Study of Erosive Effect of Some Brands of Bangladeshi Tea on Dental Enamel

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Abstract

In this study, the pH and neutralisable acidity of some commonly consumed tea produced in Bangladesh were investigated. Eight brands of tea including six black tea (Acme premium gold tea (B_1), Ispahani Mirzapore (B_2), Seylon gold (B_3), Tetley premium leaf tea (B_4), Sylhet special tea (B_5), Brooke bond taaza (B_6)) and two green tea (k & k green tea (G_1) and Finlays green tea (G_2)) were collected from different markets of Dhaka city, Bangladesh. The mean pH and neutralisable acidity values of black tea (B_1-B_6) for extraction time periods of 0, 2, 5 and 10 minutes found to be varied from 4.93 to 5.04 and 0.86 to 1.53, respectively and those of green teas (G_1 and G_2) for the same periods of extraction varied from 5.51 to 5.65 and 0.87 to 1.22, respectively. The black tea were found to be more acidic than green ones. In the light of critical pH value (pH 5.5), dental enamel may be affected from the drinking of black tea because of their lower pH values. The pH of green tea was found to be close to the critical value.

Keywords: pH, neutralisable acidity, green tea, black tea, dental erosion

1. Introduction

Tea is the second most consumable beverage in the world after water [1] and prepared from the leaves of the shrub *Camellia sinensis*. It is one of the most popular and important non-alcoholic beverages across the world and has been considered 'healthy drink' due to its purported medicinal value [2]. This beverage is commonly prepared by pouring hot or boiled water over tea with and without mixing milk and sugar. It is served as morning drink for nearly 2/3rd of the world population daily [3]. Even though, Bangladeshi tea is a minor player in the world tea picture but has a mentionable role in the national economy and employment sector [4]. According to Food and Agriculture Organization (FAO) of the United Nations, Bangladesh produced 66.2 thousand tons of tea in 2013 which was higher than the production in any previous years. World tea production (Black, Green and Instant) increased significantly by 6 percent to 5.07 million tons in 2013 [5]. There are different types of tea, such as black tea, green tea, oolong tea, herbal tea, fruit tea, etc. Tea is considered to be a healthy alternative to caffeine-based beverages because of its antioxidant properties [6]. Regular drinking of tea can improve antioxidant status in vivo, which may contribute to lowering the risk of coronary heart disease, stroke and certain types of cancer [7-11]. However, tea is known to have an erosive effect on enamel of tooth [12-16]. Apart from caries, enamel loss is considered to be the most frightening problem for dental health. Enamel loss or dental erosion defined as irreversible loss of dental hard tissues due to a chemical process without the involvement of microorganisms which seems to be a growing problem. The consumption of beverages containing acids increases tooth erosion. Considerable erosive potential of some types of teas such as fruit teas has been reported [4, 13, 17, 18]. Some reports have been indicated that beverages with low pH are the cause of enamel loss of tooth [19, 20]. The critical pH value below which enamel begins to erode is 5.5 [18]. Another study has reported that neutralisable acidity is a more effective indicator than pH value for determining the erosive potential of beverages [21] which depends on a complex interaction of various factors such as acid type, acid concentration, temperature, duration of the drink held in the mouth and the buffering capacity of the saliva. It is now accepted that both pH and neutralisable acidity are indicators of the erosive potential of a food or drink [19-21].

The purpose of this research work is to investigate the erosive effect produced from the drinking of some locally available tea on dental enamel by measuring their pH value and neutralisable acidity.

2. Material and Method

2.1 Reagents and Glassware

All reagents used in this study were of analytical grade. Deionized water was used as a solvent to prepare solution. The glassware used for the experimental work were Pyrex glassware washed with detergent solution followed by immersion in 10% HNO_3 overnight to remove any trace of inorganic or organic impurities. The cleaned materials were then rinsed with tap water and finally with deionized water and dried in an oven.

2.2 Preparation of 0.1 M Standard NaOH Solution

The procedure for the preparation of 0.1 M sodium hydroxide (NaOH) solution included the following steps:

2.2.1 Preparation of an Approximate Standard NaOH Solution

A clean weighing bottle was first weighed carefully in a microbalance. A suitable amount of sodium hydroxide pellet (Analytical Reagent Grade) was placed in the bottle and the weight was taken. The weighed mass was then transferred to a volumetric flask and diluted up to the mark with deionised water.

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