total</b>	<b>.519</b>	<b>19</b>			

Fig 4: Table showing the One Way ANOVA result

(I) Group	(J) Group	Mean Difference(I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Protex	Orbit	.1060	4.455E-02	.122	-2.1470E-02	.2335
	Chloremint	.3360(*)	4.455E-02	.000	.2085	.4635
	Boomer	.3440(*)	4.455E-02	.000	.2165	.4715
Orbit	Protex	-.1060	4.455E-02	.122	-.2335	2.147E-02
	Chloremint	.2300(*)	4.455E-02	.000	.1025	.3575
	Boomer	.2380(*)	4.455E-02	.000	.1105	.3655
Chloremint	Protex	-.3360(*)	4.455E-02	.000	-.4635	-.2085
	Orbit	-.2300(*)	4.455E-02	.000	-.3575	-.1025
	Boomer	8.000E-03	4.455E-02	.998	-.1195	.1355
Boomer	Protex	-.3440(*)	4.455E-02	.000	-.4715	-.2165
	Orbit	-.2380(*)	4.455E-02	.000	-.3655	-.1105
	Chloremint	-8.000E-03	4.455E-02	.998	-.1355	.1195

**\*The mean difference is significant at the P<0.05 level.**

Fig 5 : Table showing Multiple Comparisons with Post Hoc Test

A Single blind randomized control trial was carried out between sugar free and sugared chewing gum and the results reveal that the mean QHPI scores reduction after chewing sugar free gum is 0.4 (Protex) and 0.3 (Orbit) whereas the mean scores of sugared chewing gums is 0.09 (Chlormint) and 0.08 (Boomer). This shows that the plaque reduction in sugar free chewing gums is 2 to 4 times more when compare to sugared chewing gums.

In comparison between group 1 (Protex-0.4) and group 2 (Orbit-0.3), the plaque reduction was more in group 1 (Protex). The principle sugar free ingredient in Protex was xylitol<sup>[8]</sup> and in orbit was aspartame<sup>[9]</sup>; this shows xylitol is more efficient in plaque control. Thus the results of the present study compares well with other studies.

Giuseppe Pizzo studied the plaque inhibitory effects of three sugar-free chewing gums each containing lactoperoxidase, micro granules of silicon dioxide, and zinc glacialate. He concluded that there were no significant differences in antiplaque activity of the gums tested, neither for the smooth nor for the occlusal surfaces<sup>[10]</sup>. The other study by Barnes, Santarpia was to evaluate the plaque control effect of a chewing gum versus tooth brushing with a dentifrice. The results suggest that chewing gum may serve as an effective oral hygiene device whenever brushing may not be possible and it can also serve as an effective adjunct to brushing for enhanced oral health.<sup>[11]</sup> Kieso Thakahashi suggest that mastic chewing gum is a useful anti plaque agent in reducing the bacterial growth in saliva and plaque formation on teeth<sup>[12]</sup>. Sharma NC et al found that, the test group (sugar-free chewing gum) experienced a 17% reduction in plaque over 4 weeks, while the control group reduced their plaque amounts by approximately 9% over the same period<sup>[13]</sup>.

In the present study it has been observed that sugar-free chewing gums are more potent than sugared chewing gums in reducing the plaque accumulation.

## CONCLUSION

§ The efficiency of plaque reduction in sugar-free chewing gums Protex and Orbit is two to four times more potent when compared to sugared chewing gums.

§ Sugar free chewing gum containing xylitol is more potent in reducing plaque accumulation when compared to sugared chewing gums

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