

**Concentrations of Selected Elements in Permanent
Teeth, Enamel and Saliva among a Group of
Adolescent Girls in Relation to Severity of Caries
and Selected Salivary Parameters.**

A thesis

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Abstract

Background: Human teeth considered to be an important etiological host factor in relation to dental caries through its morphology and composition. Elements may incorporate in tooth structure during pre and post-eruptive period changing the resistance for caries. Saliva is the second host factor that plays a role in the caries process through the physicochemical properties.

Aims of the study: To determine the concentration of selected major and trace elements in permanent teeth, enamel and saliva among a group of adolescent girls in relation to severity of dental caries. In addition, to explore the relation of selected salivary elements, flow rate and pH with dental caries.

Material and Methods: The study group consisted of 25 girls with an age of 13-15 years old referred by Orthodontists for extractions of upper first premolars (two sides). Tooth and enamel samples were prepared for chemical analysis according to method described by Lappalainen and Knuttila (1979). The collection of stimulated salivary samples from patients was performed between 9-11 Am, before the clinical examination and under standardized conditions according to Tenovuo and Legerlof (1994). Tooth, enamel and salivary samples were then chemically analyzed to determine ions concentrations of calcium, phosphorus, ferrous iron, nickel, aluminum and chromium. Dental caries was diagnosed by both clinical and radiographical examinations following the criteria of D₁₋₄MFS index described by Muhlemann (1976).

Results:

In teeth and enamel samples the concentration of Ca ions was (21.56% of dry weight \pm 1.34, 19.59 % of dry weight \pm 1.32) respectively, while that of P ions was (11.90% of dry weight \pm 1.17, 10.31% of dry weight \pm 2) respectively, both ions were higher in teeth than enamel. The concentration of trace elements in these two samples showed that Al ions was the highest followed by Ni then

ferrous Fe and finally Cr ions. All elements showed highly significant difference of concentration between teeth and enamel samples ($P < 0.001$). In saliva the concentration of P ions was (84.62ppm \pm 11.72), and that for Ca ions was (80.6ppm \pm 22.97), while the concentration of trace elements in saliva showed that ferrous Fe ions was the highest followed by Al ions then Ni and finally Cr ions.

Major and trace elements measured in teeth samples in addition to Ca/P ratio showed statistically not significant correlation with DMFS, except Ni ions in teeth that recorded a statistically significant correlation with DMFS ($r=0.40$, $P=0.05$). In enamel P ions showed a negative and statistically significant correlation with DMFS ($r= -0.40$, $P= 0.05$), for trace elements Al ions recorded a positive and statistically highly significant correlation with DMFS($r= 0.56$, $P= 0.003$). The correlations of other elements were statistically not significant. All elements measured in saliva in addition to P/Ca ratio recorded statistically non significant correlation with DMFS, except ferrous Fe ions which showed statistically significant correlation ($r= 0.34$, $P=0.05$). Salivary flow rate and pH correlated weakly and statistically not significant with DMFS. There were weak and statistically not significant correlations between all elements measured in saliva with those measured in teeth and enamel.

When multiple linear regression tests was applied between elements in teeth, saliva and salivary parameters as (independent variable) and DMFS as (dependent variable), the complete correlation coefficient was recorded to be 0.795 and R^2 was recorded to be 0.632.

Conclusions: - Incorporation of major and trace elements in teeth, in addition to their presence in saliva may change the resistance of teeth to caries process.