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EFFECTIVENESS OF HERBAL MOUTHRINSE IN MAINTAINING SALIVARY AND PLAQUE p H ; A RANDOMIZED CONTROLLED TRIAL

Clinical Research

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ABSTRACT

Introduction: Antibiotics and antimicrobial agents provide an invaluable tool for a control of infection in modern dentistry and present in oral care products have been shown to be effective in inhibiting the growth of oral bacteria and the bio film.Hence this study was conducted to evaluate salivary and plaque p H of commercially available herbal rinses and compare with bench mark chlorhexidine at different intervals .

KEYWORDS

Dental plaque pH, mouth wash, oral health, salivary pH.

INTRODUCTION:

Streptococcus mutans are gram – positive cocci, non motile facultative anaerobic micro organism which can metabolize carbohydrates and are considered to be the principal etiological agent of dental caries. [1]Antibiotics and antimicrobial agents provide an invaluable tool for a control of infection in modern dentistry and present in oral care products have been shown to be effective in inhibiting the growth of oral bacteria and the bio film development. Chemical agents used to prevent dental caries are either in the form of dentrifices or mouth rinses which may have undesirable side effects such as tooth staining, taste alteration and development of hypersensitivity reactions. [2]So to overcome these problems herbal mouth rinses are used as an alternative which contains extracts or oils of medicinal plants have been used for many years for prevention of various infections .

In India, fennel seeds are often chewed after meals along with anise seeds. In dentistry, commercial sesame oil has been used for oil pulling and showed considerable reduction in plaque and S mutans count.[3] and there is an increase in salivary and plaque pH after chewing fennel seeds immediately and at 10 min interval and it thereby reduce microbial load and reduce the dental caries. [4]

Saliva plays a critical role in maintaining oral health through various defensive mechanism and salivary pH is a fair indicator of various dental diseases.[5] A lot of synthetic salivary pH stabilising agents are available but they have undesirable side effects such as allergic reactions, tooth staining etc . Therefore need arises for search of alternate products. “Dantashastra' is a term used for utilizing the natural products ranging from chewing sticks to herbal mouthwashes for healthy teeth [6]. Herbal products are comparable with that of gold standard in dental plaque prevention due to its various systemic and oral benefits and can be used in many forms .

Plant products have received special attention because of being non-chemical, non-synthetic, safe and reliable. Hence, the need arises to done to compare and evaluate the effectiveness of fennel and sesame seed extracts rinses with that of chlorhexidine ,the gold standard in dental plaque prevention and if proved so to identify an inexpensive, simple and effective method to prevent and control caries as well as other oral health problems .

OBJECTIVES :

To assess salivary and plaque pH at baseline and at intervals of 0, 5 ,15 and 30minutes following oral rinse with commercially available fennel oil mouth rinse , sesame oil mouthrinse ,chlorhexidine mouth rinse .

MATERIALS AND METHODS :

Study design -A randomized controlled trial (parallel group)
Study participants -dental college students from Coorg institute of dental sciences aged 18-24 years who met the inclusion criteria

Sample size estimation :

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2 \times 2 \times (\sigma)^2}{(\Delta)^2}$$

Where Zα/2 =1.96
Zβ=0.84
is standard deviation = 0.54
Δ =0.35 (mean difference between groups)
After substituting the values n= 18.6 ,which was rounded to 20 in each group

Inclusion criteria :

Subjects who gave informed consent ,no systemic conditions , 18-24 years ,not allergic to formulation .

Exclusion criteria :

Students undergoing orthodontic treatment / systemic medications .

STUDY PROTOCOL :

After the inclusion of the participants in the study, randomization of the students to their respective groups was done using table of random numbers. (Fennel, sesame and chlorhexidine)

- Collection of Saliva :On the day of study, the participants was asked to refrain from their normal oral hygiene procedure for 24 hours and from eating or drinking up to one hour prior to saliva collection. Participants were seated comfortably in a dental chair and were instructed to bend the head forward to collect saliva into a paper cup at 5 intervals i.e. before rinsing, immediately after rinsing, 5 min after,15min after and half an hour after rinsing).salivary p H . was assessed with the help of digital p H meter .

Plaque harvesting and pH measurement:

- On the test day, a sample of plaque was taken from the buccal surfaces of four sites of the subject's teeth using a sterile stainless steel straight probe.
- The collection of plaque samples will be done at 5 intervals i.e. before rinsing ,immediately after rinsing ,5 minutes after,15 min after and half an hour after rinsing
- The plaque sample will be mixed with 20 ml of distilled water and the pH will be measured with a digital p H meter.

Armamentarium :

Test materials used :

- Himalaya herbal mouth wash fennel flavour
- Himalaya herbal mouth wash sesame flavour
- Chlorhexidine mouthwash as control
- Digital p H meter with calibration powders .

Instruments used:

- Plane mouth mirrors

- Disposable containers and toothpicks
- Distilled deionized water
- Disposable gloves and mouth masks
- Collection of saliva and plaque

pH measurement

Statistical Analysis.

- Descriptive statistics were prepared using Microsoft excel 2007 version , SPSS version 23 was used for analysis .Data was analyzed using ANOVA and post hoc .

All statistical tests were performed at 95% confidence interval , p value less than 0.05 was considered as statistically significant.

RESULTS:

The present randomized controlled trial assessed the variation in plaque and salivary p H after mouth rinsing with fennel, sesame and chlorhexidine respectively .The mean age group of study participants in each group was 23.3 years respectively. In the present study majority of participants were females i.e . in fennel and sesame group females were 80% and males 20 % and in chlorhexidine group it was 70 % females , and 30 % males respectively .(table 1)

MEAN SALIVARY P H SCORES:

The mean salivary pH scores at baseline, immediately ,5 minutes ,15 MIN AND 30 MINUTES after rinsing with herbal mouth rinse containing fennel seeds was 7.1, 7,3 and 7.51 ,7.56,7.56(p value 0.000) and is statistically highly significant . For sesame mouth rinse group the mean salivary p H scores at baseline, immediately ,5minutes,15 minutes ,30 minutes was 7.4 , 7.6 , 7.5,7.8,7.9(p=0.000) and is statistically significant . For chlorhexidine group mean salivary p H scores at baseline, immediately ,5 minutes ,15 MIN AND 30 MINUTES after was found to be 7.5 (baseline),7.6, 7.7, 7.9 and 7.9 respectively .(p=o.000) and is statistically significant

Mean plaque p H scores:

The mean plaque pH scores at baseline, immediately 5 minutes , 15 minutes and 30 minute after rinsing with herbal mouth rinse containing fennel seeds was 7.4, 7.55, 7.53 ,7.7.7.8(p value 0.001) and is statistically significant. The mean plaque pH scores at baseline, immediately 5min , 15 min and 30 minutes after mouth rinse with herbal oil containing sesame seeds was 7.74, 7.73, 7.8 ,7.8 ,7.91 respectively (p 0.000) and is statistically significant . The mean plaque pH scores at baseline, immediately 5 minutes, 15 minutes and 30 minute after rinsing with chlorhexidine was found to be 7.7, 7.8, 7.9,8.0, 8.0(p 0.001) respectively and is found to be significant. (table 3 ,figure 2)

TABLE 1 :Distribution of study subjects based on gender and age

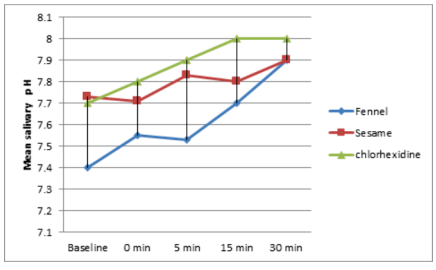
Group	FEMALE (N %)	MALES (N%)	Mean age
Fennel	16(80%)	4 (20%)	23.3±1.26
Sesame	16(80%)	4 (20%)	
chlorhexidine	14 (70%)	6(30%)	

TABLE 2 : Comparison of mean salivary p H in different groups at different time intervals

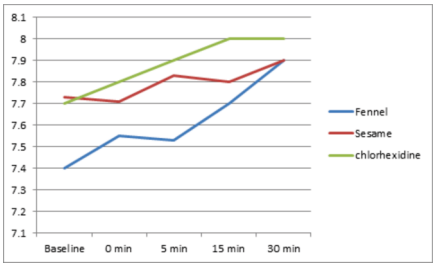
TIME INTERVAL	MEAN	STANDARD DEVIATION	F-value	Significance
Baseline				
Fennel Sesame CHX	7.16 7.44 7.50	0.25 0.08 0.07	25.43	.000
0 minutes				
Fennel Sesame CHX	7.3 7.6 7.6	0.42 0.07 0.07	25.43	.000
5minutes				
Fennel Sesame CHX	7.51 7.50 7.78	0.33 0.07 0.03	9.44	.000
15minutes				
Fennel	7.56 7.80 7.90	0.25 0.07 0.03	12.84	.000
Sesame				
CHX				
30 minutes				
Fennel	7.56 7.9 7.9	0.05 0.01 0.01	31.45	.000
Sesame				
CHX				

TABLE 3: Comparison of mean plaque p H in different groups at different time intervals

TIME INTERVAL	MEAN	STANDARD DEVIATION	F-value	Significance
Baseline				
Fennel Sesame CHX	7.44 7.74 7.78	0.82 0.10 0.03	111.769	.000
0 minutes				
Fennel Sesame CHX	7.50 7.73 7.8	0.07 0.11 0.07	64.87	.000
5minutes				
Fennel Sesame CHX	7.53 7.8 7.9	0.007 0.072 0.051	283.48	.000
15minutes				
Fennel	7.7 7.8 8.00	0.007 0.072 0.051	89.97	.000
Sesame				
CHX				
30 minutes				
Fennel	7.8 7.91 8	0.05 0.01 0.01	8.627	.001
Sesame				
CHX				



Distribution of study participants based on mean salivary p H scores at baseline ,o minutes ,5 minutes ,15 minutes and 30 minutes after mouthrinsing with fennel ,sesame and chlorhexidine mouth wash



Distribution of study participants based on mean plaque p H scores at baseline ,immediately ,5minutes ,15minutes and 30 minutes after mouthrinsing with fennel ,sesame and chlorhexidine mouthrinse .

DISCUSSION :

The present RCT was carried out to assess variation in plaque and salivary pH after mouth rinsing with herbal mouth rinses and to compare their values with that of chlorhexidine mouth rinse .According to a review by S.Kirti et al [6],spices besides of giving aroma and flavour to food also have antimicrobial, anti-inflamtory, anti-oxidative and immune boosting properties and also have lesser side effects than chemicals eg : sesame oil contains Steroids alkaloids phenols and glycosides are the phytochemicals and inhibited the growth of E.fecalis Invitro, pointing out that it can be used as an alternative to sodium hypochlorite(unpublished data).According to a study conducted by Saima S [10] et al highest increase in plaque p H changes was more in fennel oil group ,followed by recaldent and

sesame suggesting that effective, inexpensive, easily accessible methods of maintaining oral health can be achieved via use of herbal products .Saliva is critical in allowing functions of chew, taste and swallow foods and beverages and the buffering capacity also plays a fundamental role in balancing the phenomena of demineralization and remineralization. Germ-fighting abilities are one of the benefits of saliva, which can also prevent the dreaded halitosis or bad breath. Surprisingly, saliva contains important proteins and minerals that help to inhibit gum disease and tooth decay via the buffering action as there is an inverse relationship with buffer capacity and amount of caries prevalence .The results in the present study indicate that there is an increase in salivary and plaque pH levels after mouth rinsing with herbal mouthrinses and chlorhexidine at different time intervals ranging from 0 to 30 minutes .This significant change in p H may be due to diffusion of calcium and phosphorous into plaque and saliva leading to sialogogue effect by the herbal product .The results of the present study are in accordance with the study done by Swathi et al [4] who observed the increase in plaque and salivary p H after chewing fennel and cardamom seeds .The results in the present study indicate an increase in salivary p H after mouth rinsing shows that herbal mouth rinsing increase salivary p H and it is statistically significant($p<0.05$) when compared at different intervals . Gupta A and Purohit A conducted a randomized controlled trial to assess the effectiveness of Curry-Leaf Mouthwash in Maintaining Salivary and Tongue pH as Compared to Chlorhexidine Mouthwash and observed that Mean salivary pH difference was found statistically significant within both the groups and mean tongue pH difference was found significant only within curry leaf mouthwash group at 2 point intervals (immediately and half an hour after rinsing) which concludes that traditional curry leaf mouthwash can be considered as safe, [12] effective, and economical agent and as an alternative to the commercially available mouthwash .Dental caries is often linked to diet ,salivation and the presence of a bacterial biofilm on dental surfaces .The drop of plaque can create an ideal environment which helps the growth of acidophilic microorganisms thereby inducing further drop in p H and promoting caries .plaque p H therefore plays a fundamental role in balancing the biofilm flora on the tooth surface s. In the present study the plaque pH changes was not statistically significant indicating that it does not seem to induce any change to the" critical p H " . Between group comparison of fennel ,sesame and chlorhexidine did not reveal any statistical significance indicating that all 3 agents were equally effective in increasing salivary and plaque p H .The study was done only at our institution among the dental students limiting the generalizability of the study .the sample size choosen were not equally representative sample .Prospective studies should be conducted to assess other salivary parameters including flow rate ,buffering capacity ,viscosity as it does have a significant and crucial role in oral health so it can envision on antibacterial properties of saliva and plaque changes .

The results of the present study revealed that fennel chewing led to an increase in plaque pH, calcium and phosphate concentration. This shows that the diffusion of calcium and phosphate into plaque has occurred which may be due to the leaching of calcium from fennel seeds due to chewing which increases salivary flow and hence increases pH and calcium and phosphate concentration of plaque.. Sesame seeds, scientifically known as *Sesamum indicum* is considered to be the oldest oilseed crop known to humanity. It has been utilized for over 5,000 years and may be one of the most potent, nutrient-dense medicinal foods still used today. The seeds are especially high in calcium, phosphate, potassium, manganese, sodium, iron and low amounts of zinc [7]

After chewing sesame seeds subjects showed a significant increase in plaque ph after 5 and 30 mints which could be because of chewing effect which increases salivary flow and hence increases plaque pH. Asokan S et al., in their study found a significant reduction in the *S. mutans* count in plaque and saliva of children after oil pulling with 1 teaspoon (5ml) of sesame oil [8]

Fennel seeds, scientifically known as *foeniculum vulgare* are a shout, tall, aromatic herb grown globally . They are concentrated source of minerals and vitamins like calcium, phosphorous, iron, sodium, potassium, thiamine, riboflavin, niacin and vitamin C [6].

The World Health Organization reported that 80% of the world's population rely primarily on traditional medicine and a major part of the traditional therapies involve the use of plant extracts or their active constituents [9].

CONCLUSION:

- With public being increasingly cautious about adverse effects run of masses towards natural remedies is an uptrend with oral health being no exception ,therefore scientific evidences suggest that ,herbal rinses containing essential oils can be used to lubricate and moisten the mouth, while at same time they can be used to provide caries protection to highly susceptible individuals in comparison to chlorhexidine as it increases the salivary p H .

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