

Study to Assess the Availability of Fluoride Concentration in Saliva Following the Use of Fluoride Mouthrinse and Dentifrice

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| Received: 16.06.2019 | Accepted: 26.06.2019 | Published: 30.06.2019

DOI: [10.36347/sjds.2019.v06i06.006](https://doi.org/10.36347/sjds.2019.v06i06.006)

Abstract

Original Research Article

Background- Topical fluorides in the form of toothpastes, mouthrinses, varnishes and gels are effective caries preventive interventions. **Aim:** To assess the availability of fluoride concentration in saliva following the use of fluoride mouthrinse and dentifrice. **Methods:** In this cross-over study, two agents were used in the same children. The first test agent was daily fluoride mouthrinse (0.05% NaF) and the second test agent was 1000 ppm monofluorophosphate (MFP) dentifrice. Comparison of fluoride concentration in saliva for the two test agents (mouthrinse and dentifrice) was carried out at 1 hours, 5 hours, 10 hours, and 20 hours. **Results:** Mean values for the fluoride concentration available in saliva for Mouthrinse at 1 hour, 10 hours and at 20 hours were 0.38 ± 0.356 , 0.14 ± 0.084 and 0.13 ± 0.053 whereas mean values for Dentifrice were 0.31 ± 0.264 , 0.17 ± 0.045 and 0.15 ± 0.047 . Significant difference was observed between the two test agents at 1 hour, 10 hours and 20 hours. Mean values for the fluoride concentration available in saliva for Mouthrinse at baseline and at 5 hours were 0.031 ± 0.028 and 0.20 ± 0.140 whereas mean values for Dentifrice were 0.032 ± 0.019 and 0.19 ± 0.067 . It was observed that there is no significant difference between the two test agents at baseline and 5 hours. **Conclusion:** After use of NaF (0.05%) daily mouthrinse and MFP dentifrice (1000 ppm) the fluoride concentration in saliva continued high up to 20 hrs postuse.

Key words: Dentifrice, fluoride mouthrinse, fluoride concentration.

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INTRODUCTION

Role of fluoride in restoring and maintaining oral health is well known. The understanding of the process of dental caries and the mode of action of fluoride has changed in recent years. Dental caries is a continuous process of demineralization and remineralization of the enamel and fluoride plays a key role in this process through its action at the plaque enamel interface [1, 2]. Fluoride use should be part of any preventive programme for the control of dental caries in children [3].

The fluoride concentration in unstimulated whole saliva is a cumulative reflection of the sum of fluoride present in ductal saliva and various hard and soft tissue retention sites in the mouth [4]. Availability of fluoride in the oral environment is a dynamic process determined on the one hand by the concentration, quantity, frequency duration of the topical fluoride used [5, 6] and factors affecting retention and clearance. Fluoride-containing dentifrices, and more recently F

mouth- rinses, are the most widely used methods of home delivery of topical F. Fluoride dentifrices have been shown to be effective in reducing dental caries in numerous clinical trials in both optimally fluoridated and fluoride-deficient communities[7].

Studies among children would help depict availability of fluoride concentration in saliva to rationalize the frequency of use. Studies have been conducted in children, but the subjects have been followed up for a short time period. Therefore, the present study was to investigate the availability of fluoride concentration in saliva following the use of fluoride mouthrinse and dentifrice.

METHODS

This crossover study was planned in a dental hospital of Jammu region. School children residing in nearby hostels formed the study population. Water fluoride of the area was 0.34–0.38 ppm. The children did not had any history of exposure to either topical

(fluoride dentifrice, tea) or systemic fluoride. Exclusion criteria were children on any medical treatment and on orthodontic treatment.

Two agents were used in the same children. The first test agent was daily fluoride mouthrinse (0.05% NaF) and the second test agent was 1000 ppm monofluorophosphate (MFP) dentifrice. Before the start of the study, baseline saliva samples were collected. As the children were nonfluoride users, they were exposed to the NaF (once) daily mouthrinse for 7 days before sampling. The children were exposed to the first test agent initially, and saliva sampling was done. After a washout period of (three and half months), the same children were exposed to fluoride dentifrice twice daily for 1 week as the use of fluoride dentifrice is routinely advised twice daily after meals. Of the hundred children who were exposed to the mouthrinse (0.05%), 90 children were exposed to the fluoride dentifrice (1000 ppm) whereas ten children were lost to follow-up. Baseline early morning unstimulated saliva samples were collected. Children were instructed not to touch the inside of the bottles. The vials were transported to the dental department for storage. Estimation of fluoride in saliva samples was performed by AMS P507 ion-analyzer with fluoride combination electrode.

Children were told to carry out rinsing once daily with 0.05% NaF mouthrinse for 2 mins from the day 1 to 7. On the 8th day, saliva samples were collected in the morning referred to as the cumulative baseline that reflects the fluoride concentration available in saliva after 7 days postuse. On the 8th day itself, the children were asked to do their routine brushing with nonfluoridated toothpaste, have their breakfast and at 9 a.m., they were asked to do fluoride mouthrinse with 0.05% NaF solution under professional supervision for 2 mins and expectorate. Postrinse unstimulated saliva samples were collected at 60 mins, before dinner (10 hrs), and early next morning (20 hrs). Oral intake in between sample collection was allowed except in the 1st hr of sampling.

Same children were given the second test agent, 1000 ppm MFP dentifrice after a gap of three and half months. A 200 g tube of Cibaca fluoride dentifrice (1000 ppm F), and a Cibaca junior toothbrush (standard

size) was given to the subjects. They were instructed to brush their teeth with half-length ribbon twice in a day, once in the morning, and once at bedtime from the day 1 to day 7. On the day 8, early morning unstimulated whole saliva samples were collected between 6 and 6.30 a.m. Subsequently, the subjects brushed their teeth with a nonfluoride paste, had breakfast, and were asked to brush their teeth with a half-length ribbon of Cibaca fluoride dentifrice for 3 mins under supervision. The children expectorated the saliva-dentifrice slurry and rinsed with tap water. Unstimulated whole saliva samples were collected at 60 mins, before dinner (10 hrs), and early next morning (20 hrs). Oral intake in between sample collection was allowed except in the 1st hr of sampling.

Comparison of fluoride concentration in saliva for the two test agents (mouthrinse and dentifrice) was carried out at 1 hours, 5 hours, 10 hours, and 20 hours. Written and informed consent was obtained from study subjects. Permission of ethical committee was obtained from the Institutional Ethics Committee. All the questionnaires were manually checked and edited for completeness and consistency and were then coded for computer entry. After compilation of collected data, analysis was done using Statistical Package for Social Sciences (SPSS), version 21 (IBM, Chicago, USA). The results were expressed using appropriate statistical variables.

RESULTS

Mean values for the fluoride concentration available in saliva for Mouthrinse at 1 hour, 10 hours and at 20 hours were 0.38 ± 0.356 , 0.14 ± 0.084 and 0.13 ± 0.053 whereas mean values for Dentifrice were 0.31 ± 0.264 , 0.17 ± 0.045 and 0.15 ± 0.047 . Significant difference was observed between the two test agents at 1 hour, 10 hours and 20 hours.

Mean values for the fluoride concentration available in saliva for Mouthrinse at baseline and at 5 hours were 0.031 ± 0.028 and 0.20 ± 0.140 whereas mean values for Dentifrice were 0.032 ± 0.019 and 0.19 ± 0.067 . It was observed that there is no significant difference between the two test agents at baseline and 5 hours (Table 1).

Table-1: Comparison of two test agents among study subjects

Timeline	Test groups	Mean	SD	P-value*
At baseline	Mouthrinse	0.031	0.028	>0.05
	Dentifrice	0.032	0.019	
At 1 hrs	Mouthrinse	0.38	0.356	<0.05
	Dentifrice	0.31	0.264	
At 5 hrs	Mouthrinse	0.20	0.140	>0.05
	Dentifrice	0.19	0.067	
At 10 hrs	Mouthrinse	0.14	0.084	<0.05
	Dentifrice	0.17	0.045	
At 20 hrs	Mouthrinse	0.13	0.053	<0.05
	Dentifrice	0.15	0.047	

*Mann Whitney U-test

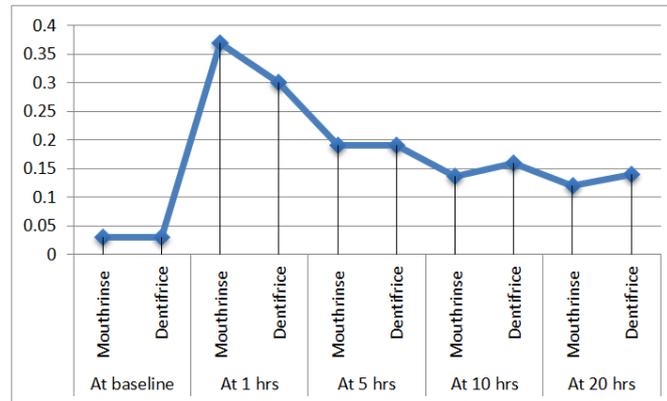


Fig-1: Line graph showing comparison of two test agents among study subjects

DISCUSSION

Cariostatic efficacy of topical fluorides is attributed to their ability to decrease the rate of demineralization of enamel and enhance the rate of remineralization. The most effective topical fluorides are dentifrices and mouthrinses used daily. There is a current consensus that bacteria-mediated tooth destruction can be arrested or even reversed by adopting fluorides. The fluoride concentration in unstimulated whole saliva is a cumulative reflection of the sum of fluoride present in ductal saliva and various hard and soft tissue retention sites in the mouth. Availability of fluoride in the oral environment is a dynamic process determined on the one hand by the concentration, quantity, frequency duration of the topical fluoride used and factors affecting retention and clearance [8, 9].

Various modes of fluoride use have evolved, each with its own recommended concentration, frequency of use, and dosage schedule. The use of topically applied fluorides in particular, which are much more concentrated than the fluoride in drinking water, has increased over recent decades and fluoride containing toothpastes (dentifrices), mouthrinses, gels and varnishes are the modalities most widely used at present, either alone or in different combinations. By definition, the term 'topically applied fluoride' describes those delivery systems which provide fluoride to exposed surfaces of the dentition, at elevated concentrations, for a local protective effect and are therefore not intended for ingestion. Fluoride gels and varnishes are typical methods of professional topical fluoride application and both delivery systems have been used in preventive programs. Fluoride gels have also been used as a self-applied intervention in such programs. Fluoride mouthrinses and toothpastes are the main forms of self-applied fluoride therapy. The intensive use of fluoride mouthrinsing in school programs has been discontinued in many developed countries because of doubts regarding its cost-effectiveness at a low prevalence of dental caries and are being replaced by selective fluoride therapy directed to high risk children. Such procedures usually involve the combined use of fluoride toothpastes with gels or

varnishes. Toothpaste is by far the most widespread form of fluoride usage and the decline in the prevalence of dental caries in developed countries has been mainly attributed to its increased use [10-13].

Naumova *et al.* [14] found peak increase of salivary fluoride concentration immediately after brushing and lasting at least 30 mins. Studies have been conducted by several authors in whom almost similar time intervals have been used. Design of this experiment was different in comparison with previous studies in that it was carried out in subjects who had not used fluoride in any form before the experimental period and were asked to use the fluoride agents, namely, 0.05% NaF daily mouthrinse (225 ppm) and 1000 ppm MFP dentifrice for 1 week before the experiment.

In this study we observed that mean values for the fluoride concentration available in saliva for Mouthrinse at 1 hour, 10 hours and at 20 hours were 0.38 ± 0.356 , 0.14 ± 0.084 and 0.13 ± 0.053 whereas mean values for Dentifrice were 0.31 ± 0.264 , 0.17 ± 0.045 and 0.15 ± 0.047 . Significant difference was observed between the two test agents at 1 hour, 10 hours and 20 hours.

Another study by Talwar M *et al.* [15] observed that there is no significant difference between the two test agents at baseline ($P = 0.879$), 45 mins ($P = 0.08$) before lunch ($P = 0.055$). At all other time intervals, there was a statistically significantly higher fluoride concentration available in saliva. Mean salivary fluoride concentration subsequent to the use of mouthrinse from the day 1 to day 7 referred to as cumulative baseline and at time intervals of 15, 30, 45 mins, before lunch (5 hrs), before dinner (10 hrs), and 20 hrs (early next morning) postrinse were elevated above baseline. Similar findings have been reported in a study by Zero *et al.* [16] Fluoride concentration in saliva can be maintained to an optimal therapeutic level with the regular use of fluoridated products.

CONCLUSION

On the basis of findings of this investigation, it can be concluded that after use of NaF (0.05%) daily mouthrinse and MFP dentifrice (1000 ppm) the fluoride concentration in saliva continued high up to 20 hrs postuse. Thus suggested frequency of use is NaF mouthrinse (0.05%) once daily at bedtime for 1-2 mins and 1000 ppm fluoridated dentifrice half ribbon twice daily after meals. Further larger studies are needed to support our findings.

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