

EVALUATION OF EFFICACY OF 2% POVIDONE IODINE & CHLORHEXIDINE IN REDUCING SALIVARY STREPTOCOCCUS MUTANSHemant Gupta¹, Sumeet Hardiya²**HOW TO CITE THIS ARTICLE:**

Hemant Gupta, Sumeet Hardiya. "Evaluation of Efficacy of 2% Povidone Iodine & Chlorhexidine in Reducing Salivary Streptococcus Mutans". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 72, December 22; Page: 15214-15220, DOI: 10.14260/jemds/2014/4047

ABSTRACT: AIM: The present study was designed to evaluate the effectiveness of mouthrinses. Povidone iodine (PI) (2%) and Chlorhexidine (CHX) (0.2%) in reducing the count of streptococcus mutans (SM) in saliva and to compare the effectiveness of these drugs with each other in reducing the count of Streptococcus mutans. **MATERIALS & METHODS:** 20 subjects were randomly selected between the age group of 25 to 60 years from the OPD of Modern Dental College & Research Centre, Indore and were equally divided in two groups i.e. Group A and B. Saliva sample from the patients was collected in two phases. In first phase, 2ml of stimulated saliva was collected in a sterile plastic container before treating with the drug. Later in second phase saliva sample was collected after treating the subjects with respective drug i.e. Group A with 2% povidone iodine and Group B with 0.2% chlorhexidine. The number of streptococcus mutans colonies was counted on Mitis Salivarius Bacitracin (MSB) agar medium after culture. **RESULTS:** The results of study confirmed that povidone iodine mouthrinses were more effective in reducing the count of streptococcus mutans in saliva as compared to chlorhexidine. **CONCLUSIONS:** Both the drugs i.e. chlorhexidine and povidone iodine were effective in reducing Streptococcus mutans count, however povidone iodine is more effective in decreasing streptococcus mutans count as compared to chlorhexidine. Use of anti-microbial mouthrinses provides better reduction in streptococcus mutans count thereby dental caries.

KEYWORDS: Povidone iodine, Chlorhexidine, Streptococcus mutans, MSB Agar.

INTRODUCTION: Dental caries is the most prevalent disease of the oral cavity. Streptococcus mutans has been implicated as one of the major and most virulent caries producing organism.¹ In India prevalence of dental caries varies from 33.7% to 90%.² Treating a carious tooth by providing a restoration does not cure the disease. Unfavorable oral environment lead to the persistence of cavity and will result in increased dental caries. Reduction in number of cariogenic microorganisms by treating them and establishing a favourable oral environment leads to remineralization of tooth structure and will stop caries process. 2% Povidone Iodine and 0.2% Chlorhexidine has been found to lower the Streptococcus mutans count in oral environment.^{1,2,3,4}

Chlorhexidine is the antimicrobial agent most familiar to dental professionals for prevention of dental caries.⁵ It is delivered as mouthrinses, gels and most recently as varnishes. An alcohol-free chlorhexidine has recently been introduced which enables patients to obtain the benefits of chlorhexidine gluconate oral rinse without the drying effects of alcohol. chlorhexidine due to its highly cationic (positive) charge has been showed to reduce the number of Streptococcus mutans, however, it does not seem to be effective against lactobacillus.⁶

Povidone Iodine or betadine is a potent microbicidal agent with several advantages over other iodine solutions. Combining iodine with Polyvinyl pyrrolidone (PVP) increases its ability to dissolve in water and alcohol, reduces irritability and decreases the staining caused by pure iodine.

ORIGINAL ARTICLE

PVP, the hydrophilic polymer that acts as a carrier in povidine iodine, does not have any intrinsic antibacterial activity, but because of its affinity to the cell membrane, it delivers free iodine directly to the bacterial cell surface. Delivery of iodine to the sensitive elements of the cell membrane is a crucial event of antibacterial action. Iodine targets are located in the bacterial cytoplasm and cytoplasmic membrane, and its killing action takes place in a matter of seconds.⁵

Concurrent use of positively charged chlorhexidine and negatively charged iodine therapy is not recommended, as they bind together and become less effective.⁶

The present study was carried out with the following Objectives:

- To evaluate anti-bacterial activity of Povidone Iodine and Chlorhexidine in vivo.
- To compare the effectiveness of Povidone Iodine and Chlorhexidine in reducing the count of oral Streptococcus mutans.

MATERIALS & METHODS: STUDY SAMPLE: The sample size consisted of 20 patients from out-patient department of Modern Dental College & Research Centre, Indore, with a variable age ranging between 25 to 60 years. The patients were randomly divided into two groups consisting 10 patients each.

Group A: Subjects were treated with 2% Povidone Iodine. (Win-Medicare)

Group B: Subjects were treated with 0.2% Chlorhexidine. (Periex)

EXCLUSION CRITERIA:

- Individuals who were taking antibiotics or any other medication since one month.
- Individuals with orthodontic appliances.
- Individuals with intra oral soft tissue pathology.
- Individuals with restored teeth.
- Medically compromised individuals.
- Individuals with changes in normal range of total leucocyte and differential leucocyte count.

DATA COLLECTION: Patients were made comfortable in dental chair. Case history with DMFT recording was done by a single examiner using mouth mirror and probe according to the criteria for dentition status assessment outline in basic oral health surveys 4th edition 1997 by WHO.⁷ These patients were asked to refrain from drinking or eating one hour before the collection of sample. After one hour they were asked to chew paraffin wax for two minutes and then stimulated saliva was collected in sterile universal container.

SAMPLE COLLECTION:

PHASE I: 2ml of paraffin wax stimulated saliva (1min.) was collected in a sterile universal container before treating the subject with the respective drug. The container was immediately transported to the Department of Microbiology, in the institute, for processing. This sample was labeled as pre-treatment sample.

PHASE II: Subsequently those subjects were treated with respective drug as.

ORIGINAL ARTICLE

Group A: Subjects were instructed to rinse the mouth for 1min with 5ml of 2% Povidone Iodine diluted in 5ml of water.

Group B: Subjects were instructed to rinse the mouth for 1min with 10ml of 0.2% Chlorhexidine without diluting it.

After the application of respective drug patients were asked to continue refraining from drinking or eating for an hour. After one hour 2ml of paraffin stimulated saliva sample was collected. This sample was labeled as post treatment sample. The sample was transported immediately to the Department of Microbiology, in the institute for processing.

LABORATORY PROCEDURE: Saliva sample was diluted with phosphate buffer saline (PBS) in 1:1 dilution. 50µl of diluted saliva sample was inoculated on petriplate containing Mitis Salivarius Bacitracin by using spread plate technique.^{8,9,10} After inoculation the petriplates were kept in an anaerobic gas jar (Hi Media, Mumbai) containing indicator tablet (Hi Media, Mumbai) and Anaerogas 1.5L pack (Hi Media, Mumbai). Anaerobic chamber was placed in bacteriological incubator at 37°C for 48 hours. The *Streptococcus mutans* colonies were identified MSB agar plate by its typical colonial characteristics. (Figure 1) Colonies based on their morphology were counted for the presence of *Streptococcus mutans*.



Fig. 1: Colonies of *Streptococcus mutans* in MSB Agar Medium

Streptococcus mutans was confirmed by using Gram's staining and fermentation test for sugar i.e. mannitol and sorbitol (figure2). Snyder Test (figure3) was also performed to confirm the cariogenic activity of salivary microorganism.



Fig. 2: Positive Fermentation Test for confirming the cariogenic activity of *S. mutans* in saliva

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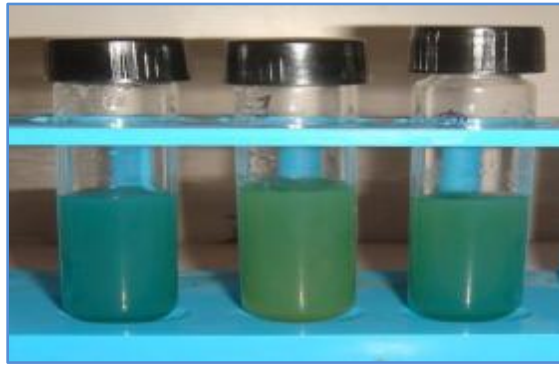


Fig. 3: Positive Snyder Test for confirming the cariogenic activity of *S. mutans* in saliva.

Colony counting was done with the magnifying glass and the count of *Streptococcus mutans* was expressed in terms of number of colony forming units per millilitre (CFU/ml) of saliva.

RESULTS:

Group	Mouth Rinse Used	Mean		t-Obs	p-value	Significance
		Pre	Post			
A	Povidone Iodine	163000	29700	5.545	0.0004	(S*)
B	Chlorhexidine	127000	39200	2.503	0.0337	(S*)
t-tabulated= 2.262, degree of freedom=(n-1)=9, p(tab)=.05 S*→Significant						

Table 1: Comparison of bacterial count before and after treatment with Povidone iodine & Chlorhexidine mouth rinses

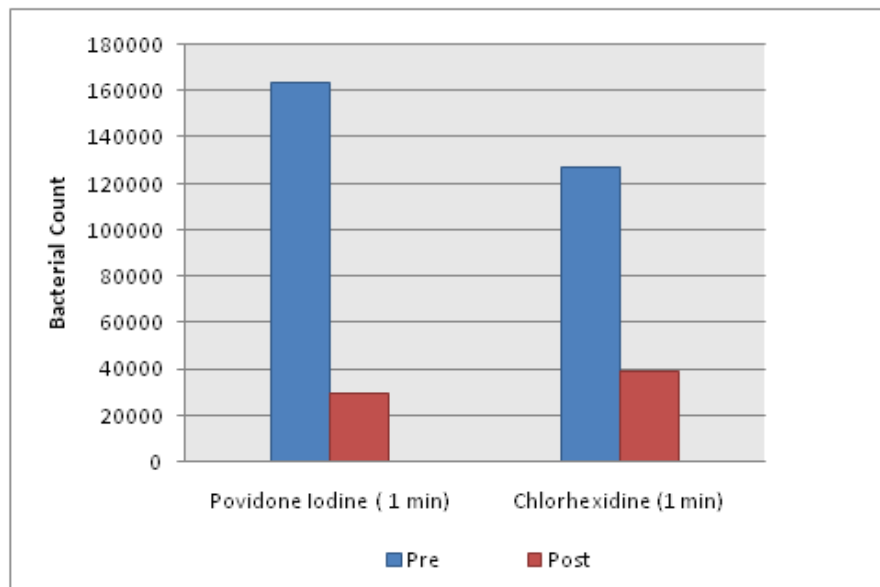


Fig. 4: Comparison of Pre and post bacterial counts

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The present study evaluated antimicrobial activity of two mouth rinses in vitro having different composition. Further effectiveness of both mouthrinses was evaluated by measuring pre and post *Streptococcus mutans* count in vitro. 82% reduction in *Streptococcus mutans* bioload was observed in group A salivary samples while in group B it was observed to be only 69%. Further the results obtained by Paired Student's 't' Test in both the mouthrinses i.e. povidone iodine and chlorhexidine proved significant in reducing bacterial count (Graph1). However based on the significance values (P- value), povidone iodine showed more reduction in count of *Streptococcus mutans* as compared to chlorhexidine.

DISCUSSION: *Streptococcus mutans* is a significant pathogen of oral cavity and initiates dental caries. This organism was isolated for the first time from the dental plaque by Clarke in 1924. The name 'mutans' was chosen because of its tendency to exhibit both coccid and rod shaped (mutant) cell morphology. *Streptococcus mutans* belongs to the *S. viridans* group, which is a poorly defined, heterologous group of the Genus *Streptococcus*. Members of this group are indigenous to the oral cavity. Though the classification of this particular group is oversimplified, it includes a variety of strains with different physiological and serological characteristics comprising *S. mutans*, *S. sanguinis*, *S. mitis*, *S. salivarius*, *S. Milleri*, *S. mitior* and *S. oralis*.

Streptococcus mutans is the major component of oral streptococci which are indigenous to the oral cavity. It can produce large amounts of extracellular glucan from sucrose by the enzyme glucosyl transferase. The production of glucan and large amounts of lactic acid by fermentation of carbohydrates constitutes major virulence factors in the causation of dental caries which is proved beyond doubts.¹⁰

In the present study stimulated saliva was taken by following Dasanayake et al (2005) who has stated that stimulated saliva samples yield higher number of *Streptococcus mutans* than the unstimulated saliva.¹¹ This study was commenced to analyze the efficacy of the two routinely used anti-bacterial drugs.

In general dental practice, chlorhexidine is routinely prescribed mouthrinse. However our findings revealed more reduction in *Streptococcus mutans* count with the use of povidone iodine as compared to chlorhexidine. Azza El Housseiny (2005) also observed povidone iodine to be more effective in reducing the count of *Streptococcus mutans*. Though significant reduction ($p \leq 0.05$) of *Streptococcus mutans* count was observed with use of both drugs, povidone iodine gave most effective results.¹² According to Gibbons et al (1973) topical application of povidone iodine solution has also demonstrated suppression of oral *Streptococcus mutans* population. In an early investigation he indicated that a single application of 0.2% potassium iodine solution (KI) eliminated *Streptococcus mutans* from accessible human tooth sites for up to 13 weeks following treatment.¹³

Caufield et al (1981) observed that both the drugs i.e. povidone iodine and chlorhexidine reduced caries significantly on topical application but povidone iodine was most effective in reducing buccal caries.¹⁴

Povidone iodine is a potent antimicrobial agent that kills microorganism on contact.⁶ Moreover povidone iodine has been found to significantly reduce the incidence of post-operative wound complications in surgery. However it is contraindicated as a regular mouth wash in patients with thyroid disorders or on lithium therapy. Side effects related to povidone iodine include mucosal irritation and hypersensitivity reaction.¹⁵

ORIGINAL ARTICLE

The present study can serve as a base line data between the two drugs and suggests that both drugs can be used as mouthrinses for decreasing the bacterial count. Our study shows povidone iodine can be preferred as it was observed to be best in reducing Streptococcus mutans count among both mouthrinses. Besides this the study has to be carried forward on large scale so as to construct a reliable caries prevention modal for the future.

Following conclusions can be drawn from the present Study:

- Both the drugs i.e. chlorhexidine and povidone iodine were effective in reducing the count of Streptococcus mutans.
- Povidone iodine showed more effect in decreasing the count of Streptococcus mutans as compared to the chlorhexidine.
- Use of anti-microbial mouthrinses provides better reduction in Streptococcus mutans count and thereby dental caries.

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ORIGINAL ARTICLE

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AUTHORS:

1. Hemant Gupta
2. Sumeet Hardiya

PARTICULARS OF CONTRIBUTORS:

1. Senior Lecturer, Department of Oral Pathology, MDS, Index Institute of Dental Sciences, Indore.
2. Senior Lecturer, Department of Orthodontics, MDS, Modern Dental College, Indore.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Hemant Gupta,
435, Swapnil Apartment,
Flat No. 203, Goyal Nagar,
Indore, M. P.
Email: macrocyte@gmail.com

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