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A Randomised Control Trial on the Role of Various Sugar Free Chewing Gums on Levels of Streptococcus Mutans, Salivary Calcium and Phosphorous- A Prospective Study

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ABSTRACT

Introduction: Dental Caries Is A Multifactorial Disease That Starts With Microbiological Shifts Within The Complex Biofilm. The Goal Of Modern Dentistry Is The Non-Invasive Management Of Non- Cavitated Caries Lesions Involving Remineralization Systems To Repair The Enamel.

Aims And Objective: The Main Purpose Of This Study Was To Evaluate The Effects Of Different Sugar Free Chewing Gums On Concentration Of Calcium, Phosphorus And Streptococcus Mutans Count.

Materials And Methods: This Study Was Conducted In 54 Children Of Age Group 10 – 14 Years And They Are Divided Into Three Groups. Group I Was Given Xylitol Containing Chewing Gum, Group Ii Chewed Sorbitol Containing Chewing Gum And Group Iii Chewed Cpp Acp Containing Chewing Gum. Each Group Chewed 2 Pellets Of Their Respective Chewing Gum For 20 Minutes Twice Daily For A Week Time. The Saliva Samples Were Collected At Base Line, On The First Day And On 7th Day Of Chewing Regimen.

Results: There Was Increase In Calcium Concentration In Every Group After Chewing The Gum, But Very Highly Significant Increase Was Shown By Cpp – Acp Containing Chewing Gum. The Phosphorus Concentration Of Saliva Decreased In All Group After Chewing The Gum And Cpp – Acp Containing Chewing Gum Group Showed Significantly Low Phosphorus Concentration Than The Other Groups. Mutans Count Reduced Significantly In All Chewing Gum Groups After Chewing The Gum And No Significant Difference Between The Groups.

INTRODUCTION

Dental caries is one of the most prevalent yet preventable diseases in children worldwide.1 This condition affects individuals of all ages and backgrounds, regardless of gender, socioeconomic status, ethnicity, or age.2 The 2000 Surgeon General's report on Oral Health in America indicated that over half of children aged 5 to 9 had experienced at least one cavity or filling, with this figure rising to 78% by age 17.3 Saliva plays a crucial role in maintaining oral

health, providing a non-invasive medium through which metabolic processes can be assessed.4 Since the early 2000s, studies have demonstrated that stimulating salivary flow, a known protective agent, may help prevent dental caries and support the health of both teeth and soft tissues.5

A primary goal in contemporary dentistry is the non-invasive treatment of non-cavitated carious lesions through remineralization techniques aimed at restoring enamel.6 Preventive strategies—such as dietary modifications, fluoride application, and pit and fissure sealants—enhance resistance to decay. Additionally, substitution therapy, which involves replacing harmful dietary habits (like high sucrose intake) with healthier alternatives (such as non-fermentable sugar substitutes), is increasingly effective in managing caries.7 Chewing gum, particularly sugar-free types, has become a valuable oral health aid. With a gum core and sometimes a coating, its structure requires minimal water and no preservatives, making it well-suited for oral health purposes.11 Sugar-free gum offers two primary oral health benefits: it reduces lactic acid production in plaque and enhances salivary flow, which boosts plaque's acid-buffering capacity, and it promotes salivary supersaturation with mineral ions, aiding in sugar clearance from the oral cavity.12 Polyols like sorbitol and xylitol, common sugar substitutes in chewing gum, are non-cariogenic because they are either metabolized slowly or not at all in dental plaque. Sorbitol, a hexitol derived from glucose, and xylitol, a pentitol found naturally in many plants, each have properties that support their non-cariogenic status.13 Xylitol, a low-calorie sugar substitute, specifically inhibits the growth, metabolism, and polysaccharide production of Streptococcus mutans, a primary cariogenic bacterium.14,15 Sorbitol, however, is a six-carbon sugar alcohol that mutans streptococci can slowly ferment, potentially adapting to metabolize it if sugar intake is restricted.16,17

The principal mechanism by which chewing gum aids in remineralizing early enamel lesions is through the stimulation of saliva, which provides calcium and phosphorus ions to demineralized enamel.18 The addition of casein phosphopeptide-amorphous calcium phosphate (CPP-ACP) nanocomplexes to sugar-free gum has been shown to significantly enhance enamel remineralization.19,20 Casein phosphopeptides (CPP) contain multiphosphoryl sequences that stabilize calcium phosphate in the amorphous calcium phosphate (ACP) form, localizing at the tooth surface to counteract enamel demineralization. These small complexes can penetrate enamel porosities, facilitating the repair of enamel crystals. Moreover, CPP-ACP complexes interact with fluoride ions, forming stabilized amorphous calcium fluoride phosphate, which binds to the tooth surface to provide extended protection.21 Chewing gums labeled as "tooth-friendly," especially when used after meals or carbohydrate-rich snacks, are therefore highly recommended as a practical and accessible means of promoting oral health.

Medicated chewing gums and remineralizing agents represent significant advancements in the prevention of dental caries. Such products, infused with ingredients like xylitol, fluoride, and CPP-ACP, target early enamel demineralization and assist in reversing initial stages of decay. Medicated gums deliver therapeutic agents that stimulate salivary flow and support the transport of essential ions like calcium and phosphate to the tooth surface, promoting the remineralization process. These chewing gums also enhance the bioavailability of fluoride, which reinforces enamel and makes it more resistant to acid attack. By incorporating remineralizing agents in routine oral care, medicated gums not only offer convenience but also serve as an effective preventive measure, helping reduce caries progression and support long-term oral health.

This study aims to evaluate the effects of various sugar-free chewing gums on the concentration of calcium, phosphorus, and Streptococcus mutans counts.

OBJECTIVES

1. To compare the effect of different sugar free chewing gums on concentration of calcium and phosphorus.
2. To compare the effectiveness of different sugar free chewing gums on levels of Streptococcus mutans in saliva

METHODOLOGY

This study was conducted in children of age group 10 – 14 years to evaluate the effects of different sugar free chewing gums on concentration of calcium, phosphorus and streptococcus mutans count.

SAMPLING PROCEDURE

We performed the study on children reported to the Department of Pediatric Dentistry, A.J. Institute of Dental Sciences Mangalore from school camp. 54 children were selected and divided into three groups.

Group I was given xylitol containing chewing gum,

Group II chewed sorbitol containing chewing gum and Group III chewed CPP ACP containing chewing gum.

Approval for the study was obtained from the respective authorities. A detailed schedule was prepared for data collection.

DENTAL EXAMINATION PROCEDURE

A dental examination was performed by one qualified dentist using diagnostic set, that is plane mouth mirror and probe. The data was recorded by a separate recorder. Chemical sterilization procedure was used to sterilize the instruments. Each group chewed 2 pellets of their respective chewing gum for 20 minutes twice daily (morning and evening). The study was conducted for a week time. Baseline saliva samples were collected by spitting method in sterile sample collecting bottles for all the subjects. After this the subject were given the respective chewing gums as per the groups and chewed as instructed under supervision. Then the saliva samples were collected by spitting method. The same procedure was repeated for all the 7 days (morning and evening) under supervision. Then the saliva samples were collected on 7th day evening after chewing the gum. The samples collected in sterile bottles were carried in the ice box containing ice (used as transport media). The study took place during January 2014. Samples were collected by a single investigator.

INCLUSION CRITERIA:

1. Children whose parents give the consent for the examination.
2. Systemically healthy subjects.
3. Children with good oral hygiene and no active carious lesion.

EXCLUSION CRITERIA:

1. Children with history of antibiotic therapy within previous 3 months.
2. Children using fixed or removable orthodontic appliance or removable prosthesis.
3. Children with regular habitual use of sugar free containing products.
4. Children with history of oral prophylaxis done at least 3 months prior to the study.

Calcium

2 ml of saliva was centrifuged and 200µl of supernatant was taken.100µl of OCPC reagent and 100µl of Calcium reagent (Calcium Kit, Aspen Laboratories, HP) were added to the supernatant and mixed well. Calcium levels were calculated by using a semi-automated photometer.

Phosphorus

2 ml of saliva was centrifuged and 200µl of supernatant was taken.100µl of OCPC reagent and 100µl of phosphorus reagent (phosphorus Kit, Aspen Laboratories, HP) were added to the supernatant and mixed well. Phosphorus levels were the calculated by using a semi-automated photometer.

Streptococcus Mutans Count

The saliva samples were taken in a loop of inoculating rod of diameter 1/1000 CFU/ml and inoculated onto Mitis Salivarius Agar plate. The plates then kept in the incubator for 48 hours at 370C for the growth of Streptococcus mutans colony. After 48 hours colony count was done manually using magnifying lens.

DATA ANALYSIS

Data was entered onto a computer using Microsoft Excel 2007. The data was statistically analyzed by using ANOVA, BONFERONI test, KRUSKAL WALLIS test and TUKEY HSD test with the aid of a professional statistician.

RESULTS

Table: 1 Calcium concentration of saliva of three different chewing gums at different time intervals (pre,day 1 and day7) (mg/dl)

Group	Time	N	Mean	Std. Deviation	H	p
	Pre	18	4.264	.845		
Xylitol	Day 1	18	4.358	.795		
	Day 7	18	4.853	.957	3.797	.029
	Pre	18	4.556	1.207		
Sorbitol	Day 1	18	4.701	.987		
	Day 7	18	5.240	.904	1.027	.035
	Pre	18	4.773	.937		
CPPACP	Day 1	18	9.148	.957		
	Day 7	18	10.063	.780	179.739	.000

Table 1 shows the salivary calcium concentration of 3 different chewing gum at 3 different time intervals. In xylitol group, the mean calcium concentration of saliva before chewing the gum was 4.264 mg/dl (SD 0.845) and it became 4.358mg/dl (SD – 0.795) on first day and 4.853mg/dl (SD – 0.957) on 7th day. The result was found that statistically significant (p - .029).

In sorbitol group, the mean calcium concentration of saliva before chewing the gum was 4.556mg/dl (SD 1.207) and it became 4.701mg/dl (SD – 0.987) on first day and 5.240 mg/dl (SD – 0.904) on 7th day. The result was found that statistically significant (p - .035).

In CPP – ACP containing chewing gum group, the mean calcium concentration of saliva before chewing the gum was 4.77 mg/dl (SD 0.937) and it became 9.148 mg/dl (SD – 0.957) on first day and 10.063mg/dl (SD – 0.780) on 7th day. The result was found that statistically very highly significant (p - .000)

Table: 2 Inter Group Comparison Of Salivary Calcium Concentration (mg/dl)

TIME		N	Mean	Std. Deviation	F	p
Pre	Xylitol	18	4.264	.957		
	Sorbitol	18	4.556	1.207		
	CPPACP	18	4.773	.937	.419	.660
Day 1	Xylitol	18	4.358	.795		
	Sorbitol	18	4.701	.987		
	CPPACP	18	9.148	.957	153.370	<.001 vhs
Day 7	Xylitol	18	4.853	.845		
	Sorbitol	18	5.240	.904		
	CPPACP	18	10.063	.780	234.699	<.001 vhs

Table 2 shows the intergroup comparison of salivary calcium concentration at different time intervals. Before chewing the calcium concentration of xylitol group was 4.264mg/dl (SD – 0.957), sorbitol group showed 4.556 (SD- 1.207) and CPP – ACP containing chewing gum group showed 4.773 (SD- .937). There was no significant difference between different groups of chewing gum (p = .660).

On first day of chewing the gum the salivary calcium concentration of xylitol group was 4.358mg/dl (SD - 0.795), sorbitol group showed 4.701mg/dl (SD- 0.987) and CPP – ACP containing chewing gum group showed 9.148mg/dl (SD- .957). There was very highly significant difference between different groups of chewing gum (p = <.001).

On 7th day of chewing the gum the salivary concentration of xylitol group was 4.853mg/dl (SD - .845), sorbitol group showed 5.240 mg/dl (SD- 0.904) and CPP – ACP containing chewing gum group showed 10.063 mg/dl (SD- .780).

There was very highly significant difference between different groups of chewing gum (p = <.001).

Table 3: Multiple Comparisons of Salivary Calcium Concentration among Each Group

DependentTIME (I) GRP	**Variable**	**(J) GRP**	**Mean Difference (I-J)**	**p**
Pre CALCIUM	Xylitol	Sorbitol CPPACP	-.2921 .07976	.652 .969
	Sorbitol	CPPACP	-.21742	.795
Day 1 CALCIUM	Xylitol	Sorbitol CPPACP	-.68200 -4.79026	.064 <.001 vhs
	Sorbitol	CPPACP	-4.10825	<.001 vhs
Day 7 CALCIUM	Xylitol	Sorbitol CPPACP	-.63672 -5.99915	.101 <.001 vhs
	Sorbitol	CPPACP	-5.36243	<.001 vhs

Table 3 shows multiple comparison of salivary calcium concentration among xylitol, sorbitol and CPP – ACP containing chewing gum group. Before chewing the gum, the mean difference was found to be -.2921 between xylitol and sorbitol group (p - .652 NS). The mean difference between xylitol and CPP – ACP containing chewing gum group was .0798(p - .969 NS). The mean difference between sorbitol and CPP – ACP containing chewing gum group was -0.2174 (p - .795 NS).

On the first day of chewing the gum, the mean difference was found to be .6820 between xylitol and sorbitol group (p - .064 NS). The mean difference between xylitol and CPP – ACP containing chewing gum group was -4.7903(p - <.001 VHS). The mean difference between sorbitol and CPP – ACP containing chewing gum group was -4.1083 (p -

<.001VHS). On the 7th day of chewing the gum, the mean difference was found to be .63672 between xylitol and sorbitol group (p - .101 NS). The mean difference between xylitol and CPP – ACP containing chewing gum group was -5.99915(p - <.001 VHS). The mean difference between sorbitol and CPP – ACP containing chewing gum group was -5.36243 (p- <.001VHS).

Graph: 1

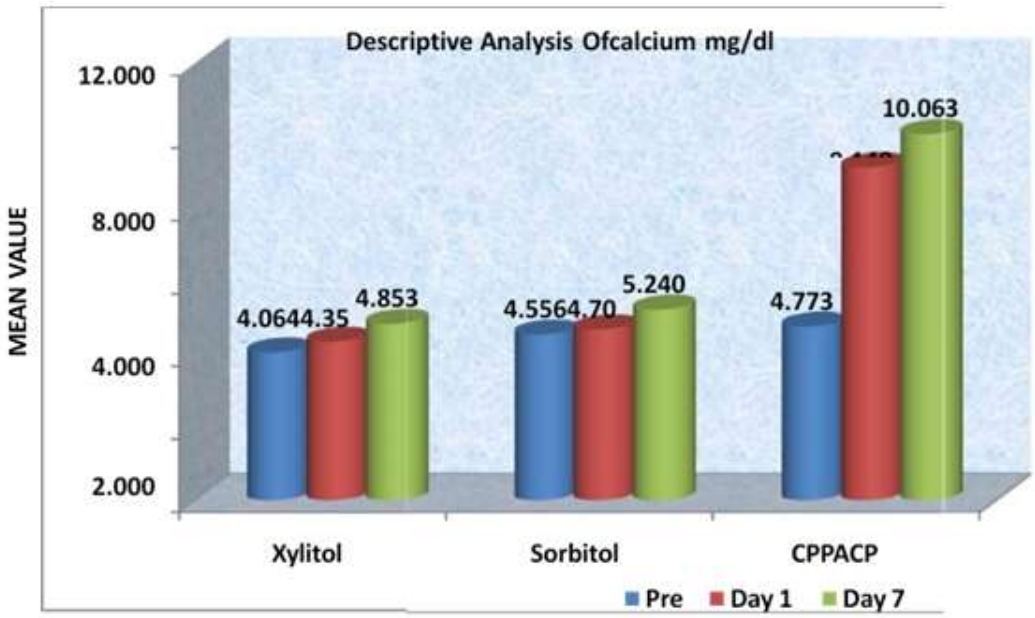


Table : 4 Concentration of Phosphorus in Saliva of Three Different Chewing Gums at Different Time Intervals (Pre, Day 1 And Day7) (mg/dl)

Group	time	N	Mean	Std. Deviation	H	P
	Pre	18	2.373	.290114		
Xylitol	Day 1	18	2.017	.463568		
	Day 7	18	1.818	.440089	8.508	.001
	Pre	18	2.450	.308323		
Sorbitol	Day 1	18	2.042	.428586		
	Day 7	18	2.008	.301193	8.826	.001
	Pre	18	2.502	.284049		
CPPACP	Day 1	18	2.145	.354161		
	Day 7	18	1.647	.405072	15.832	.000

Table 4 shows the concentration of phosphorus in saliva of 3 different chewing gum at 3 different time intervals. In xylitol group, the mean phosphorus concentration of saliva before chewing the gum was 2.373 mg/dl (SD 0.2901) and it became 2.017mg/dl (SD – 0.4636) on first day and 1.818mg/dl (SD – 0.4400) on 7th day. The result was found that statistically significant (p - .001).

In sorbitol group, the mean phosphorus concentration of saliva before chewing the gum was 2.450 mg/dl (SD .3083) and it became 2.042mg/dl (SD – 0.3083) on first day and 2.008 mg/dl (SD – 0.3012) on 7th day. The result was found that statistically significant (p -.001).

In CPP – ACP containing chewing gum group, the mean phosphorus concentration of saliva before chewing the gum was 2.502mg/dl (SD 0.2840) and it became 2.145 mg/dl (SD – 0.3542) on first day and 1.647 mg/dl (SD – 0.4051) on 7th day. The result was found that statistically very highly significant (p - .000).

Table: 5 Inter Group Comparison Of Salivary phosphorus Concentration (mg/dl)

TIME		N	Mean	Std. Deviation	F	p
Pre	Xylitol	18	2.373	.290		
	Sorbitol	18	2.450	.308		
	CPPACP	18	2.502	.440	.316	.726
Day 1	Xylitol	18	2.017	.464		
	Sorbitol	18	2.042	.429		
	CPPACP	18	2.145	.354	.473	.626
Day 7	Xylitol	18	1.818	.440		
	Sorbitol	18	2.008	.301		
	CPPACP	18	1.647	.405	3.916	0.026sig

Table5 shows the intergroup comparison of salivary phosphorus concentration at different time intervals. Before chewing the phosphorus concentration of xylitol group was 2.373mg/dl (SD – 0.290), sorbitol group showed 2.450 (SD- .308) and CPP – ACP containing chewing gum group showed 2.502 (SD- .440). There was no significant difference between different groups of chewing gum (p = .726).

On first day of chewing the gum the salivary calcium concentration of xylitol group was 2.017mg/dl (SD – 0.464), sorbitol group showed 2.042mg/dl (SD- 0.429) and CPP – ACP containing chewing gum group showed 2.145mg/dl (SD- .354). There was no significant difference between different groups of chewing gum (p = .626).

On 7th day of chewing the gum the salivary concentration of xylitol group was 1.818 mg/dl (SD - .440), sorbitol group showed 2.008 mg/dl (SD- 0.301) and CPP – ACP containing chewing gum group showed 1647 mg/dl (SD- .405). There was significant difference between different groups of chewing gum (p = .026).

Table 6: Multiple Comparisons Of Salivary Phosphorus Concentration Among Each Group

TIME	Dependent Variable(I) GRP		(J) GRP	Mean Difference(I-J)	p
Pre	Phosphorus	Xylitol	Sorbitol	-.11042	.483
			CPPACP	-.17043	.389
		Sorbitol	CPPACP	.19008	.311
Day 1	Phosphorus	Xylitol	Sorbitol	-.02517	.982
			CPPACP	-.12789	.632
		Sorbitol	CPPACP	-.10272	.743
Day 7	Phosphorus		Sorbitol	-.18633	.345
	Xylitol		CPPACP	-.22894	0.034 sig

Sorbitol CPP ACP -0.2520 0.024sig

Table 6 shows multiple comparison of salivary phosphorus concentration among xylitol, sorbitol and CPP – ACP containing chewing gum group. Before chewing the gum, the mean difference was found to be -.1104 between xylitol and sorbitol group (p - .483 NS). The mean difference between xylitol and CPP – ACP containing chewing gum group was - .1704(p - .389 NS). The mean difference between sorbitol and CPP – ACP containing chewing gum group was 0.1901 (p - .311 NS).

On the first day of chewing the gum, the mean difference was found to be -0.0257 between xylitol and sorbitol group (p - .982 NS). The mean difference between xylitol and CPP – ACP containing chewing gum group was -0.1279(p – 632 NS). The mean difference between sorbitol and CPP – ACP containing chewing gum group was -0.1027(p - .743NS).

On the 7th day of chewing the gum, the mean difference was found to be -0.1863 between xylitol and sorbitol group (p - .345 NS). The mean difference between xylitol and CPP – ACP containing chewing gum group was -0.2289(p - .034Sig). The mean difference between sorbitol and CPP – ACP containing chewing gum group was -0.252 (p - .024

Sig).

Graph: 2

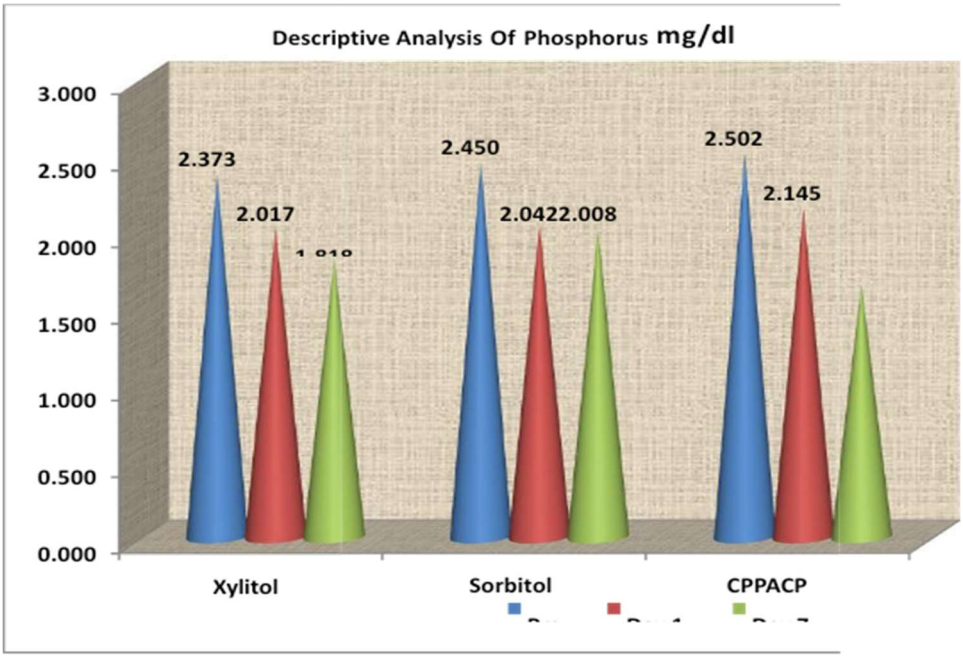


Table : 7 S. Mutans Count in Saliva of Three Different Chewing Gums at Different Time Intervals (Pre,Day 1 And Day7) (CFU/ml)

Group	N	Mean	Std. Deviation	H	P
Pre	18	1232222.22	838847.638		
Xylitol Day 1	18	1169888.89	794938.539		
Day 7 Pre	18	597666.667	538384.007	9.882	.007hs
Sorbitol Day 1	18	1658888.89	1246255.044		
Day 7 Pre	18	1521666.67	509593.263		0.009 hs
CPPACP Day 1	18	522222.222	504118.982	8.000	
Day 7	18	1788333.33	1529385.143		
	18	1675000.00	450819.515		
	18	552777.778	464704.910	22.533	<0.001 vhs

Table 7 shows the S. Mutans count in saliva of 3 different chewing gum at 3 different time intervals. In xylitol group, the mean S. Mutans count in saliva before chewing the gum was 1232222.22 CFU/ml (SD 838847.64) and it became 1169888.89CFU/ml (SD – 794938.54) on first day and 597666.67CFU/ml (SD – 538384.01) on 7th day. The result was found that statistically highly significant (p - .007).

In sorbitol group, the mean S. Mutans count in saliva before chewing the gum was 165888.89CFU/ml (SD 1246255.04) and it became 1521666.67 CFU/ml (SD – 509593.26) on first day and 522222.22 CFU/ml (SD – 504118.98) on 7th day. The result was found that statistically highly significant (p - .009).

In CPP – ACP containing chewing gum group, the mean S. Mutans count in saliva before chewing the gum was1788333.33CFU/ml (SD 1529385.14) and it became 1675000.0 CFU/ml (SD –450819.52) on first day and 552777.77 CFU/ml (SD – 464704.91) on 7th day. The result was found that statistically very highly significant (p - <.001).

Table: 8 Inter Group Comparison of Salivary S. Mutans Count (CFU/ml)

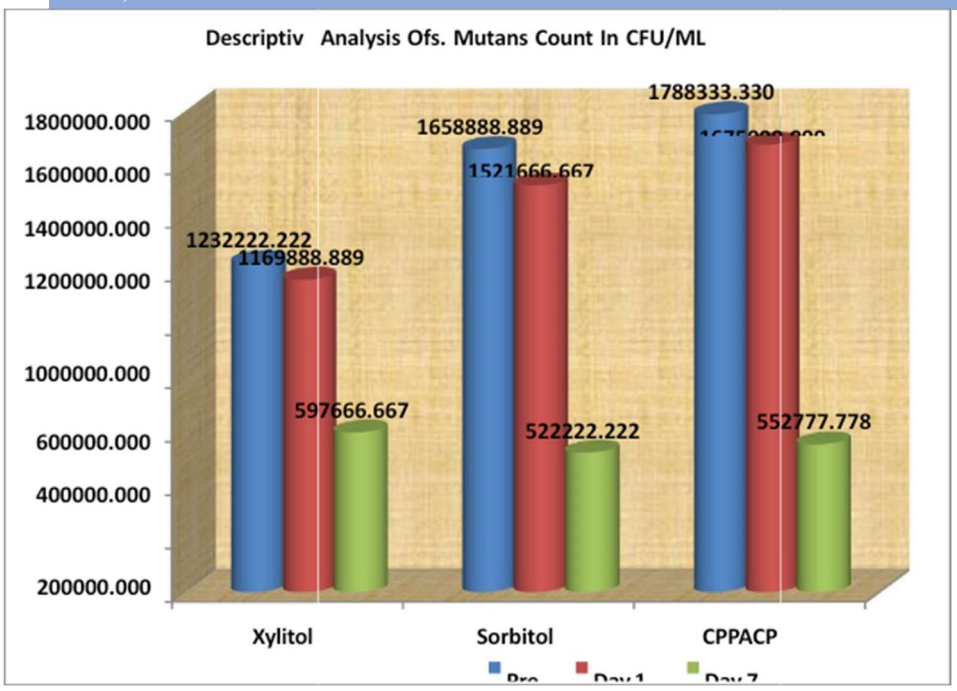
Time	N	Mean	Std. Deviation	H	P
Xylitol	18	1232222.22	838847.638		
Pre Sorbitol	18	1658888.89	1246255.044		
CPPACP	18	1788333.33	1529385.143	1.766	.181
Xylitol	18	1169888.89	794938.539		
Day 1 Sorbitol	18	1521666.67	509593.263		
CPPACP	18	1675000.00	450819.515	1.735	.187
Xylitol Day 7 Sorbitol	18	597666.667	538384.007		
CPPACP	18	522222.222	504118.982		
	18	552777.778	464704.910	.077	.926

Table8 shows the intergroup comparison of salivary S. Mutans count at different time intervals. Before chewing, the S. Mutans count of xylitol group was 1232222.22 CFU/ml (SD 838847.64), sorbitol group showed 165888.89CFU/ml (SD 1246255.04) and CPP – ACP containing chewing gum group showed was1788333.33CFU/ml (SD 1529385.14). There was no significant difference between different groups of chewing gum (p = .181).

On first day of chewing the gum the salivary S. Mutans count of xylitol group was 1169888.89CFU/ml (SD – 794938.54), sorbitol group showed 1521666.67 CFU/ml (SD – 509593.26) and CPP – ACP containing chewing gum group showed 1675000.0 CFU/ml (SD –450819.52). There was no significant difference between different groups of chewing gum (p = .187).

On 7th day of chewing the gum the salivary S. Mutans count of xylitol group was 597666.67CFU/ml (SD – 538384.01) , sorbitol group showed 522222.22 CFU/ml (SD – 504118.98) and CPP – ACP containing chewing gum group showed 552777.77 CFU/ml (SD – 464704.91). There was no significant difference between different groups of chewing gum (p = .926).

Graph 3



DISCUSSION

Dental caries is a multifactorial and dynamic condition influenced by numerous factors, with saliva playing a pivotal role in its onset and progression. Chewing gum, recognized as an effective salivary stimulant, has been extensively investigated as a delivery medium for therapeutic agents, including antibiotics, phosphates, and fluoride. Among these, sugar-free gums have gained prominence for their tooth-friendly attributes and positive impact on oral health, supported by an estimated global chewing gum market of 560,000 tons annually.9,10

This study evaluated the effects of various sugar-free gums—containing xylitol, sorbitol, and CPP-ACP (casein phosphopeptide-amorphous calcium phosphate)—on salivary calcium and phosphorus concentrations, as well as Streptococcus mutans counts.

Calcium Concentration

The results revealed a significant rise in salivary calcium levels in the xylitol and sorbitol gum groups throughout the study period. In the xylitol group, calcium concentrations increased from 4.06392 mg/dl at baseline to 4.3572 mg/dl on day 1 and 4.8529 mg/dl by day 7. Similarly, the sorbitol group exhibited an increase from 4.5572 mg/dl initially to 4.70064 mg/dl on day 1 and 5.0392 mg/dl by day 7.

The CPP-ACP gum group demonstrated the most pronounced increase, with calcium levels rising from 4.773 mg/dl at baseline to 9.148 mg/dl on day 1 and reaching 10.063 mg/dl by day 7. These findings align with the study by BP Santhosh et al., which reported an increase in calcium levels from 7.075 mg/dl to 12.075 mg/dl following the use of CPP-ACP gum.49 Additionally, Manning et al. observed that xylitol and sorbitol gums contribute to the remineralization of carious lesions by stimulating saliva flow.54

The significant increase in calcium levels, particularly in the CPP-ACP group, underscores its critical role in remineralization. Elevated salivary calcium enhances the deposition of minerals into demineralized enamel, thereby promoting the repair of incipient carious lesions and strengthening tooth structure. These benefits make CPP-ACP gum a potent agent in preventive dentistry.

Phosphorus Concentration

Contrary to calcium, salivary phosphorus levels showed a decline across all groups over time. In the xylitol group, phosphorus concentrations decreased from 2.173 mg/dl at baseline to 2.017 mg/dl on day 1 and further to 1.647 mg/dl

by day 7. Similarly, the sorbitol group demonstrated a reduction from 2.450 mg/dl initially to 2.042 mg/dl on day 1 and 2.008 mg/dl by day 7. The CPP-ACP gum group also showed a decline, with phosphorus levels dropping from 2.502 mg/dl at baseline to 2.145 mg/dl on day 1 and 1.818 mg/dl by day 7.

While the differences in phosphorus concentrations were not significant immediately after chewing, the reduction became more apparent by day 7, particularly in the CPP-ACP group. These findings are consistent with BP Santhosh et al., who noted a decrease in salivary phosphorus levels from 17.475 mg/dl to 12.525 mg/dl after chewing CPP-ACP gum.49

Streptococcus Mutans Count

All gum groups demonstrated a notable reduction in Streptococcus mutans counts over time. In the xylitol group, counts declined from 1.2 × 10^6 at baseline to 1.1 × 10^6 on day 1 and further to 5.9 × 10^5 by day 7. Similarly, the sorbitol group showed a decrease from 1.6 × 10^6 initially to 1.5 × 10^6 on day 1 and 6.2 × 10^5 by day 7. The CPP-ACP gum group exhibited a reduction from 1.7 × 10^6 at baseline to 1.6 × 10^6 on day 1 and 5.5 × 10^5 by day 7.

Despite the reduction in S. mutans counts across all groups, the differences between the groups were not statistically significant. These findings are in line with the study by Eva Soderling et al., which reported similar reductions in S. mutans counts for both xylitol and sorbitol gums.53 Hildebrandt et al. also observed that after three months of gum use, xylitol gum significantly reduced S. mutans levels compared to sorbitol gum.29

While all tested gums provided measurable benefits, CPP-ACP gum demonstrated superior efficacy in enhancing salivary calcium levels, supporting remineralization, and reducing S. mutans counts. These findings highlight the potential of targeted sugar-free gums in preventive dentistry.

CONCLUSION

From this study, it was concluded that:

1. There was increase in calcium concentration in every group after chewing the gum, but very highly significant increase was shown by CPP – ACP containing chewing gum.
2. The phosphorus concentration of saliva decreased in all groups after chewing the gum and CPP – ACP containing chewing gum group showed significantly low phosphorus concentration than other groups.
3. S. Mutans count reduced significantly in all chewing gum groups after chewing the gum. There was no significant difference between the groups.

This study underscores the positive effects of sugar-free gums in enhancing salivary calcium levels and reducing S. mutans counts. Among the tested gums, CPP-ACP gum demonstrated the most significant impact on calcium levels, while all groups exhibited comparable reductions in S. mutans counts. These findings highlight the potential of sugar-free gums as adjunctive tools for promoting oral health.

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