

Antimicrobial efficacy of two commercially available toothpastes on salivary *Streptococcus mutans*, *Lactobacillus*, and *Candida*: A randomized controlled trial

K. Saravana Kumar, Sharath Asokan, J. Baby John, P.R. Geetha Priya

Department of Pedodontics and Preventive Dentistry, KSR Institute of Dental Science and Research, Thiruchengode, Tamil Nadu, India

ABSTRACT

Aim: To assess and compare the antimicrobial efficacy of two commercially available tubes of toothpaste on salivary *Streptococcus mutans*, *Lactobacillus*, and *Candida*. **Setting and Design:** A total of 30 school children at the age of 4-6 years with decayed, missing, and filled teeth ≤ 2 , subjected to similar dietary restrictions were randomly divided into two Groups A and B. Children in Group A were provided with Pediflor toothpaste and in Group B with Kidodent toothpaste. Saliva was collected for all the children and the baseline salivary count for *Streptococcus*, *Lactobacillus*, and *Candida* were recorded. The brushing technique was demonstrated and the students were asked to brush twice daily. Salivary bacterial counts were again assessed after 30 days and 60 days respectively. **Statistical Analysis:** The results were statistically analyzed using Friedmans test and Mann-Whitney U-test. **Results and Conclusion:** The baseline means salivary *S. mutans* count significantly reduced from 58.4 to 12.67 in Group A and from 58.73 to 13.8 in Group B in 60 days ($P = 0.001$). Similarly, *Lactobacillus* count reduced from 25.07 to 6.0 in Group A and from 26.60 to 6.13 in Group B in 60 days ($P = 0.001$). *Candida* count was too less to be subjected to statistical analysis. Both Pediflor and Kidodent toothpaste showed a marked reduction of *S. mutans* and *Lactobacillus* at 30 and 60 days intervals. But there was no statistically significant difference between the two pastes.

Key words: Kidodent, *Lactobacillus*, pediflor, *streptococcus mutans*

INTRODUCTION

Dental caries is a localized microbial infection that affects the calcified hard tissues of the oral cavity due to biochemical interactions of a complex oral microflora causing dissolution of the organic matrix and breakdown of the inorganic portion

of tooth.^[1] The incorporation of fluoride into the calcium and phosphate structure of enamel by using fluoridation techniques results in the formation of fluorapatite crystals which is harder and insoluble compared to normal enamel.^[2]

Many studies reveal that *Streptococcus mutans* are the principal microorganism that caused dental caries by fermenting carbohydrates resulting in acid production and


Address for correspondence:

Dr. K. Saravana Kumar, Department of Pedodontics and Preventive Dentistry, KSR Institute of Dental Science and Research, Thiruchengode, Tamil Nadu, India.
E-mail: shravkumar55@gmail.com

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demineralization of the tooth.^[3] The role of bacteria like *Lactobacillus* and *Candida* in active carious lesions has also been reported in the literature.^[4] The study attempts to evaluate the antimicrobial efficacy of two commercially available fluoridated pediatric toothpastes namely Pediflor and Kidodent on three bacterial species namely *S. mutans*, *Lactobacilli*, and *Candida* in children within 4-6 years of age.

MATERIALS AND METHODS

The study was approved by the Institutional Review Board and Ethical Committee of KSR Institute of Dental Science and Research. The study was conducted by a residential government aided the school in Thiruchengode, Tamil Nadu. Thirty children in the age group of 4-6 years with a decayed, missing, and filled teeth score ≤ 2 were selected for our study and randomly divided into two Groups A (Pediflor) and Group B (Kidodent). Of them, 19 were girls and 11 were boys. Exclusion criteria:

- Children with oral pathologies, or those who have taken an antibiotic treatment for past 3 months,
- Children taking orthodontic treatment and
- Medically compromised children.

The duration of the study was for 60 days from mid-July to September. Saliva collection was done on 0, 30, and 60 days, respectively. A washout period of 1-week was given prior to the start of our study during which the children were asked to brush their teeth with plain toothbrush alone. Saliva collection was done by asking the students to spit directly into a sterile bottle while being seated. It was done 2 h after breakfast to minimize diurnal variations and was done over a period of 5-7 min. The sterile bottles were transported within an hour to the laboratory.^[5]

The collected salivary samples were uniformly streaked on Mitis Salivarius agar specific for *S. mutans*, *Lactobacillus* MRS Agar for *Lactobacillus* and Saborauds Dextrose agar for *Candida* using an L glass rod. The plates were immediately incubated at 37°C for 48 h. Gram-staining was done to identify the bacteria. Colonies were counted. Semi-quantitation was done by multiplying the colony forming units into 10^3 as the sample was diluted 1000 times. The baseline bacterial count was recorded for all the 30 children and Pediflor toothpaste was distributed to Group A and Kidodent Group B, respectively. The horizontal scrub technique of tooth brushing was demonstrated to the warden and the children. The children were asked to brush twice daily and it was monitored by the warden.^[5]

Statistical analysis

Comparison of antimicrobial efficacy of the two pediatric pastes at different time periods was analyzed using Friedmans test. Comparison of efficacy between the two groups was calculated using Mann-Whitney U-test.

RESULTS

The baseline mean salivary *S. mutans* count reduced significantly from 58.4 to 12.67 in Group A after 60 days. Similarly, in Group B, the mean salivary *Streptococcus* count at baseline level was 58.73 which was gradually reduced to 13.8 as shown in Table 1. The mean salivary *Lactobacillus* count at baseline level was 25.07 gradually reduced to 6.0 after 60 days in Group A. Similarly in Group B, the mean salivary *Lactobacillus* count at baseline level was 26.60 reduced to 6.13 in 60 days time interval as show in Table 2. The results were statistically significant with a $P = 0.001$ for both the groups. Intergroup comparisons analyzed using Mann-Whitney U-test revealed that there was no statistical difference between the two toothpaste in both the time intervals as shown in Table 3. *Candida* count was very few to count in all the 3 time periods. Hence, the scores for *Candida* could not be subjected to statistical analysis.

DISCUSSION

According to the American Academy of Pediatric Dentistry (2014), the antimicrobial efficacy of fluoridated toothpaste in children is greater with an increase in the concentration of fluoride used, frequency of usage, and supervised brushing. It also suggests using not more than a pea sized amount of fluoride toothpaste for children in the age group of 3-6 years.^[6] Almost all caries control programs utilize the fluoridated toothpaste and are the most commonly employed technique for caries reduction.^[4] Studies of Glass 1982, Marthaler (1994), Ripa 1999 clearly establish the fact that the reduction of caries has been made possible by using fluoridated toothpaste. Interestingly, researchers have also

Table 1: Mean SM count in Group A and B at 3 time periods

Time period	Group A		P	Time period	Group B	
	SM CFU Mean \pm SD ($\times 10^3$)				SM CFU Mean \pm SD ($\times 10^3$)	P
Baseline	58.40 \pm 11.57		0.001	Baseline	58.73 \pm 12.29	0.001
30 days	26.67 \pm 4.3			30 days	26.40 \pm 3.85	
60 days	12.67 \pm 2.53			60 days	13.80 \pm 2.21	

*Friedmans test; SM: *Streptococcus mutans*; CFU: Colony forming unit; SD: Standard deviation

Table 2: Mean *Lactobacillus* count in Group A and B at 3 time periods

Time period	Group A		P	Time period	Group B	
	LB CFU Mean \pm SD ($\times 10^3$)				LB CFU Mean \pm SD ($\times 10^3$)	P
Baseline	25.07 \pm 6.18		0.001	Baseline	26.60 \pm 6.90	0.001
30 days	12.27 \pm 2.94			30 days	12.67 \pm 3.77	
60 days	6.00 \pm 1.36			60 days	6.13 \pm 2.33	

*Friedmans test; LB: *Lactobacillus*; CFU: Colony forming unit; SD: Standard deviation

Table 3: Intergroup comparison of bacterial count at 3 time periods

Groups	n	Mean ± SD (×10 ⁸)	P
SM - baseline			
Group A	15	58.40±11.57	0.95
Group B	15	58.73±12.28	
LB - baseline			
Group A	15	25.06±6.18	0.52
Group B	15	26.60±6.89	
SM-30 Days			
Group A	15	26.66±4.36	0.88
Group B	15	26.40±3.85	
LB - 30 Days			
Group A	15	12.26±2.93	0.71
Group B	15	12.66±3.77	
SM - 60 days			
Group A	15	12.66±2.52	0.22
Group B	15	13.80±2.21	
LB - 60 days			
Group A	15	6.00±1.36	0.73
Group B	15	6.13±2.32	

Mann-Whitney U-test; SM: *Streptococcus mutans*; LB: *Lactobacillus*; SD: Standard deviation

found no change in the plaque microflora using fluoridated toothpaste.^[5] Walsh *et al.* in their systematic review concluded that caries prevention was greater in toothpaste with higher fluoride concentrations (>1000 ppm) and that there was no statistically significant effect when used in concentrations <500 ppm.^[7] A meta-analysis done by Wright *et al.* reported that fluoridated toothpaste at 500 ppm or more has a greater impact on caries reduction when compared to toothpaste with lesser fluoride concentration in children aged 6 years or lesser.^[8]

Studies by Gudipani *et al.* in children between 3 and 5 years with severe early childhood caries have shown that brushing with toothpaste containing lysozyme, lactoferrin, and lactoperoxidase after a week showed highly significant reduction of both salivary *S. mutans* and *L. acidophilus* with statistically significant values ($P < 0.001$). Whereas, a toothpaste containing 500 ppm fluoride showed a highly significant reduction in the *S. mutans* levels ($P < 0.001$) and only a significant reduction in *Lactobacillus* count ($P < 0.01$). Nonfluoridated toothpaste showed a highly significant reduction in *S. mutans* ($P < 0.001$) only, but the reduction in the *Lactobacillus* levels was not significant ($P < 0.05$).^[9] The results of our study showed that fluoridated toothpaste in the concentration of 500 ppm or lesser were equally effective against both *Streptococcus* as well as *Lactobacillus* count.

Children in the age group of 4-6 years were included in this study since the antimicrobial efficacy of two pediatric tubes of toothpaste was analyzed. There was a significant reduction in mean salivary *Streptococcus* and *Lactobacillus* counts after the use of toothpaste containing 458 and 500 ppm of fluoride. Interestingly, Pediflor, which has lesser than 500 ppm fluoride concentration was more or less equally

effective as Kidodent toothpaste which has a 500 ppm concentration. Children in this study who previously brushed once daily were asked to brush twice a day. This might be the reason for the increased antimicrobial efficacy.

Patil *et al.* (2010) compared the antimicrobial efficacy of Cheerio gel and Himalaya herbal toothpaste in children 4-6 years of age and found that both the herbal and fluoridated toothpaste were effective against *S. mutans* and that inter group comparison between the two toothpastes was not statistically significant.^[5]

CONCLUSION

Within the limitations of the study, it is possible to conclude that both Pediflor and Kidodent have shown statistically significant reduction of *S. mutans* and *Lactobacillus* at both 30 days and 60 days intervals. Both the pediatric toothpaste had almost equal antimicrobial efficacy with no statistical difference between the groups. Due to the presence of too few colony forming units of *Candida*, the effect of the two toothpaste on the microorganism could not be established.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Prasanth M. Antimicrobial efficacy of different toothpaste and mouthrinses: An *in vitro* study. Dent Res J (Isfahan) 2011;8:85-94.
2. Lewis CW. Fluoride and dental caries prevention in children. Pediatr Rev 2014;35:3-15.
3. Sentila R, Gandhimathi A, Karthika S, Suryalakshmi R, Michael A. *In-vitro* evaluation and comparison of the anti-microbial potency of commercially available oral hygiene products against *Streptococcus mutans*. Indian J Med Sci 2011;65:250-9.
4. Marinho VC, Higgins JP, Sheiham A, Logan S. One topical fluoride (toothpastes, or mouthrinses, or gels, or varnishes) versus another for preventing dental caries in children and adolescents. Cochrane Database Syst Rev 2004;CD002780.
5. Patil S, Venkataraghavan, Anantharaj KA, Patil S. Comparison of two commercially available toothpastes on the salivary *Streptococcus mutans* count in urban preschool children – An *in vivo* study. Int Dent 2010;12:72-9.
6. AAPD Reference Manual. Guideline on Fluoride Therapy 2014;36:14/15.
7. Walsh T, Worthington HV, Glenny AM, Appelbe P, Marinho VC, Shi X. Fluoride toothpastes of different concentrations for preventing dental caries in children and adolescents. Cochrane Database Syst Rev 2010;CD007868.
8. Wright JT, Hanson N, Ristic H, Whall CW, Estrich CG, Zentz RR. Fluoride toothpaste efficacy and safety in children younger than 6 years: A systematic review. J Am Dent Assoc 2014;145:182-9.
9. Gudipani RK, Kumar RV, Jesudass G, Peddengatagaris S, Duddu Y. Short term comparative evaluation of antimicrobial efficacy of tooth paste containing lactoferrin, lysozyme, lactoperoxidase in children with severe early childhood caries: A clinical study. J Clin Diagn Res 2014;8:18-20.