

A STUDY ON THE EROSIVE EFFECT OF SOFT DRINKS ON HUMAN DENTAL ENAMEL

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Abstract

The consumption of soft drinks has increased dramatically over past decades. Present study analyzed the erosive effect of the two popular categories of soft drinks on human dental enamel. Ten soft drinks were categorized into 2 groups based on the popularity among people. The first group Carbonated drinks which includes Coca cola, Pepsi, Sprite, 7-Up, Mirinda and Fanta and the second group is Fruit drinks it includes Frooty, Jive, Maaza, Mr Apple. Estimation of the influence of soft drinks on teeth dissolution was analyzed based on the amount of weight loss from the enamel surface following exposure to the drinks. In carbonated drinks, Coca cola caused 13.64% of weight loss of enamel after 31 days. Pepsi caused 15.20% of weight loss of enamel after 31 days. Sprite caused 12.42% of weight loss of enamel after 31 days. 7-UP caused 14.01% of weight loss of enamel after 31 days. Mirinda caused 10.29% of weight loss of enamel after 31 days. Fanta caused 11.23% of weight loss after 31 days. In fruit drinks, Frooty caused 25.33% of weight loss of enamel after 31 days. Jive caused 21.89% of weight loss of enamel after 31 days. Mr Apple caused 11.82% of weight loss of enamel after 31 days. Maaza caused 26.91% of weight loss of enamel after 31 days. Mineral water caused 0.84% of weight loss of enamel after 31 days. The finding indicate that soft drinks displayed significantly greater percent mean weight

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loss of the tooth. These results suggest that intake of these soft drinks of enamel dissolution with accompanying clinical diagnosis of dental erosion. Caution should be exercised in the excessive consumption of these soft drinks, especially by children and adolescence.

Introduction

The consumption of soft drinks has dramatically increased over past several decades; the soft drink industry is reported to produce 10 billion 192-ounce cases per year .Over 50 year period annual soft drink production appears to have increased fivefold, from 100, 12-ounce cans per person in 1947 to nearly 600, 12 ounce cans per person in 1997. Looking at it another way, the average person in 1947 consumed approximately two cans of soft drinks per week, or nearly two cans per day (Rogers, 2014)

The greatest increase in soft drink consumption has occurred among children and adolescents; nearly 40% of preschool children drink more than 250 ml of soft drinks in the U.S in 2002 was approximately 53 gallons per year, or 16 ounces per day, which represents the 24% of the recommended daily fluid intake of 67 ounces. Although no distinction is made between regular and diet soft drinks, recent figures (examining the period from 1994-1996) indicates that soft drink consumption among 12 to 19- year old boy is 28 ounces (800mL) per day; 12 to 19 -year old girl ,the rate of consumption is 21 ounces (600mL) per day (Rahman, 2002)

In recent years, diet (i e ,reduced-calorie) version of popular drinks have increased in relation to their non-regular beverage counterparts (i e, those containing sucrose or fructose). In 1997, artificially -sweetened diet sodas is a growing trend within North America (and perhaps throughout the developed world) towards increased consumption of non-cola drinks and non -traditional beverages (for e.g ;pre-packed coffees and teas).there also have been an upward trend in the consumption of sports drinks, although these may have a sugar content as high as 20%.

Materials and Methods

The erosive effect of the soft drinks was based on the amount of weight loss from the enamel surface following exposure to the drinks. Preparation of enamel specimens

Permanent teeth were selected and sterilized in an autoclave prior to use in the experiments. The enamel surface is fixed with an area of about 30mm³ .The sites for the windows were carefully chosen to be at surfaces with the least surface contours. This is done to ensure uniform surface for the experiment in all treatments including control .One ready the specimens were divided into two groups, each with exposed enamel windows. Each group is divided into subgroups based on each type of soft drink. The groups were designated as Group I Carbonated drinks (Coco cola,

sprite, Fanta, Mirinda, 7Up & Pepsi) Group2 Fruity drinks (Jive, Frooty, Maaza & Mr Apple) and mineral water was used as the negative control medium. Calcium and phosphate were listed amongst the constituents in all the soft drinks. The design of the enamel window was to standardize the surface area of enamel exposed to the soft drinks during the experiments.

Selection of soft drink Two groups of soft drinks-carbonated drinks and fruit drinks and a control medium are taken in this study. Determination of weight loss

The method described by story (2006) was employed in this section with slight modification. The initial weight of the tooth specimens in each study groups (Group 1&2) were recorded. The specimens were then immersed in 70 ml of the different type of soft drinks, with constant stirring. After 24 hours the specimens were removed, washed with distilled water and left to dry in an oven at 30c for 24 hours. Following that the specimens were re-weighed and the weight loss due to the first exposure to the drinks was calculated. The whole process was repeated every three day over a period of 31 days using fresh sample of soft drinks each time. Graph of weight loss versus cycles of exposures to each drinks were plotted and the erosion potentials of the drinks were calculated and analyzed. Using the equation;

$$\text{Percentage of weight loss (gms)} = (\text{Weight loss} / \text{initial weight}) \times 100$$

Result and Discussion

All the ten drinks selected for study namely, Coco cola, Sprite, Pepsi, Mirinda, Fanta, 7-up, Jive, Maaza, Frooty and Mr Apple showed significant enamel dissolution. All soft drinks exhibited a progressive attacks on dental enamel with a linear or straight line relationship between enamel dissolution and exposure time over the test period. Typical dissolution curves are shown in Fig- 1 and Fig- 2

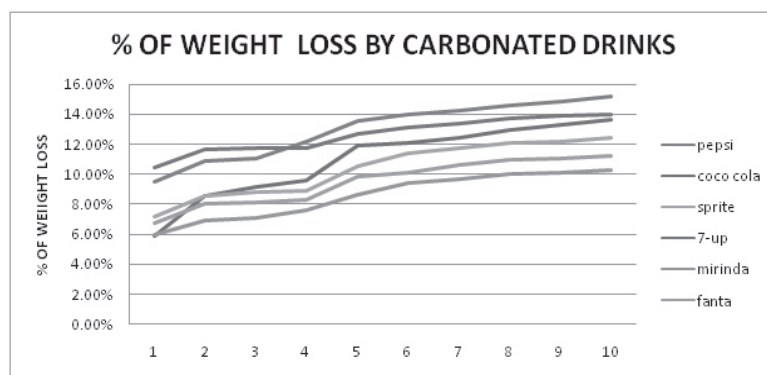


Figure 1:- percentage of weight loss of dental enamel caused by carbonated drinks in 31 days of experiment.

It shows that Pepsi caused highest dental enamel dissolution(15.20%) followed by 7up(14.01%),coco cola(13.64%),Sprite(12.42%) and Fanta(11.23%).Mirinda caused minimum dental enamel dissolution(10.29%)when compared to other carbonated drinks.

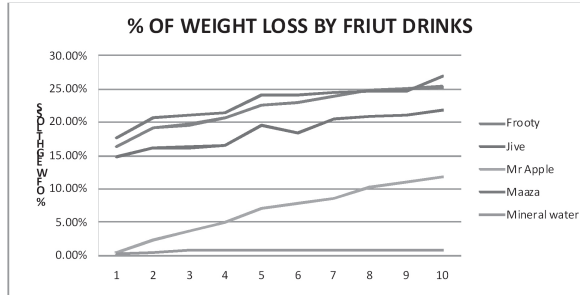
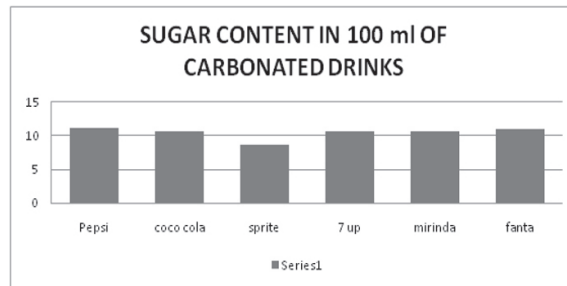


Figure 2:- percentage of weight loss of dental enamel caused by fruit drinks in 31 days of experiment.

It shows Maaza caused highest dental enamel dissolution (26.91%) followed by Frooty(25.33%) and Jive(21.89%).Mr.Apple caused minimum dental dissolution(11.82) when compared to other drinks. Aqua mineral water was taken as a negative control. It caused 0.84% of weight loss after 31 days.

Comparison of Sugar content present in Carbonated and Fruit Drinks



3 sugar content present in 100 ml of carbonated drinks.

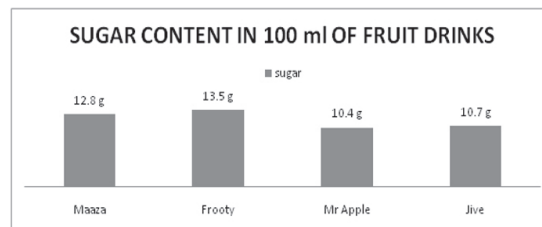


Figure-4 sugar content present in 100 ml of fruit drinks.

Conclusion

The data reported here indicate that carbonated soft drinks may cause significant long term enamel dissolution. Comparative assessment of the dissolution caused by these soft drinks indicated that the Pepsi caused highest dental enamel dissolution followed by 7-Up, Coco cola, Sprite, Fanta, Mirinda. 100 ml of Pepsi contains 11 g of sugar so it causes maximum dental dissolution. Mirinda contains only 10.6g of sugar so it causes only minimum loss of dental enamel as compared to Pepsi. Mr Apple caused minimum dental enamel dissolution when compared to the other fruit drinks it contain only 10.4g of sugar in 100 ml. The pattern of dental enamel dissolution is similar in all the soft drinks with a progressive increase in weight loss. In fruit drinks, Maaza caused maximum damage to dental enamel, it contain 12.8g of sugar. It is the most popular fruit drinks. Frooty causes dental enamel damage near to Maaza. In carbonated drinks Fanta caused minimal dental damage, in fruit drinks Mr Apple caused minimal dental damage. An important observation made in this study was that although being of a fruit drinks, Maaza caused more damage when compared to carbonated drinks. . These results suggest that intake of these soft drinks cause enamel dissolution with an accompanying clinical diagnosis of dental erosion. Caution should be exercised in the excessive consumption of these soft drinks, especially by children and adolescence.

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