Letter to the Editor

The Elemental Composition of the Child's Body and Its Effect on General and Dental Health

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Dear Editor-in-Chief

In recent years, an interest in an in-depth study of macro and microelemental metabolism in the human body has increased significantly both in normal and pathological conditions (1).

The determination of essential chemical macro and microelements in dental hard tissues and hair plays an important role in monitoring human health and assessing the risks of developing dental diseases; Moreover, it gives us a complete picture of the metabolic processes and the quality of the mineral composition in the human body (2). Children and adolescents are most sensitive to diseases caused by an imbalance in mineral metabolism (3).

The goal of the research was to determine the composition of the essential macro and microelements in hair and dental hard tissues and to study the possible effect of their imbalance on both the general and dental health of the child.

In order to assess the state of dental hard tissues, 375 children from Batumi (Georgia) pre and public schools aged 3 to 12 years were randomly examined. They were divided into three age groups: 108 preschooles aged 3-6 (28.8%), 153 students aged 7-9 (40.8%) and 114 children aged 10-12 (30.4%). The study was carried out in the period from June 2018 –

June 2019. Ethical approval was obtained from the Bioethics Committee at the National Centre for Disease Control and Public Health, Tbilisi, Georgia (approval number #2018-032).

Monitoring of the examined children was carried out using standard indices provided by the WHO. According to the dmft/DMFT score we differentiated three categories of the status of caries: mild caries (dmft/DMFT<6), moderate caries (dmft/DMFT: 6-9) and severe caries (dmft/DMFT>9).

Overall, 48 children aged 3-12 were chosen from the examined 375 children. They were divided into two groups - control group (15 children) with mild caries only with dmft/DMFT<2, and case group (33 children) with severe caries with dmft/DMFT>9. Hair samples and extracted teeth were used to evaluate elemental composition. We used X-ray fluorescent spectroscopy to study the qualitative and quantitative composition of chemical elements in the hair and dental hard tissues (4). After preparing the hair under study, we determined instantaneous composition of essential macro -(Ca, K, S, Cl) and microelements (Zn, Fe, Cu, Se, Mn, Cr, Br, Co, Ag, V, Ni, Rb, Mo, Sr, Ti).

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Determination of essential macro (Ca) and micro-elements (Fe, Cu, Rb, Zn, Ni, Mn, Sr) in dental enamel and dentin was carried out using the same method, x-ray fluorescent spectroscopy.

General health status was measured based on the examined children's medical care provided by the pediatrician.

The obtained data were statistically processed and were analyzed using the SPSS Statistics, version 21 (IBM Corp., Armonk, NY, USA).

The prevalence and experience of dental caries in all age groups and gender was high and its average value was 88.5% (prevalence) and 5.89±4.42 (caries experience).

Evaluation of caries experience (dmft/DMFT) among the caries indices showed the number of caries decayed teeth had the highest component both with girls and boys. The mean value of carious teeth was 5.29±4.3 and of filled teeth was 0.56±1.64. A mild caries among the examined children (375) was recorded 34.9 % (131), a moderate caries 21.6 % (81) and a severe caries 43.5 % (163).

Four macro and 15 microelements were investigated in hair in 48 children aged 3-12 (Table 1).

Table 1: Macro and microelements composition in hair ($P<0.05$)

Chemical elements	Composition in hair Norma (mkg/g)	Mean	Std. Deviation
Ca	300-700	335.3087	100.39855
Zn	120-200	126.6663	40.43051
K	70-170	116.5987	190.25130
Fe	15-35	18.8708	6.14159
Cu	9.0-30	10.9721	4.59782
Se	0.3-1.2	0.3379	0.19091
Mn	0.5-2.0	0.7615	0.40183
Cr	0.5-5.0	2.6608	1.96059
S	21000-49000	23826.4485	8834.58857
Br	2.0-12	3.8787	3.39996
Cl	60-560	371.7560	312.98137
Co	0.0-2.0	0.4173	0.35662
Ag	0.0-2.0	0.1848	0.28024
V	0.0-1.0	0.1037	0.14711
Ni	0.0-3.5	0.7123	0.59328
Rb	0.0-2.0	0.8967	0.77395
Mo	0.0-3.0	0.1333	0.11858
Sr	0.0-3.0	1.2479	0.89155
Ti	0.0-4.4	0.8629	1.20430

The average composition of Ca, Zn and Fe in the hair was the lower limit of the norm according to spectral analysis among the examined children and the composition of these elements was even lower in those children who had a severe caries and we believe that this caused the demineralization of the dental hard tissues.

Particularly significant relationship was found between the caries status and composition of Ca, Zn and Fe in dental hard tissue (Fig. 1).
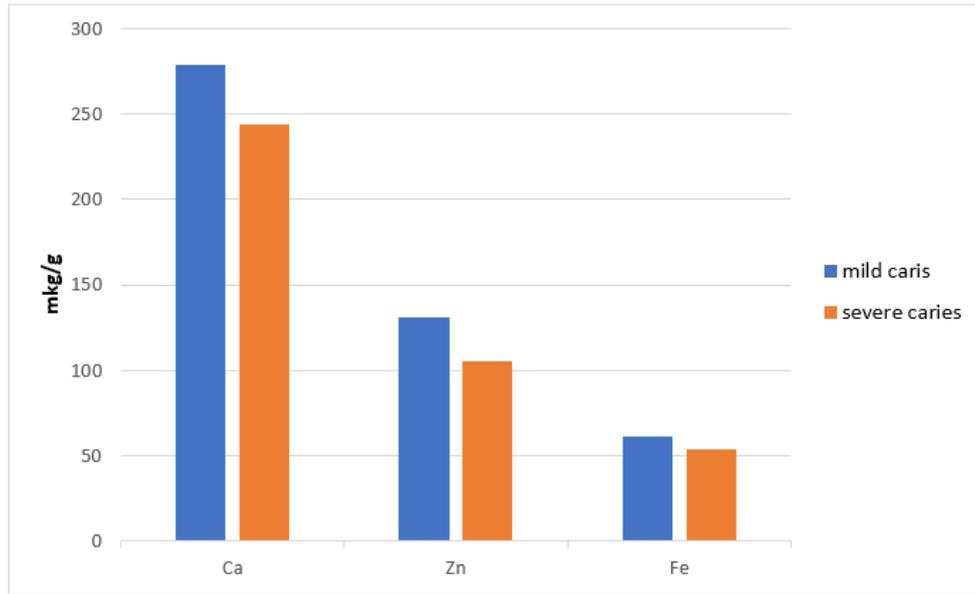
Fig. 1: Composition of Ca, Zn and Fe in dental hard tissues according to caries status.

This study revealed a high coefficient of correlation between both the mineralization of dental hard tissues and with the general health of the growing body

Conflict of interest

The authors declare that there is no conflict of interest.

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