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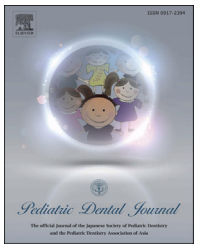

Original Article

The erosive effects of honey, molasses and orange juice on the primary teeth of children

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ABSTRACT

Background and aim: The objective of this study is to investigate whether or not the surface properties of the primary tooth enamel is affected by erosive foods frequently given to children by their mothers at breakfast.

Materials and methods: In our study, the materials used consisted of honey, molasses and orange juice as acidic foods and 60 primary teeth for tooth material. The samples belonging to Group 1 (n = 20) were kept within 20 ml of honey for 10 min, while those of Group 2 (n = 20) were kept within 20 ml of molasses for 10 min, and those of Group 3 (n = 20) were kept within 20 ml of orange juice, again for 10 min. Afterwards, all the samples were kept in 20 ml of saliva (pH = 6.8) for 60 min. These cycles were repeated 180 times in order to simulate the oral environment. The enamel surface roughness values of the samples were examined in the profilometry device at baseline and after procedure.

Results: The most effective change on the surface roughness was seen to have been in the samples kept in the orange juice and molasses. It was determined that there was no statistically significant difference in the group where honey was applied ($p = 0.624$), whereas a statistically significant difference was seen in the group where both molasses ($p = 0.017$) and orange juice ($p = 0.012$) were applied.

Conclusion: It is considered that the foods with erosive potential which are frequently given to children by mothers affect the surface properties of primary teeth at different rates.

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1. Introduction

Dental erosion can be defined as the loss occurring in the dental tissue as the result of a chemical event containing no bacteria [1,2]. Acid exposure causes enamel surface demineralization, and long-term demineralization leads to erosive enamel wear as a consequence of progressive mineral loss. If the oral pH drops below the critical pH of enamel which is basically reported to be 5.5, an erosion occurs due to the duration and frequency of acid attacks [3]. Erosion is influenced by the chemical properties of foods and beverages [chelation properties, calcium, phosphate and fluoride content], the behavioural characteristics of patients [eating and drinking habits, life style, excessive acid consumption] and the biological structure of teeth and saliva [saliva flow rate, buffer capacity of the saliva, pellicle formation, the anatomy of the dental hard tissue and soft tissue] [4]. It is reported in a number of studies that dental erosion which is not precisely known by the majority of the society and which results in a major damage on the surface of the tooth is associated with foods and beverages with acidic potential, such as fruit juice, energy drinks and carbonated soft drink [5]. The erosion lesions that develop due to diet are commonly seen on the labial surfaces of lower and upper anterior teeth [6]. There is smooth appearance in erosion lesions in the early stages, and the surface contour has not been lost. As the loss of teeth increases, less mineralized and more soluble dentin tissue manifests. In such cases does a dental sensitivity develop [7].

Although there are a number of studies today as to the effect of orange juice consumed frequently at breakfast by children in particular on the surface of the tooth enamel, there is no study in which the effects of the erosive foods on tooth enamel, such as honey and molasses given to children at breakfast by their mothers, are evaluated.

The objective of this study is to investigate how seriously the surface properties of the primary tooth enamel are affected by the erosive foods often given to children at breakfast by their mothers.

2. Material and methods

The daily-consumed nutrients with erosive potential which were used in this study and the pH levels are shown in Table 1. In the study, a total of 60 pieces of extracted primary maxillary santral incisor teeth were used. The range of the donors' age was 6 and 7. The fact that the teeth would not be decayed, that they would have no fillings, that they were not damaged at the time of extraction and that there would be no structural defect in the tooth enamel was of primary importance. At the outset of the experiment, the debris layer over the teeth was cleansed by polishing with the help of a rubber brush and pumice. By using silicon moulds, each tooth was buried horizontally into the acrylic resin block that got polymerized on its own in the way that the roots of each tooth would be within the block and the crown parts would be parallel to the surface while the labial enamel surfaces would remain in the open. As soon as the acryl polymerization was ensured, the samples were kept in distilled water until the experimental procedure was performed. The enamel surfaces of buried teeth were rubbed with an emery of 600-800-1000-1200 grains, respectively, in the way that they would cause a minimum loss of tissue. The teeth were coated with an acid resistant nail varnish, leaving a narrow window, approximately 1 mm wide on the sound, intact surface of the labial enamel and randomly divided into 3 groups (n = 20). The profilometry device (Mahr Perthometer M2/M3, Gottingen, Germany) was used to measure the surface roughness. The initial surface roughness values of the samples were measured and evaluated in the profilometry device. 3 measurements for each sample was performed, and their averages were taken. The initial pH values of the foods used in the study were measured, as well. The samples in Group 1 (n = 20) were kept within 20 ml of honey for 10 min, while those in Group 2 (n = 20) were kept in 20 ml of molasses for 10 min, and those in Group 3 (n = 20) were kept in 20 ml of orange juice for 10 min, as well. The dimension of the enamel surface exposed to erosive foods was the same. Afterwards, all the samples were kept in 20 ml of artificial saliva (pH = 6.8) for 60 min. The artificial saliva consisted of 0.2 mM glucose, 9.9 mM NaCl, 1.5 mM $CaCl_2.2H_2O$, 3 mM NH_4Cl, 17 mM KCl, 2 mM NaSCN, 2.4 mM K_2HPO_4, 3.3 mM urea, 2.4 mM NaH_2PO_4, and 11 μM ascorbic acid (pH 6.8). These cycles were repeated 180 times in order to simulate the oral environment. The enamel surface roughness values of primary teeth samples were re-examined.

Table 1 – The erosive foods and pH values.

Foods	pH
Honey	4,11
Molasses	4,50
Orange juice	3,60

The data analysis was performed through the SPSS 15.0 (Chi., IL, USA) statistical package program. In the identification of the data, mean, standard deviation, minimum and maximum values were used. In the multiple comparisons between groups, the Kruskal–Wallis test was used, whereas in the advanced pairwise comparisons, the bonferroni corrected Mann Whitney U test was used. In the inter-group comparisons, Wilcoxon test was used. The $p < 0.05$ level was regarded as statistically significant.

3. Results

The mean surface roughness values, standard deviations and rates of changes obtained as the result of the surface roughness tests are shown in Table 2.

When the results in the surface roughness values that came as the result of keeping the primary tooth enamel in different nutrients during the same period of time were compared in terms of the rate of change, honey, molasses and orange juice followed each other one after the other, from lower to higher values. In the advanced pairwise analyses performed, this difference was determined to have been due to the fact that the change in the surface roughness values of the samples kept in honey was lower than that in the other groups. When the roughness values of the groups prior to and