

Original Article

**COMPARATIVE EVALUATION OF ANTIMICROBIAL EFFICACY OF TWO COMMERCIALY AVAILABLE DENTIFRICES (FLUORIDATED AND HERBAL) AGAINST SALIVARY MICROFLORA**

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**ABSTRACT**

**Objective:** The aim of this study was to compare the antimicrobial efficacy of two commercially used toothpastes.

**Methods:** The two toothpastes used in the study were Fluoride containing toothpaste (Group A) and Herbal toothpaste (Group B) at various concentrations in salivary samples of children in the mixed dentition age group. The antimicrobial activity was assessed by measuring the inhibition zones by agar well diffusion method. Saliva was collected from children of age group 6-12 years having high caries activity.

**Results:** The results suggested that Fluoridated toothpaste had maximum antimicrobial activity at all concentrations when compared to Herbal toothpaste which was statistically significant when tested with ANOVA and Post hoc test.

**Conclusion:** The higher antimicrobial activity of fluoride containing toothpaste could be attributed to the presence of different components like triclosan and fluoride.

**Keywords:** Toothpaste, Fluoride, Antimicrobial, Herbal.

**INTRODUCTION**

Dental caries and periodontal diseases are essentially caused by the micro-organisms present in dental plaque. Biofilm formation is a natural process in the oral environment, but needs to be controlled through regular brushing in order to prevent the development of caries and periodontal diseases.

Both chemical and mechanical oral hygiene aids are used for removal and prevention of plaque. Mechanical plaque control measures, such as toothbrushes, dental floss, toothpicks and interdental brushes are very popular and are mostly used in conjunction with chemical plaque control aids, e.g. mouthrinses and medicated toothpastes [1]. Yet, in most people, brushing alone is inadequate to remove oral biofilm to an extent that the development of periodontal diseases and caries is prevented [2]. Thus, antimicrobial toothpastes that augment mechanical plaque removal may provide an effective means to maintain good oral hygiene.

Despite the efficacy of many toothpaste formulations with antibacterial properties, [3, 4] there is an increasing societal desire to rely on naturally occurring compounds for health care, which has also found its way into dentistry [5].

The other alternative toothpaste on the market for use by infants, do not contain fluoride in their composition, but have herbal products or enzymes to produce antiseptic or antimicrobial effects against cariogenic and opportunistic micro-organisms in the oral environment [6]. The components of natural toothpastes should be as safe as those of conventional toothpastes, provide efficient protection against cariogenic micro-organisms to enhance biofilm control, and prevent dental caries. A nineteenth century analysis showed that root bark of the herbal toothpaste contains 27.06 % ash, large amounts of chlorine, and trimethylamine, an alkaloid, and a resin. In addition, further research has revealed it to contain silica, sulfur and vitamin C but negligible quantities of tannins and saponins. Accordingly, some of these components are useful to tooth cleaning [7]. This study is thus aimed at comparing the antimicrobial efficacy of triclosan containing fluoridated dentifrice and Herbal tooth paste.

**MATERIALS AND METHODS**

**Toothpaste**

Two toothpastes namely fluoride containing and herbal were selected for assessment of their in vitro antimicrobial activity. The products were collected from local market, Pune.

**Criteria for selection of patients**

In the present study, patients of 6-12 years of age, in mixed dentition period with high caries experience were included. These patients had no history of antibiotic therapy or use of chemical anti-plaque agents prior to six months of study initiation.

**Method of saliva collection and storage**

The subjects were told to rinse with water; saliva was allowed to accumulate in the floor of the mouth for approximately two minutes and by asking the subject to spit in uricol container. By following the above mention method, 10 samples were collected in the early morning time. The samples were transported immediately to the laboratory.

**Minimal inhibitory concentration of toothpastes**

All toothpaste samples were diluted in sterile water and prepared series dilution. The concentrations considered - 25%, 50% and 100%.

**Antimicrobial Assay**

The antimicrobial activity of different concentrations of the dentifrices was determined by modified agar well diffusion method. In this method, nutrient agar plates were seeded with 0.5 mL collected saliva sample for 24h. The plates were allowed to dry for 1 h. A sterile 8 mm cork borer was used to cut one central and two wells at equidistance in each of the plates. Dentifrice dilutions at different concentrations were introduced into each of the three wells. The plates were incubated at 37°C for 24 h. The antimicrobial activity was evaluated by measuring the diameter of zones of inhibition (mm)

**RESULTS**

The antimicrobial activity of fluoride containing dentifrice has been consistently high at 25%, 50% and 100% concentrations as

compared to herbal toothpaste with a mean zone of inhibition of 14.4mm, 17.5mm respectively (Tables 1,2 and 3 and figures 1and 2). When the results were subjected to ANOVA and post hoc tests the

results showed that fluoride containing dentifrice had zones of inhibition which were significantly higher than the other two groups at all concentrations (Tables 1,2 and 3 and figures 1and 2).

**Table 1: Comparison of antimicrobial activity at 25% in study groups**

Parameter	Antimicrobial activity at 25%	F value	P value
Fluoride toothpaste	mean - 14.4 SD - 3.34	4.92	<0.05
Herbal toothpaste	mean - 10.7 SD - 2.54		

P=0.015 Fluoride toothpaste Vs Herbal toothpaste: P<0.05

**Table 2: Comparison of antimicrobial activity at 50% in study groups**

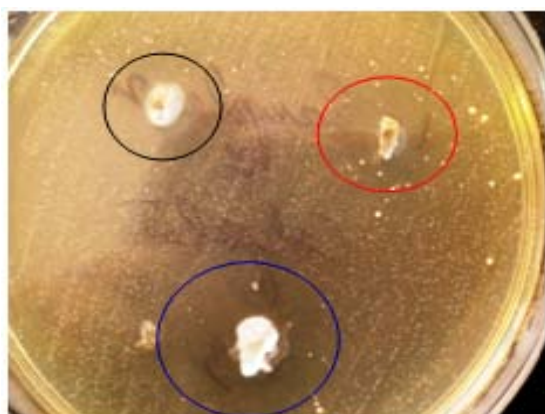
Parameter	Antimicrobial activity at 50%	F value	P value
Fluoride toothpaste	mean - 17.5 SD - 4.01	3.67	<0.05
Herbal toothpaste	mean - 13.5 SD - 2.79		

P=0.039 Fluoride toothpaste Vs Herbal toothpaste: P<0.05

**Table 3: Comparison of antimicrobial activity at 100% in study groups**

Parameter	Antimicrobial activity at 100%	F value	P value
Fluoride toothpaste	mean - 21.8 SD - 3.58	7.28	<0.05
Herbal toothpaste	mean - 16.3 SD - 2.49		

P=0.003 Fluoride toothpaste Vs Herbal toothpaste: P<0.005



**Fig. 1: Inhibition zones of fluoridated toothpaste at 25%, 50%, 100% 25% Black ring, 50% Red ring and 100% Blue**

## DISCUSSION

Fluoride containing toothpaste due to the triclosan/copolymer along with the 1000ppm Fluoride provides a more effective level on plaque control and periodontal health than conventional fluoride toothpaste [8]. It has been suggested that triclosan blocks lipid biosynthesis by specifically inhibiting the enzyme enoyl-acyl carrier protein reductase (ENR). This feature of fluoride toothpaste can be attributed to the antimicrobial efficiency.

Although the commonly used and recommend toothpastes by WHO, ADA, FDI is the fluoride and triclosan containing. But the excess use of the fluoride can cause the dental fluorosis so the recommended amount of the fluoride should be used as the ingredients in the toothpaste. The fluoride tooth paste reduces the number of streptococcal colony forming units of dental plaque despite the fact that fluoride was added to the toothpastes first with aiming to preserve the product and then to protect the teeth [9]. The effectiveness of fluoride toothpastes as an antimicrobial agent is concentration dependent.

Using natural medicines to cure various diseases has become an increasing trend. Herbal medicine has made significant contribution to modern medical practice [10]. The antimicrobial activity of the herbs is due to the presence of secondary metabolites such as

alkaloids, flavonoids, polyphenols, and lectins [11]. Synergistic interactions between the principal components of these herbs are considered to be a vital part of their efficacy. This synergistic activity, however, needs to be established. Many studies on herbal base toothpaste in control of plaque and gingivitis are reported. Herbal toothpaste however showed the least zones of inhibition at all concentrations.



**Fig. 2: Inhibition zones of herbal toothpaste at 25%, 50%, 100% 25% Black ring, 50% Red ring and 100% Blue ring**

Although the Herbal product had less potency as an antimicrobial agent in this study, but the tannins, flavonoids and lectins present in it definitely strengthens the periodontium and gingival tissue [12]. It can definitely be used in children upto 3 yrs of age to avoid fluoride toxicity as fluoride uptake upto 0.3-0.6ppm is sufficient for this age group which generally met through the dietary supplements and drinking water as specified by the AAPD guidelines 2013.

## CONCLUSION

The level of pathogenic organisms in the oral microbiota is one of the etiological factors for dental caries and other periodontal diseases. There are a number of toothpastes available in the market that claim to have antimicrobial potential. This study has proved that the fluoridated toothpaste remains a gold standard as far as

antimicrobial efficacy is concerned. However, it must be recognized that 1000 ppm fluoride containing toothpastes are not recommended for children. Herbal tooth paste also showed antimicrobial properties and is a herbal product; thus reducing the chances of fluoride toxicity.

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