

Evaluation of Salivary pH Changes with Probiotic, Baking Soda and Mineral Water Rinse Among Individuals with Low Caries Experience

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Abstract

Background: Dental caries is a multifactorial disease; it causes decay in tooth and leads to unbearable pain and expensive dental procedures. One of potential risk factor that favor the caries process is acidic pH that a person faces usually after consumption of any food or drinks. Various mouth rinses are evaluated to normalize the salivary pH to break the chain of caries pathophysiology.

Objective: To evaluate the role of probiotic, baking soda and mineral water rinses on pH of Saliva.

Materials and methods: It were a cross sectional study conducted in institute of Karachi from -10 January to 25 June 2020. Out of 150 participants 60 qualified the inclusion criteria and were explained about the procedure of the study after their agreement they were divided into three groups each group comprised of 20 participants. Group 1 was given probiotic mouth rinse; Group 2 was given baking soda mouth rinse and in Group 3 mineral water rinses were given. They were told to rinse the oral cavity before and after the food consumption and pre and post salivary changes were recorded.



Results: Significant (p-value = 0.001) change in salivary pH was observed with baking soda and mineral water rinses however probiotic mouth rinse did not show significant (p-value = 0.22) change.

Conclusion: Rinsing with Baking soda and mineral water mouth rinses increased the salivary pH to normal.

Keywords: Dental Caries, Probiotic, Oral Hygiene, Mineral Water, Salivary pH.

I. Introduction

Dental caries is a multifactorial and the most prevalent chronic disease in Asian region. For dental caries oral hygiene, diet and streptococcus mutans plays an important role for initiation and progression of disease (1)(2). Saliva plays an important role in preservation of oral health. Salivary components are important in keeping balanced pH, buffering capacity and proteins that play an important role in maintenance of oral health (3) With the disturbance of salivary pH the the remineralization of tooth surface occurs because of the degree of supersaturation. It has been reported that the demineralization of enamel occurs when environment of oral cavity falls below <5.5 pH (4). To understand this phenomenon strong organic acids such as lactic acid along with other acids helps in promoting acidic environment that causes destruction of the tooth enamel causing dental caries(5). One study reported that plaque, that is exposed by sucrose can decline the pH resulting in acidic environment in oral cavity. Proper hygiene in oral cavity and alkaline pH promotes proline-rich proteins, mucins, provide protection to the tooth surface also attract calcium ions and promote remineralization (6)(7).

Various economical agents have been tried out in combating dental caries. Among these, baking soda and probiotics are also being used.

The World Health Organization defined probiotics as living bacteria that are beneficial for human health. These natural microflorae are beneficial and essential for gut wall also maintain or healthy oral environment. Various clinical trials have demonstrated that certain gastrointestinal bacteria, have the ability to control the growth of oral microorganisms, including streptococcus mutans (8). Probiotic use provides an effective strategy to combat oral disease, including the development of dental caries and periodontal infections (9). Baking soda, easily available. Economical and safe house hold item being minimal abrasively, and having potent bactericidal property. Different microbiological studies proven its bactericidal activity towards oral pathogens (10)(11) Baking soda has been shown to be effective in reducing the acidity of oral cavity and reduction in caries lesion by help of remineralization. Therefore, its effect on oral remineralization is noteworthy (12) it is suggested by different authors baking soda also helpful in reducing stains and having whitening property (13)(14).

The aim if this article is to describe and prove the beneficial role of homemade mouth rinse either by probiotic or by baking soda and to evaluate the salivary pH of both mouth rinses that could be beneficial in long term for remineralization of oral lesions

2. Materials and Methods

The cross-sectional study was done in the institute of Karachi, Pakistan. After taking ethical clearance from Ethical committee 150 dental students were enrolled in the study, before starting the study, informed consent obtained was taken and procedure were explained to each participant. Patients having any acute or chronic disease of oral cavity as well as the use of any antibiotics two months that could affect the salivary function or pH, were excluded from the study. The patients having history of any habits like smoking or chewing tobacco were also excluded.

By the help of mouth mirror and explorer examined all the subjects.

The evaluation of decayed, missing and filled teeth (DMFT) were based on the WHO criteria. dental students of the institution aged RANGE 21–25 years and with DMFT < 3 were included in the study. Of the 150 voluntary participants, 60 dental students (32 females and 28 males) with a mean age of 23.2 ± 0.71 years were eligible to participate in the study after applying the inclusion and exclusion criteria.

The participants who fulfilled the inclusion criteria were selected and randomly divided into three groups, with 20 participants in each group.

- Group A: Probiotic group
- Group B: baking soda group
- Group C: rinse with mineral water group

2.1 Preparation of Probiotic Mouth Rinse

Probiotic mouth rinse was prepared using commercially available probiotic product. 1 g powder contains *Lactobacillus acidophilus*, *Lactobacillus rhamnosus*, *Bifidobacterium longum*. The sachet contents were dissolved in 10 ml of distilled water which was used as a mouth rinse (15).

2.2 Preparation of Baking Soda Mouth Rinse

Rinse solution was prepared by mixing approximately 1g of baking soda in 10ml of distilled water (16).

2.3 Salivary pH Measurements

2ml volume were collected using Navazesh spitting method. After rinse, saliva then spit in a disposable plastic container. Saliva was collected in the morning between 9:00 am and 9:30 am to prevent any bias in sample. Participants were also informed not to eat or drink anything which can alter the pH of saliva (except water) 1 h before sample collection. GC pH strips were used to check the salivary pH. After dipping for 30 sec the change of colour strip was compared with the code chart given by the manufacturer.

Group A received probiotic mouth rinse and Group B received baking soda mouth rinse and group C received chlorhexidine mouth rinse which is used as a control group.

Participants were instructed to swish the 10 ml of mouth rinse for 1 min and salivary pH was recorded at pre and post values measured using GC pH strips.

2.4 Statistical Analysis

Data were analyzed using SPSS version 18. Descriptive statistics, such as mean and standard deviation, were calculated. Paired t-test was used to compare the pH of saliva in pre and post results. The statistical significance was assessed at $P < 0.05$.

3. Results

Table I. 20 participants in different group

N= 20 participants in each group	Group A	Group B	Group C
	Mean SD	Mean SD	Mean SD
Pre pH	6.4 ± 0.71	6.2 ± 0.72	6.6 ± 0.70
Post pH	6.9 ± 0.75	7.2 ± 0.32	7.0 ± 0.41
P value	$P < 0.22$	$P < 0.001$	$P < 0.001$

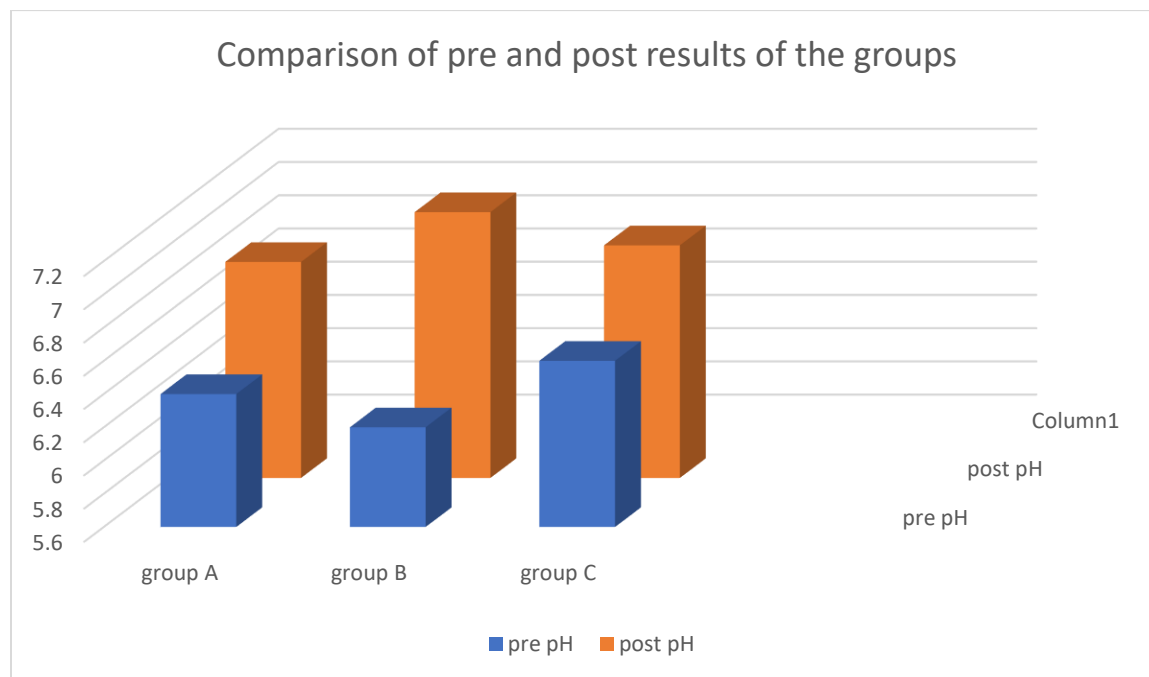


Figure I. Comparison of pre and post results of the group

4. Discussion

Oral diseases including dental caries, periodontitis and halitosis usually occur when there is an imbalance between bacterial growth and host immune system (1). To maintain the balance in offer mentioned saliva plays major role in the favor of host and provide a homeostatic environment for oral tissues as well as for normal flora (2). The changes in saliva leads to initiation of disease pathophysiology that ultimately harms the patient (3). In our study three different oral rinses were used to identify the differences in pH of saliva before and after the use of the regimen. However, we do not find significant results with probiotic mouth rinse though the salivary pH was increased to neutral level but it was not statistically significant when compared with baking soda mouth rinse. The mentioned results are similar with the findings of Kamalaksharappa et al. In his study he also found the rise in pH after probiotic mouth rinse use in children, however the finding was not statistically significant (4). In another study a different protocol was highlighted in which the research makes the participants to apply the probiotic (in paste form) directly on teeth. The results in initial weeks were not significant nevertheless after 4th application of probiotic on 14th day he found a significant rise in pH of saliva (5). The mentioned study highlighted that the long-term application of probiotic may significantly alter the pH in favor of host besides short term application i.e. rinsing that one can perform in few seconds. Study by Byju et., al. revealed that continuous use of probiotic decreased the colonies of *Streptococcus mutans* but when the salivary pH was compared the result was in favor of our study he also noticed the non-significant rise in salivary pH (6). Koopaie et., al used normal and probiotic cakes in his study to identify the difference in salivary pH and *Streptococcus mutans* count, he reported that there was significant decrease in colonies of *Smutans* besides he also had the same finding regarding salivary pH as ours furthermore, he mentioned that the both cakes i.e. normal and probiotic reduced the pH of saliva for some time after eating (7).

Regarding baking soda our study found promising results immediately after the rinsing and we observed significant (p-value = 0.001) beneficial change in salivary pH. The parallel findings were highlighted in a meta-analysis in which it was mentioned that after sugar consumption the baking soda significantly reversed salivary pH to normal(8). In another study acidic drinks (orange juice, sugar syrups) were given to participants and after that pH changes were noted in saliva, the study demonstrated the findings regarding baking soda similar to our study(9). Ballal et., al highlighted the effects of using bicarbonated sugar free gums on salivary pH, the researcher found significant increase in pH of saliva in participants who used sugar free bicarbonated chewing gums when compared with the participants who used sugar free chewing gums (10).

The role of different mouth rinses (homemade and herbal) has been evaluated by different researchers to provide a better preventive regimen with good safety profile to general public, however no any homemade or herbal product is marketed yet and clinical trial on larger population are required to obtain the good results and to identify the potential side effects of these mouth rinses after long term use.

5. Conclusion

Rinsing with Baking soda and mineral water mouth rinses increased the salivary pH to normal. Probiotic mouth rinses did not show a significant effect on salivary pH.

Conflict of interest

None

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