

Effect of Consumption of Different Fruit Juices on Salivary Ph

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ABSTRACT

Introduction: The concept of health and “Healthy Eating” is always considered important for centuries but dietary habits are apparently changing with modernization. So the study evaluated the salivary pH changes after the consumption of different fruits juices at various time intervals.

Material and methods: 100 randomly selected children aged 5-9 years from Swami devi dyal dental college and hospital, Barwala, Panchkula were selected for consumption of two fruit juices (i.e. Sweet lime and apple) by dividing them into 2 groups on the basis of caries experience selected. The endogenous pH of the salivary samples was measured at the baseline and after consumption of the fruit juices at 1, 5, 15 and 30 minutes. The results were statistically analysed by using the t-test and ANOVA.

Result: Two fruit juices tested were acidic and reduced the pH of the saliva. The maximum pH drop was observed with consumption of Sweet lime juice in caries active group as compared to the apple group (i.e Caries free group).

Conclusion: The Sweet lime juice in caries active group is more acidogenic as compared to apple juice.

Keywords: fruit juice, salivary pH, acidogenic.

INTRODUCTION

The concept of health has prevailed for centuries and “Healthy Eating” is perceived to be important.¹ But dietary habits are apparently changing with modernization and with evolution, drastic transformations in the dietary patterns from a high roughage diet to a refined diet has been observed.^{2,3} People nowadays prefer more natural and healthy products such as fresh juices.¹ Fruits are always touted as a healthy food choice and are recommended in large quantities. Fruits contain variety of vitamins and minerals that contribute to the daily functions of the body.^{4,5} Although fruits have many health benefits, but their can be possible side effects associated with their consumption. This does not mean that consumption of fruits should be stopped, but one should be aware of the side effects as well as the benefits. Present study was designed to evaluate the salivary pH changes after the consumption of different fruits juices at various time intervals. As diet play an important role in balancing demineralization and remineralization in oral cavity.³ The present in vivo study was conducted with the aim to evaluate the salivary pH changes after the consumption of different fruits juices at various time intervals.

MATERIAL AND METHODS

After ethical clearance the study was conducted. Two commonly consumed fruit juices i.e., Sweet lime and apple were selected for the study. The present study was conducted to evaluate changes in salivary pH after consumption of different fresh fruit juices by 100 subjects. The sample of 100 children with age between (5-9 yrs old), were selected randomly from the out patient department of Swami Devi Dyal Dental College and

Hospital, Barwala.

Clinical criteria:- DMF or def Index score:

The study was conducted to evaluate the changes in salivary pH after consumption of different fresh juices. 100 children between the age of 5-9 years were selected after fulfilling the clinical criteria from outpatient department of Swami Devi Dyal Hospital and Dental College, Barwala.

Group A: DMF/def = 0 Which was caries free

Group B: DMF/def > 1 (Caries active)

Only those children who had taken the parental consent were selected for the study. The glass beakers were coded with a specific identity number given to each subject for the collection of saliva samples. The pH of the samples was measured using calibrated digital pH meter.

Methodology

Volunteers were asked to refrain from oral hygiene procedure 24 hours before and were kept NPO at least two hour prior to the study. Further sample were randomly selected from both groups for consumption of freshly prepared fruit juices, after measuring their intrinsic pH with digital pH meter.

Standardization of pH meter: Before taking any recordings on the pH meter, the instrument was checked and standardized with the standard buffer of pH 4.00 and 7.00.

The intrinsic pH of test drinks was measured by the calibrated digital pH meter. 20 ml of a freshly prepared fruit juice (all at room temperature) was placed in a beaker and stirred until a stable reading was obtained. Electrode was placed directly into each solution. The subjects were asked to chew one gram of paraffin wax and saliva samples were collected in glass beakers. The pH of saliva was recorded as the baseline score. The subjects were made to consume the assigned fruit juices (100 ml) slowly over a period of 3-5 minutes. The salivary sample of each subject was collected in separate sterile glass beaker after the interval of 1 minute, 5 minutes, 15 minutes and 30 minutes of fruit juice. The recording of the pH were tabulated and was statistical analysed.

STATISTICAL ANALYSIS

The collected data was then analyzed by using the t-test and ANOVA. P-values of less than 0.05 were considered statistically significant.

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How to cite this article: Blessy Garg, Sanjay Chachra, Taranjot Kaur, Deepika Kapoor, Deepanshu Garg. Effect of consumption of different fruit juices on salivary Ph. International Journal of Contemporary Medical Research 2016;3(9):2800-2802.

RESULTS

Intercomparison of salivary ph modulation during pre and post consumption of sweet lime juice was done (Figure-1).

In case of sweet lime juice in group A, the mean resting salivary pH for the 25 children was found to be $7.3884 \pm .35641$. During the post consumption period, the mean salivary pH was found to be $6.699 \pm .3636$, $7.062 \pm .3296$, $7.2396 \pm .35072$, $7.270 \pm .3460$ at 1, 5, 15 and 30 minutes respectively. In case of sweet lime juice in group B, the mean resting salivary pH for the 25 children was found to be $7.0876 \pm .23652$. During the post consumption period, the mean salivary pH was found to be $6.415 \pm .3979$, $6.256 \pm .3456$, $6.6532 \pm .32281$, $6.779 \pm .3293$ at 1, 5, 15 and 30 minutes respectively. t test was done to compare salivary pH modulation during pre and post consumption of sweet lime juice between both the groups (Table-1). Intercomparison of salivary ph modulation during pre and post consumption of apple juice was done (Figure-2).

In case of apple juice in group A, the mean resting salivary pH for the 25 children was found to be $7.4340 \pm .35557$. During the post consumption period, the mean salivary pH was found to be $7.100 \pm .3305$, $7.321 \pm .3563$, $7.4104 \pm .35954$, $7.437 \pm .3572$ at 1, 5, 15 and 30 minutes respectively. In case of apple juice in group B, the mean resting salivary pH for 25 children in this group was found to be $7.1916 \pm .27425$. During the post consumption period, the mean salivary pH was found to be $6.698 \pm .3711$, $6.575 \pm .3912$, $6.575 \pm .35044$, $6.941 \pm .3422$ at 1, 5, 15 and 30 minutes respectively. t test was done to compare salivary pH modulation during pre and post consumption of apple juice between both the groups (Table-2).

DISCUSSION

With the evolution of mankind the dietary pattern has changed drastically.³ The desirability of healthy lifestyle has led to an increased consumption of juices.¹ The diet we are consuming has become more refined with increased access to readymade fruit juices and carbonated beverages. Simultaneously, there has been considerable emphasis on “healthy food and healthy eating”.³

Fruit juices play a vital role in our healthy diet. One glass of fruit juice is important source of vitamin C, folate, potassium and antioxidants. Some currently available fruit juices contain dietary fibre which can provide an additional fibre source to help optimise overall fibre intake. Because juices taste good, children readily accept them. Although juice consumption has its benefits, yet some potential detrimental effects are also there.⁴ The consumption of fruit juices vary greatly among populations. On consumption, they tend to alter pH of oral cavity and shift the equilibrium toward demineralization but data correlating the effect of salivary pH on cariogenicity is scarce in literature. Therefore, the present study was conducted to analyse the pre and post effect of fruit juices on salivary pH among 100 randomly selected both male and female selected children between the age of 5-9 years, visiting the outpatient department of Swami Devi Dyal Hospital and Dental College. The sample in the present study consisted of 100 children with DMF/def = 0 (Caries free) and 100 children with DMF/def > 1 (Caries active). Similar sample selection criteria was considered by Saxena S et al¹, in their study in which they analysed the effect of fresh fruit juices on pH of dental plaque in 40 people with

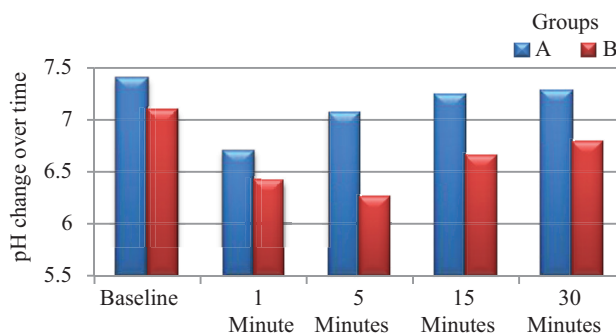


Figure-1: Graph depicting the intercomparison of salivary ph modulation during pre and post consumption of sweet lime juice

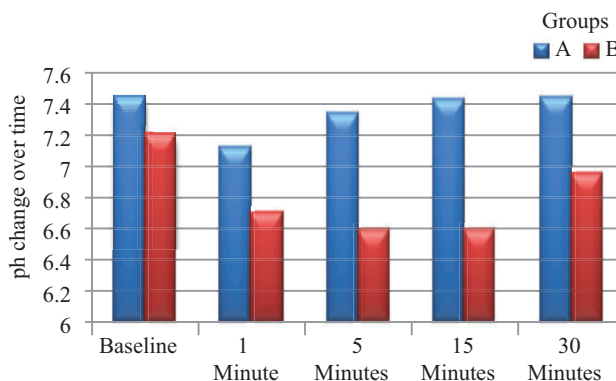


Figure-2: Graph depicting the intercomparison of salivary ph modulation during pre and post consumption of apple juice

		T	Df	P - value
Sweetlime juice	Baseline	3.516	48	.001 (S)
	1 Minute	2.631	48	.011 (S)
	5 Minute	8.435	48	.000 (S)
	15Minute	6.151	48	.000 (S)
	30 Min	5.138	48	.000 (S)

Note: p < 0.05 indicates that the result is significant (Significant results have been highlighted); (S) – Significant and (NS) – Not Significant

Table-1: t test comparing salivary ph modulation during pre and post consumption of sweet lime juice between both the groups

		T	Df	P - value
Apple juice	Baseline	2.699	48	.010 (S)
	1 Minute	4.041	48	.000 (S)
	5 Minute	7.052	48	.000 (S)
	15Minute	5.649	48	.000 (S)
	30 Min	5.014	48	.000 (S)

Note: p < 0.05 Indicates that the result is significant (significant results have been highlighted); (S) – significant and (ns) – not significant

Table-2: t test comparing salivary ph modulation during pre and post consumption of apple fruit juice between both the groups

satisfactory gingival/periodontal health. The Digital pH meter was used to measure salivary pH at various time intervals. The pH was evaluated by hand held pH meter also by Moritsuka M et al.⁶ Jeong SJ et al⁷ studied dental caries risk can be predicted by simply measuring the pH and buffering capacity of saliva. Similar parameters for pH determination were used by Saha S et al.³ In a study by Nogourani MK et al⁸, effects of chewing different flavoured gums on salivary flow rate and pH were

determined.

In the present study, resting salivary pH was recorded in children for both the groups. The result of mean resting salivary pH was found to be slightly higher in group A (Caries free) than group B (Caries active). The effect of four fruit juices on pH of dental plaque was studied by Preethi BP et al.⁵ The results of their study showed that plaque pH was higher in caries active group as compared to caries free group. Comparable results for the difference of resting pH of dental plaque were found by Oberoi SS et al.¹ Sintes JL⁹ studied cariogenic potential of fruits in rats after programmed feeding and dietary intubation. Total caries appeared in the groups in the following decreasing order: bananas, oranges, apples, freeze-dried apples, sucrose. Grobler SR¹⁰ studied the effect of a high consumption of citrus fruit and a mixture of other fruits on dental caries in human. It was concluded that a high consumption of various fruits over a long period is associated with a high caries experience. A comparative study of acidogenic potential of milk and commonly used milk formulae was done by Masih U et al.¹¹ A sharp plaque pH fall in the case of sweetened milk was observed which was below the critical value of 5.5.

On analysis of salivary pH, changes were recorded at specified time intervals during pre and post consumption of different fruit juices in group A (Caries free) and group B (Caries active). The maximum salivary pH drop occurred at 1 minute in group A. The salivary pH did not reach below the critical pH and it started gradually rising after 5 minutes. Whereas in the caries active group B, the maximum salivary pH drop occurred at 5 minutes. After 15 minute interval, pH started to rise toward the resting pH during the post consumption period but the fluctuation never reached the critical level of pH ie. 5.5. Lumikari ML et al¹² described relation between saliva and dental caries. Stookey GK studied the effect of saliva on dental caries in 2008.¹³ Fakhoury M et al¹⁴ studied importance of saliva in the prevention of dental caries. Dawes C¹⁵ studied what is the critical pH and why does a tooth dissolve in acid. Jensdottir T et al in 2006¹⁶ studied immediate erosive potential of cola drinks and orange juices. The maximum drop of pH occurred in the sweet lime juice subgroup in group A followed by and apple juice (Group A). Whereas in group B, the maximum drop of pH was observed in the sweet lime juice followed by apple juice respectively.

Hence, based on the observations, it was concluded that the maximum drop of salivary pH was found with sweet lime juice in caries active group. In a study by Toumba KJ et al¹⁷, results showed that the plaque pH drops after the subjects rinsed with the new blackcurrant drink was higher as compared with all the other test products and significantly higher as compared with the mixed citrus drink. The most important conclusion drawn from the results of this study was that the fruit juices are acidogenic but acidogenicity is more in caries active group.

CONCLUSION

After evaluating these results it is concluded that all fruit juices are acidogenic especially when consumed by a caries active subject, but the final value of pH did not drop below the level of critical pH (5.5).

Thus we being preventive dentist must provide appropriate diet counselling tailored for particular individual to maximize the

compliance. So the things to remember are: Ideally fruit juices should be served only at mealtimes, frequency of consumption of fruit juices should be decreased and straw should be used whenever possible.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 11-08-2016; **Published online:** 23-09-2016