

Research Article

Evaluation of changes in salivary pH after the intake of fruits, fresh fruit juices and processed juices: a randomized control trial

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Abstract

Nutrition is a potent constituent of oral health. Use of different fruits and their juices (fresh and processed) provide us different nutrients but also cause a change in salivary pH which may further establish a reason for other problems like dental cavities. The present study was designed to check saliva pH after intake of fresh and processed fruit juices. Fruits and processed juices of orange, apple, pomegranate, and guava were obtained from local market of Faisalabad. Data was collected separately for simple fruits, fresh fruit juices and processed juices. The intrinsic pH of fruit juices was noted by the digital electronic pH meter. Data collected was analyzed by using ANOVA statistical model. Results indicated that processed fruit juices caused acidity in saliva than fresh juices and fruits after 5 mins. After 15 mins of intake of juices and fruits, pH of fresh fruit juices moved towards neutral pH while that of processed fruits juices found to be still acidic. After 30 mins, pH tends to be alkaline in nature for both fresh and processed juices. There was least change in salivary pH with use of pomegranate fruits and juices during whole study. In conclusion, pomegranate has less changing effect on saliva pH than all other fruits used in study and processed fruit juices have significant influence on change of salivary pH. The use of fresh fruit juices can be suggested in future.

Keywords: Acidity; Fresh juice; Nutrients; Processed juice

Introduction

Nutrition is a potent constituent of oral health. There is a ceaseless synergy between nutrition and the state of the oral cavity in the health and problems associated to them [1]. Malnutrition may lead to malfunctioning of

oral cavity and problems like changing in tissue homeostasis, decreased tissue repairment, and reduced resistance to microbial load [2].

The juice and peel of pomegranate is involved in lowering of pH and the

polyphenolic compounds present in pomegranate helps in treatment of cavities [3]. Calcium fortified juices are less cariogenic as compared to unfortified and simple fruit juices. They cause less damage to teeth enamel [4]. Juices containing artificial sweeteners or labeled as “sugar free” are cariogenic like normal sugary drinks [5].

Fruits and vegetables contain many nutrients which promote good health and to fight against diseases, but pH of many fruits can be acidic which promotes the tooth decay [6]. The pH of saliva has great importance in individual's life [7]. Microorganisms are the key of developing dental caries. Acidic foods decrease the pH and cause more microorganisms to stick on death surfaces. Different studies were conducted to find cariogenic foods which also promote oral health [8]. This study was designed to check the pH of saliva after the consumption of fresh fruits, fresh fruit juices and processed juices and then examine the most cariogenic culprit.

Materials and methods

Procurement of raw material

Fruits and processed juices of orange, apple, pomegranate, and guava were obtained from local market of Faisalabad on the same day of the study. Fruits were peeled off and pulp was chopped into the desirable size. The seeds were removed from seed fruits.

Fresh and processed fruit juices

A total of 750 ml of fresh fruit juice was prepared without addition of water and sugar to which 250 ml of water is added to standardize the consistency and quantity of fruit juice. Juice was prepared in closed cabin which and given to participants 100 ml of each fruit juice. Available processed fruit juices were purchased from the local market and 100 ml was also given to participants [9].

Data collection

Data was collected separately for simple fruits, fresh fruit juices and processed juices.

Saliva was collected in test tube after consumption at different intervals (Table 1). The intrinsic pH of fruit juice was noted by the digital electronic pH meter (- bench type pH meter TASHCON) [10].

Statistical analysis

Data collected was analyzed by using ANOVA statistical model.

Results and discussion

Results indicated that before intake of fruits and juices, salivary pH was normal (Fig. 1). The results of the fruit juice of guava showed basic nature while the processed fruit juice showed pH: $7.07 \pm 0.30\%$ (Table 2). The pH of simple orange fruit was about $5.86 \pm 0.10\%$ while their simple fresh juice depicted acidic pH: $4.62 \pm 0.19\%$, while its processed fruit juice showed decline in pH (pH: $4.67 \pm 0.10\%$) (Table 3). Similar trend was observed for apple fruit and its fresh and processed juice (Table 4) but pomegranate showed somewhat different trend. (Table 5). At 0 mins, acidic pH of saliva was observed (Fig. 2). After 5 minutes, processed fruit juices caused more decline in pH than fresh juices (Fig. 3). There was much change in salivary pH even after 15 mins while for pomegranate juices, pH moved towards alkaline value (Fig. 4). But after 30 minutes, salivary pH tends to be alkaline which in case of pomegranate noticeable (Fig. 5) was. There was least change in salivary pH with use of pomegranate fruit and juice which indicated that pomegranate has less effect on change of salivary pH. The use of other fruits and juices also depicted that fruit juices were more dangerous and may interfere with the salivary pH than consuming whole fruit. The reason may be that processed juices contain a lot of artificial sugars which cause increase in their shelf life and protect from any bacterial or viral attack [11]. But also cause lowering in pH of saliva leading to dental caries [12]. Simple fruits contain a lot of nutrients and fibers but during juice making, these fibers are lost [13].

Table 1. Collection of saliva samples at different time intervals

Before consumption of sample	
After 0 minute	Right after last sip or bite of sample
After 5 minutes	After last sip or bite of sample
After 15 minutes	After last sip or bite of sample
After 30 minutes	After last sip or bite of sample

Table 2. pH values of guava at different intervals

Category	Before	0 min	5min	15 min	30 min
Simple fruit	7.11±0.10	5.34±0.19	6.46±0.61	6.89±0.48	7.07±0.30
Fresh fruit juice	7.12±0.14	4.52±0.11	5.16±0.55	5.74±0.91	6.95±0.30
Processed fruit juice	7.10±0.79	4.49±0.735	4.56±0.20	6.53±0.23	7.07±0.30

Table 3. pH values of orange at different intervals

Category	Before	0 min	5min	15 min	30 min
Simple fruit	7.19±0.17	5.32±0.20	5.86±0.10	6.52±0.14	7.1±0.30
Fresh fruit juice	7.16±0.96	3.52±0.23	4.62±0.19	6.31±0.48	6.99±0.30
Processed fruit juice	7.15±0.82	3.28±0.10	4.67±0.10	6.23±0.54	7.00±0.30

Table 4. Values of pH for apple at different intervals

Category	Before	0 min	5min	15 min	30 min
Simple fruit	7.21±0.13	5.72±0.12	6.10±0.58	6.49±0.17	7.16±0.12
Fresh fruit juice	7.13±0.72	5.52±0.14	6.21±0.97	6.81±0.96	7.09±0.59
Processed fruit juice	7.09±0.69	3.33±0.60	4.59±0.17	5.96±0.25	6.88±0.17

Table 5. Values of pH for pomegranate at different intervals

Category	Before	0 min	5min	15 min	30 min
Simple fruit	7.16±0.74	4.53±0.20	6.20±0.17	7.06±0.60	7.17±0.12
Fresh fruit juice	7.15±0.82	3.63±0.18	4.55±0.18	6.10±0.58	6.99±0.77
Processed fruit juice	7.13±0.757	3.33±0.60	4.57±0.18	5.72±0.12	6.50±0.17

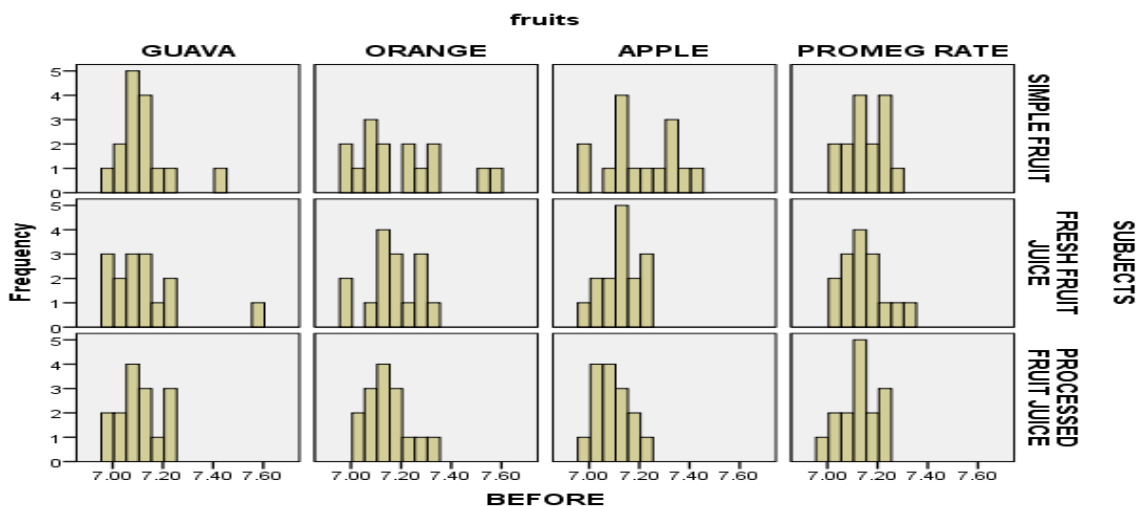


Figure 1. The value of pH before consumption of different fruits and juices

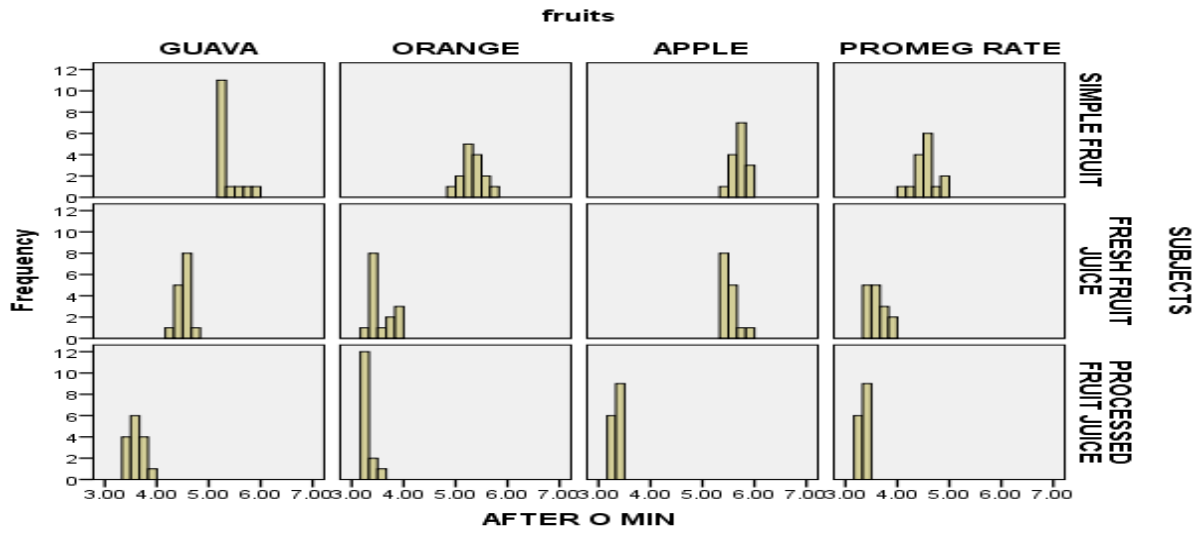


Figure 2. The value of pH after 0 minute of consumption of different fruits and juices

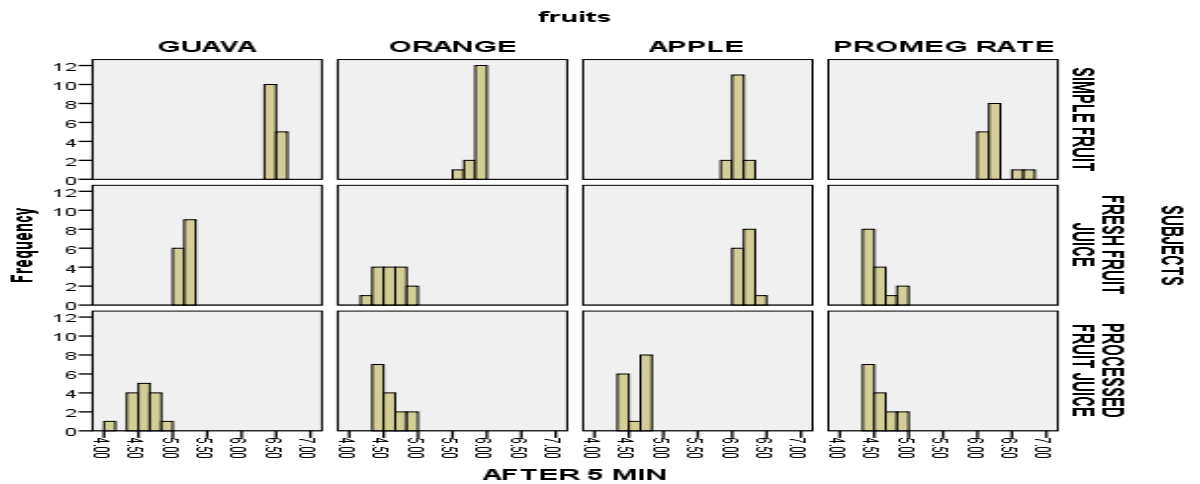
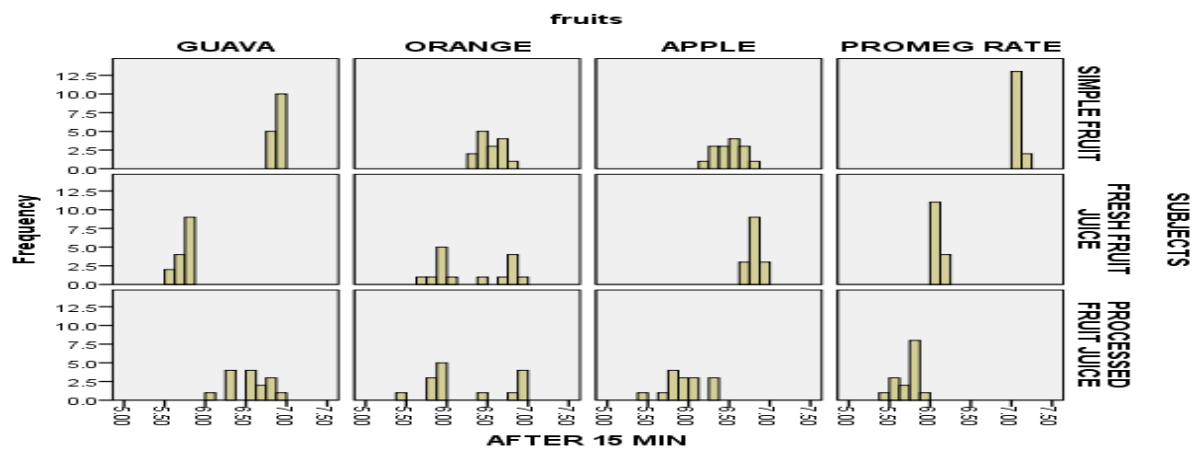


Figure 3. Value of pH after 5 minutes of intake of different fruits and juices

Figure 4. The pH value after 15 minutes of intake of fruits and juices



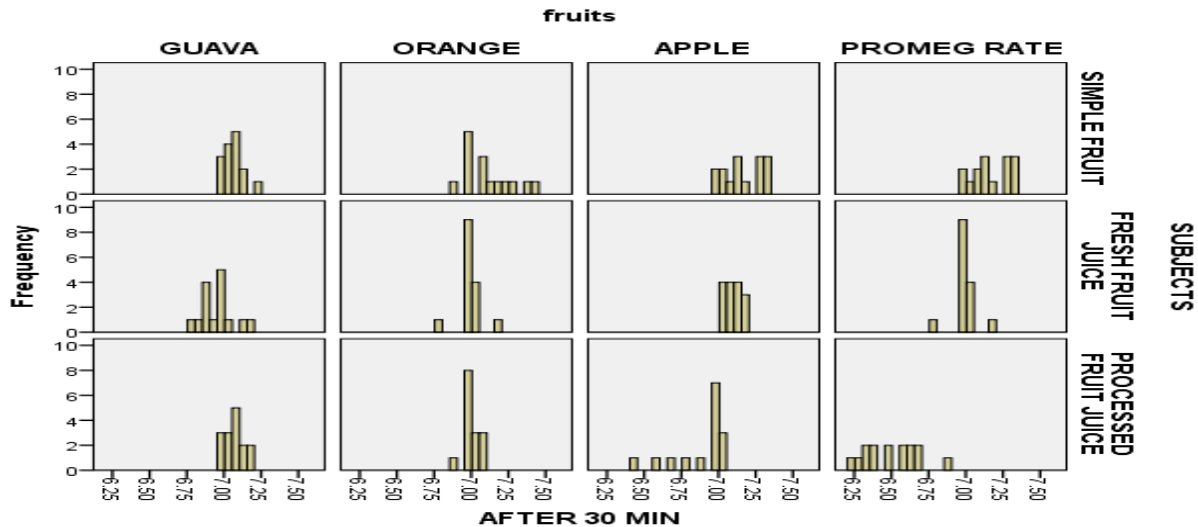


Figure 5. The salivary pH after half an hour of consuming fruits and juices

Conclusion

In case of simple fruits, pomegranate caused lowest decrease in salivary pH than all other fruits (orange, guava, and apple). Processed fruit juices have significant effect on changing the pH of saliva.

Authors' contributions

Conceived and designed the experiments: A Nazir & U Ahmad, Performed the experiments: A Nazir & Z Abaid, Analyzed the data: N Qamar & S Anam, Contributed materials/ analysis/ tools: A Nazir, Wrote the paper: S Anam & N Zafar.

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