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# THE PROBLEM OF DEVELOPING CARIES-RESISTANT ENAMEL

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**Annotation:** Among many anatomical systems, teeth provide abundant information related to the growth and development of the entire body. They change in two sequences, first as baby teeth and then as permanent teeth, so that these changes span the period from birth to the end of adolescence.

**Key words:** dental caries in children, dental health of children, prevention, quality of life.

Dental caries status was assessed in 300 subjects from a saliva subsample , equally divided between children with MH and healthy children. The International Caries Detection and Scoring System was used to identify caries. Saliva flow rate, viscosity, pH and buffering capacity were determined. Children with molar hypomineralization had significantly higher mean caries scores compared to the group of healthy children. Dentin carious lesions were ten times more common in teeth with post-eruptive decay (PED) than in teeth with only opacities. Low salivary flow rate (LSFR), moderately viscous saliva, and low pH were significantly more common in the affected group. LSFR and moderate to highly acidic saliva were most likely associated with PEB. The authors state: demarcated hypomineralized enamel is a dynamic defect, which is strongly influenced by the individual characteristics of the oral environment [2].

German researchers Kühnisch J, Standl M, Hickel R (2021) believe that after caries, molar incisor hypomineralization (MIH), also known as chalky teeth, is one of the most common dental diseases in children and adolescents. In addition to aesthetic limitations, especially in the anterior teeth, hypersensitivity and destruction of the enamel of permanent molars have functional implications. While prevalence rates for MIH range from ~10% to ~30% and are well described, the situation regarding etiology is unsatisfactory. Although attempts have been made in the past to find out the etiology, there is still no plausible cause [ 4].

Hysi D, Kuscu OO, Droboniku E. (2016) This study was carried out at the Department of Pediatric and Preventive Dentistry, Faculty of Dentistry, Tirana Public Health Dental Service. (Albania ) A total of 1575 schoolchildren aged 8–10 years were examined by 7 qualified examiners (dentists) (kappa: 0.86). Weerheim criteria have been used to diagnose demarcated opacities, eruptive failures, atypical restorations, and removed PFM due to molar incisor hypomineralization (MIH). The prevalence of MIH was 14% (n=227). In 227 children with MIH, tooth 36 was the most affected by PFM and tooth 46 was the least affected. Tooth 21 was the most affected incisor and tooth 32 was the least affected incisor according to MIH. Children with MIH (+) had significantly more childhood diseases in the first 3 years of life (p=0.006). Among children who took antibiotics, there were 1.41 (1.06-1.87) times more cases of IH (+) than in children who did not take antibiotics, there were cases of IH (-). MIH has been found to be common among 8–10 year old children in Tirana [1].

Featherstone JD. (2015) enamel remineralization has been studied for about 100 years and it has been suggested that “non-invasive treatment of early caries through remineralization could be a major advance in the clinical management of this disease. Under physiological conditions, oral fluid (saliva, biofilm fluid) contains calcium (Ca) and phosphate (Pi) in supersaturated concentrations relative to the mineral composition of the enamel, as a result of which these ions are constantly deposited on the surface of the enamel. or are re-deposited in areas of enamel where they were lost. This can be considered as a natural defense phenomenon that is facilitated by saliva to maintain the mineral structure of the enamel in the mouth [5].

Thus, remineralization is best defined as the redeposition of minerals lost by the enamel, and the term is used synonymously with the restoration or rehardening of the enamel. Mineral loss (demineralization) or gain ( remineralization ) by enamel is a dynamic physicochemical process that occurs when oral bacteria form a biofilm on the enamel surface and this biofilm is exposed to fermentable dietary carbohydrates, the most cariogenic of which is sucrose.

Thus, each time sugar penetrates the cariogenic biofilm and is converted to acids by bacterial metabolism, the biofilm fluid becomes undersaturated with respect to enamel mineral and demineralization occurs. The critically low pH for tooth dissolution is maintained for a certain time, but returns to physiological values when exposure to sugar ceases. Therefore, by raising the pH and restoring conditions of supersaturation, a certain amount of the lost mineral can be restored to the enamel. This process is called remineralization . Re-deposition of minerals lost by the enamel can occur through the action of Ca and Pi found in the biofilm fluid, or through the direct action of Ca and Pi in saliva shortly after removal of the biofilm by brushing the teeth. However, the amount of calcium and phosphorus gained is less than that lost, and the end result is a small loss of minerals.

Lima TJ et al. (2008) By influencing the dynamics of the caries process, F very effectively slows down (delays) the development of carious lesions. However, since it does not directly affect the etiological factors responsible for the disease (biofilm and sugar), it will not escape it, and invariably the disease will leave scars on the teeth, clinically visible or not. However, the relative contribution of F - decreased demineralization or increased remineralization - to the final effect on caries is unknown because it is impossible to isolate these effects given the dynamics of the process. Indeed, some authors believe that the most important effect of F is the reduction of enamel demineralization, while others believe that F accelerates the process of remineralization , and this is the main mechanism for combating caries [7].

Cury JA, Tenuta LM. (2009) Brazilian authors consider the effect of fluoride on caries. Because F enhances enamel remineralization , its clinical use for the treatment of early caries (“fluoride therapy”) is recommended. However, the effect of F on the dynamics of the caries process and its success in the fight against caries should not be confused with its stopping or reversing effect on carious lesions. In addition, it should be emphasized that shallow demineralized areas of enamel remineralize faster than deep ones [8].

The cessation of caries in the form of white spots and the changes observed in the demineralized surface and subsurface of the enamel have been well documented years ago. The change in appearance of the enamel lesions from whitish to shiny was attributed to wear and polishing of the dull, partially dissolved surface of active lesions rather than redeposition of lost minerals. However, the porosity of the deeper parts of the lesions was reduced, indicating partial remineralization of the lesion body. Therefore, the presence of a surface layer does not prevent subtle changes at the crystal level within carious lesions after removal of the biofilm accumulated on the enamel surface [ 9 ].

Restoring the physiological conditions between the enamel and oral fluid will result in the re-deposition of minerals in the demineralized areas. However, while subsurface lesions remineralize in vitro for several weeks for complete remineralization in vivo takes years. Thus, the effect of F in enhancing enamel

remineralization is well known from several studies in vitro and in situ , given the best knowledge of dental caries, any " remineralization therapy" must follow two fundamental principles: Dental biofilm, a necessary factor in causing caries, must be controlled by tooth brushing. Fluoride should be used either to stop existing lesions or to slow the progression of new ones [11].

The authors also emphasize that salivary calcium and phosphorus are the source of minerals for restoring demineralized enamel, since saliva is oversaturated with dental minerals, which promotes mineral deposition. Thus, normal endogenous concentrations of Ca and Pi found in saliva are high enough to induce remineralization , but the latter can be significantly enhanced by exogenous F supplied by various oral delivery routes [12].

Shkirmant T. A. (2018) (Belarus) presents the results of a study of the relationship between the degree of mineralization of hard tissues of permanent teeth during the process of eruption and fluorescence intensity indicators. The condition of the hard tissues of 548 visually intact permanent teeth in 32 schoolchildren aged 8 to 13 years was studied using laser fluorescence using a KAVO DIAGNOdent device . It was found that the average fluorescence intensity values of intact permanent teeth in children differed depending on the location of the area under study and the age of the patient [13].

The highest fluorescence values were determined in children aged 8–9 years on the chewing surface of the first permanent molars (7.56 and 9.92 relative units , respectively), while in the area of the mesial fossae an average fluorescence value of 5.85 relative units was recorded . units, which indicates a higher degree of mineralization. In the equator region of the teeth, the average fluorescence intensity values were lower than in the cervical region. The data obtained indicate the immaturity of hard dental tissues in the cervical region and in the area of the fossae in comparison with the equator in the first molars. As age increased, laser fluorescence indices decreased, indicating an increase in the degree of their mineralization [14].

In children aged 10–11 years and 12–13 years, fluorescence indices decreased in the area of the central and distal fossae of the first permanent molars. The highest fluorescence values were determined in children aged 8–9 years and lower ones – at the age of 10–11 years on the chewing surface of the first permanent premolars, while in children aged 12–13 years no further decrease in the value of the indicator was recorded. This may be due to the later eruption of premolars in representatives of this age group. In the second premolars, a statistically significant ($p < 0.05$) decrease in the values of indicators in the area of the central fissure with increasing age is observed. Determining the degree of mineralization of hard tooth tissues after eruption helps the dentist implement a differentiated approach when providing dental care to the child population [15].

Avraamova O.G. (2015) has now established that the leading link in the pathogenesis of dental caries is a violation of the dynamic balance between the processes of remineralization and demineralization in the oral cavity, which closes the metabolic phenomena occurring at all levels and the systems of their regulation. It is known that the frequency of carious lesions of molars in the first years after their eruption increases due to an increase in fissure caries, so it is relevant to study the possibility of regulating the process of maturation of fissure enamel and cusps of permanent teeth in children using fluoride-containing toothpastes [16].

The analysis of literary sources shows that an important stage in the formation of a child’s dental status is the process of enamel maturation, during which the “peak” incidence of caries occurs. The effectiveness of caries prevention is closely related to the problem of forming full-fledged enamel. Prevention of early forms of caries during the eruption of permanent molars stabilizes foci of caries and reduces its intensity.

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