

**EFFECT OF CARBONATED BEVERAGES ON MORPHOLOGY AND
COLOURATION OF TEETH - AN IN VITRO STUDY**

Running title: Effect of carbonated beverages on teeth.

Type of study: Original research

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Abstract

Background : Carbonated beverages are drinks which we use daily in our lifestyle nowadays. Since lifestyle modifications are changing our oral cavity status is also getting worse. The content of carbonated beverages are water, refined carbohydrates, and artificial additives. The changes in teeth with respect to carbonated beverages was evaluated.

AIM: To evaluate the effects of carbonated beverages on teeth.

Materials and methods: Six freshly extracted were taken and placed in 3 different beverages and 1 in distilled water. Time intervals were set and readings were taken in all intervals and data was collected. Morphological and colouration was evaluated.

Results: No morphological changes were observed in all aspects of the tooth. There was an observable change in colouration of the tooth. The Discoloration of roots was more compared to crown.

Conclusion: From the findings we can conclude that carbonated beverages show negative effects on teeth. It affects colouration, micro hardness and the surface of the tooth.

Keywords: Novel method, Carbonated beverages, Discolouration, Morphology, Teeth, innovative technique

Introduction

The carbonated beverages are soft drinks which usually contain water, sucrose content and carbon dioxide gas.(1). Some commercial soft drinks are high in sugar content and acidity.(1,2). The carbonated beverages supply only energy and little nutrition benefits and lack vitamins, minerals and nutrients. (2). The coloured beverages have a very bad effect on colouration on the tooth. Discoloration is a process in which teeth lose their colour process.

The teeth which are used for study i.e which were placed in beverages had a permanent change in colour. There is a rapid increase in pH of saliva which might cause bad effects to the oral cavity. (3). The artificial sweeteners present in carbonated beverages appear to have a bad effect on surface morphology of primary enamel. In recent days teenagers and adolescents are more prone to consumption of carbonated beverages. Consumption of carbonated beverages increases caries rate in teenagers.

It is found that 2 out of 10 people are prone to diabetes in the future whose intake of carbonated beverages is high. (4). Carbonated beverages cause significant greater enamel loss and decrease the microhardness of enamel. (5). The excess intake of carbonated beverages may not show its effect in primary but in the long term it has a very bad effect on teeth. Our team has extensive knowledge and research experience that has translate into high quality publications (6),(7),(8),(9),(10),(11),(12),(13),(14),(15),(16),(17),(18),(19),(20),(21),(22),(23),(24),(25)

The aim of the study is to evaluate effects of carbonated beverages on all aspects of teeth. The study was done in vitro conditions.

Materials and Methods

Six extracted teeth were taken for study. All teeth are non carious, healthy and extracted for periodontal reasons. The teeth were collected from a private dental college, oral and maxillofacial department. The study was done in the Biochemistry department. Three Carbonated commercially available Beverages were used for the study and marked as beverage1, beverage2, beverage3. The teeth were placed in different types of beverages and normal distilled water. Four different time intervals were taken (12hrs, 24hrs, 48hrs, 72hrs) and readings were taken in each time interval. In every time interval teeth were taken out, measured, taken photographs and placed back in the beaker. Morphological measurements and colour measurements were done. The morphological (mesial, distal, palatal and buccal) aspects were measured by vernier calliper and colouration was measured via scale. All precautionary measures were taken. Statistical analysis was done for results obtained. SPSS software version 23 was used for statistical analysis. Bar Graphs were generated.

Results

The readings were taken in every time interval, and data was collected.

Beverage 1



Figure 1

figure 2

figure 3

No morphological changes were observed in all aspects. But notable discoloration was seen on all surfaces. The change of colouration was permanent. Figure 1 represents tooth before placing in beverage 1, figure 2 represents tooth placed in beverage 1 (24hrs time interval), Figure 3 represents tooth placed in beverage 1 (48hrs time interval),

Beverage 2



Figure 4

figure 5

figure 6

No morphological changes were seen. There was a change in colouration of teeth. The discoloration of the root was observed more than the crown. Figure 4 represents tooth before placing in beverage 2, figure 5 represents tooth placed in beverage 2 (24hrs time interval), Figure 6 represents tooth placed in beverage 2 (48hrs time interval).

Beverage 3:



Figure 7

figure 8

figure 9

No morphological changes were seen. Discolouration was observed. Discolouration on the occlusal surface was more. The discolouration observed was no major. Figure 7 represents tooth before placing in beverage 3, figure 8 represents tooth placed in beverage 3 (24hrs time interval), Figure 9 represents tooth placed in beverage 3 (48hrs time interval).

Morphological changes



Figure 10

Figure 10 shows the bar graph representing palatal width of the teeth. It shows association between time intervals and length. The X-axis represents the time intervals and the y-axis represents length in cm. Orange colour represents different time intervals. Palatal width in all time intervals was represented.

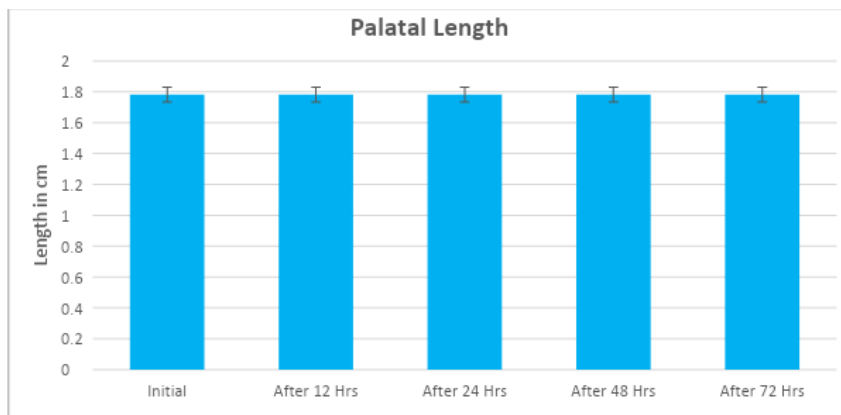


Figure 11

Figure 11 shows the bar graph representing palatal length of the teeth. It shows association between time intervals and length. The X-axis represents the time intervals and the y-axis represents length in cm. blue colour represents different time intervals. Palatal length in all time intervals was represented.

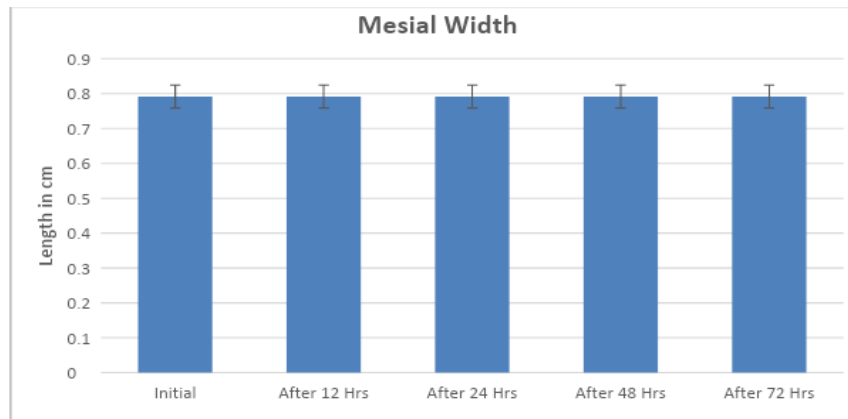


Figure 12

Figure 12 shows the bar graph representing mesial width of the teeth. It shows association between time intervals and length. The X-axis represents the time intervals and the y-axis represents length in cm. Dark blue colour represents mesial width at all time intervals.

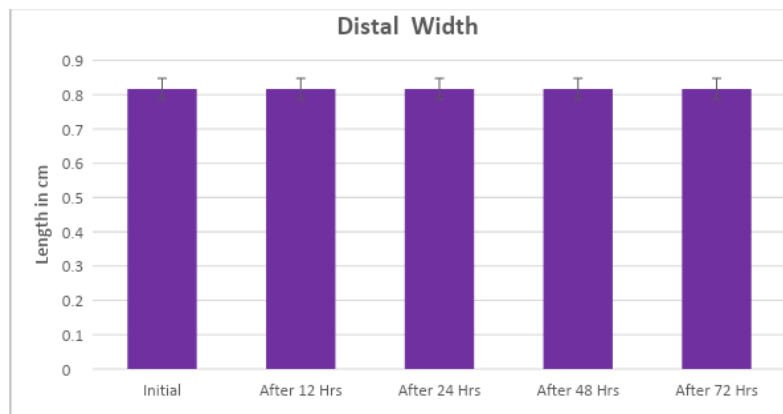


Figure 13

Figure 13 shows the bar graph representing distal width of the teeth. It shows association between time intervals and length. The X-axis represents the time intervals and the y-axis represents length in cm. Violet represents different time intervals. distal width in all time intervals was represented.

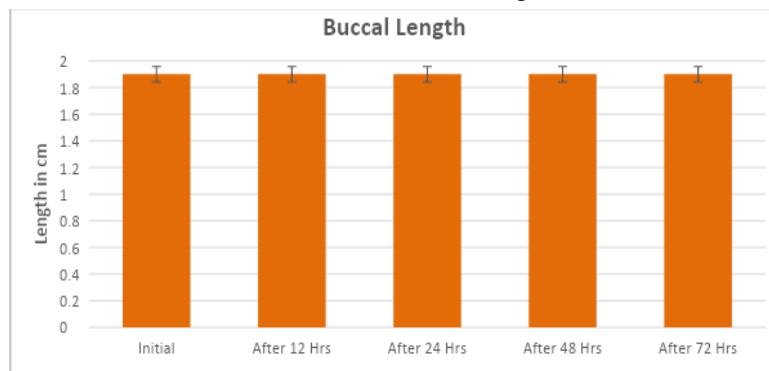


Figure 14

Figure 14 shows the bar graph representing buccal length of the teeth. It shows association between time intervals and length. The X-axis represents the time intervals and the y-axis represents length in cm. Orange represents different time intervals. buccal length in all time intervals was represented.

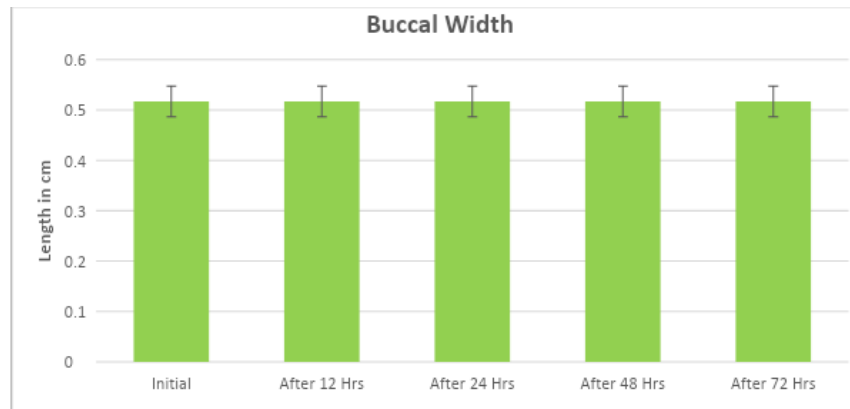


Figure 15

Figure 15 shows the bar graph representing buccal width of the teeth. It shows association between time intervals and length. The X-axis represents the time intervals and the y-axis represents length in cm. Green represents different time intervals. buccal length width in all time intervals was represente

Discussion

In recent days there has been an increase in consumption of carbonated beverages. The carbonated beverages contain high sucrose content which break down into molecules when entered in the oral cavity the process of breakdown into molecules accelerates the caries formation. (26). Based on the study findings the teeth which are placed in the beakers, had observed a lot of discoloration which suggests that excess intake of carbonated beverages may cause permanent discoloration. The contents of carbonated beverages i,e refined carbohydrates, low pH, co2 gas, artificial additives which all lead to long term enamel erosion and decrease of micro hardness of teeth. (27).

No morphological change was observed but according to (28) notable change in microhardness was seen. At the point when an individual is rinsing the beverage in the mouth there is an expanded tumult prompting improved disintegration as the semistatic layer of arrangement near the polish will be continually supplanted without arriving at the immersion level.(29). 7 of 25 studies suggest that carbonated beverages, energy drinks have a bad influence on teeth. (30). In recent days it was found that there was an association between obesity and carbonated beverages. Consumption of sugar-sweetened beverages including carbonated beverages was positively related to insulin resistance and higher plasma leptin concentrations in non overweight women.[(30,31).

Different beverages contain different acidic contents and different pH values. The beverage 1 contains dark colour artificial additives so there is more discoloration in the first tooth, the second beverage contains artificial apple additives thus is more apple deposition in all surfaces and predominantly occlusal surface. Beverage 3 contains green colour additive, though no major discoloration is root and the occlusive surface turned little into green. Based on this the study can suggest that all teeth which are placed in beverages show more or less discoloration.(32).

Limitations of the study, there are various types of carbonated beverages are available in the market but in the study only four carbonated beverages are tested i,e less sample size. By this study one can say that carbonated beverages had a lot of impact on teeth. By this study we can know the bad impact of and reduce the consumption in future for longevity of teeth.

Conclusion

Carbonated beverages have a great influence on teenagers. The consumption of carbonated beverages among teenagers is more. The excess consumption of carbonated beverages had a bad impact on teeth in the long run. Preference of fresh fruit juices over carbonated beverages can improve tooth life and overall health.

Conflict of Interest :

The authors hereby declare that there is no conflict of interest in this study.

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Author Contribution :

A. Srivaths Mukka contributed in designing the study, execution of the project, statistical analysis, manuscript drafting.

B. V.Vishnu Priya contributed in study design, guiding the research work, manuscript correction.

C. Gayathri.R contributed study design, statistical analysis, manuscript proofreading and correction.

D. Kavitha.S contributed study design, statistical analysis, manuscript proofreading and correction.

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