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SYSTEMIC IMPACT OF MIH SYNDROME ON THE CHILD AND ADOLESCENT

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Abstract. Aim. The aim of our study was to monitoring the prevalence of the First Permanent Molar and Incisor Hypomineralisation Syndrome (MIH) in schoolchildren from Iasi. **Materials and methods.** The surveyhas been carried out on a number of 681 children aging from 8 to 11: 401 girls (58.9%) and 280 boys (41.1%). The Enamel Defect Index (EDI) was used in order to classify data. **Results and discussion.** Our study showed a prevalence of enamel development in permanent incisors of 10.28% and in first permanent molars of 4.26%. The prevalence of MIH Syndrome was 14.54%, a quite high value, explained by the low fluoride concentration in the studied area. The enamel defects in permanent incisors had a RR of 2.41 (1.59 - 3.67 CI 95%). The prevalence of defect emergence in the first permanent molars is more probable if the affected incisors have a lower prevalence (r= - 0.50). **Conclusions.** Our study revealed a MIH Syndrome prevalence of 14.54%. The correlation between the permanent incisors and the first permanent molars was r = - 0.50 and on the mandible r = 0.22. The ratio of affected first permanent molars compared to the incisors was of 1/4.
Key-words: mineralization, prevalence, Molar Incisor Hypomineralisation Syndrome

Rezumat. Scop. Scopul studiului nostru a fost monitorizarea prevalenței sindromului hipomineralizării incisiv – molar la elevi, în municipiul Iaşi. **Material şi metode**. Studiul s-a efectuat la un număr de 681 copii cu vârste cuprinse între 8 şi 11 ani: 401 fete (58,9%) şi 280 băieți (41,1%). Indexul de carie (IDC) s-a utilizat în vederea clasificării rezultatelor. **Rezultate şi discuții.** Studiul a relevat o prevalență a smalțului la incisivii permanenți de 10,28% şi la molarii primi permanenți de 4,26%. Prevalența sindromului hipomineralizării incisiv-molar a fost de 14,54%, valoare destul de crescută, explicată de concentrațiile scăzute de fluor din regiunea studiată. Defectele de smalț la incisivii permanenți au prezentat un risc relativ (RR) de 2,41 (1,95 – 3,67 IC95%). Prevalența defectelor de smalț la molarii permanenți este mai mare cu cât prevalența acestor defecte la incisivi este mai mică (r = - 0,50). **Concluzii.** Studiul nostru a relevat o prevalența a sindromului hipomineralizării incisiv-molar (SHIM) de 14,54%. Corelația între incisivii permanenți şi molarii primi permanenți a fost de r = – 0,50 şi pentru cei mandibulari r = 0,22. Molarii sunt de 4 ori mai afectați decât incisivii.
Cuvinte cheie: mineralizare, prevalență, Sindrom Hipomineralizare Incisiv Molari

INTRODUCTION

At the 6th Congress of the European Academy of Paediatric Dentistry (EAPD) thematic was focused on the mineralisation defects involving the first permanent molars and on the studies concerning the prevalence of the Molar Incisor Hypomineralisation Syndrome (MIH).

In the previous studies various criteria had been used, which has made it difficult to compare any prevalence figures (1). On the other hand suggestions were made by dental

scientists according to whom, the prevalence of MIH is rising and that it would be beneficial to collect more information on the distribution of MIH in paediatric populations of Europe. To this end comparable and representative prevalence studies are urgently needed. The aim of our study was to monitor the prevalence of the First Permanent Molar and Incisor Hypomineralisation Syndrome (MIH) in child population from school communities from Iasi.

MATERIALS AND METHODS

The research has been carried out on a number of 681 children 401 girls (58.9%) and 280 boys (41.1%), aged from 8 to 11 y. The children were examined in standard conditions, without previously brushing or drying their teeth. Enamel Defect Index (EDI) as well as evaluation criteria for MIH diagnosis were used in order to classify the data (table 1).

Data bases were created and analyzed using EXCEL and EPIINFO 6.0 programs. The statistical methods used were interpreted as being 95% of the significant threshold. The applied tests to stress the differences were $\chi 2$, the relative risk (RR) and the correlation coefficient.

Table 1. The definitions of the evaluation criteria used in MIH diagnosis for the prevalence studies (2)

Demarcated opacity A demarcated defect involving an alteration in the translucency of the enamel, variable in degree. The defective enamel is of normal thickness with a smooth surface and can be white, yellow or brown.
Posteruptive enamel breakdown (PEB) A defect that indicates deficiency of the surface after eruption of the tooth. Loss of initially formed surface enamel after tooth eruption. The loss is often associated with a pre-existing demarcated opacity.
Atypical restoration The size and shape of restorations are not conforming to the temporary caries picture. In most cases in molars there will be restorations extended tot the buccal or palatal smooth surface. At the border of restorations, frequently an opacity can be noticed. In incisors, a buccal restoration can be noticed not related to trauma.
Extracted molar due to MIH Absence of a first permanent molar should be related to the other teeth of the dentition. Suspected for extraction due to MIH are: opacities or atypical restorations in the other first permanent molars combined with the absence of a first permanent molar. Also the absence of first permanent molars in a sound definition in combination with demarcated opacities on the incisors is suspected for MIH. It is not likely that incisors will be extracted due to MIH.
Unerupted The first permanent molar or the incisor to be examined are not yep erupted.
Notes: in cases of large caries lesion with demarcated opacities at the border of the cavity or on the non caries surfaces, these teeth should be judged as MIH. Other changes in dental enamel such *amelogenesis imperfecta*, hypoplasia, diffuse opacities, white spot lesions, tetracycline staining, erosion, fluorosis, white cuspal and marginal ridges should be excluded from the types of enamel defects outlined as above.

RESULTS AND DISCUSSION

The defects prevalence of enamel development was 10.28% in permanent incisors and 4.26% in the first permanent molars (fig.1). Our research shows a 14.54% prevalence of MIH Syndrome.

At present, very few data concerning MIH prevalence are accessible, even if there are many studies in this domain (1). A questionnaire achieved by the members of the European Academy of Preventive Dentistry reveals the fact that the paediatric dentists in Europe are aware of the MIH severity, and most of them consider it, a clinical problem (1).

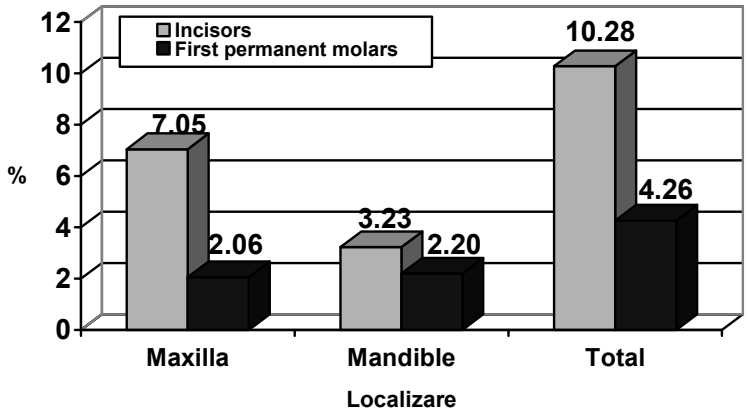

Fig. 1. Defects prevalence of enamel development for incisors and first permanent molars

The available data concerning this prevalence, especially in Northern Europe varies between 3.6 and 25%. Our study illustrated a prevalence of 14.54%, a quite high value, which is explained by the low flouride concentration in the studied area. The prevalence decreases in the area with fluorised water. Koch et al, 1987 examined children from Sweden aging 8-13 and found out variation of the prevalence between 3.6 and 15.4%. These children had the maxilla incisors more severely affected, and 60% of them presenting all the four first permanent molars affected (3). Lappaniemi et al (2001) has shown a prevalence of 19.3% at the Finnish children aging 7-13, and Alaluusua et al (1996-1999) showed a 25 percentage and 17% prevalence at the Finnish children whose mothers were encouraged to breastfeed more than eight months (4, 5).

In comparison with these results Weerheijm et al (2001) found a percentage lower than 9.7% in a group of German children of 11 years old where the MIH Syndrome presented two or more molars 79% affected (6).

Therefore, EDI is a suitable tool for studying populations, comprising a

simple classification, based on the descriptive criteria, which gives a data enrolling flexibility and which is adjusted to the research requirements.

The ratio between the enamel defects prevalence at the permanent incisors in comparison with the first permanent molars revealed a RR of 2.41 (1.59 - 3.67 CI 95%). The significance of the statistics reveals that the defects prevalence on the two types of the teeth does not exclude each other and the prevalence of a defect on an incisor represents 2.4 times bigger risk factor for the defect prevalence on the first permanent molar as well.

It has been noticed that as long as there are opacities on the eruption incisors, there is also a risk for the first permanent molars (7).

In order to determine the dependence between the two dental types the correlation coefficient (r) was used. Correlation between the enamel defect prevalence on the permanent incisors and the first permanent molars on the mandible was direct (r=0.22). The correlation between the permanent incisors and the first permanent molars on the maxilla was r=-0.50, showing an indirect correlation stressing the fact that the prevalence of defect emergence on the first permanent molars is more probable if the affected incisors have a lower prevalence (tab. 2)

Table 2. The correlation between different affected teeth in children

The correlation incisors-first permanent molars coefficient	Correlation coeficient	Confidence interval CI95%
Maxilla	- 0.50	-0.55 – -0.45
Mandible	0.22	0.11 – 0.33
Maxilla and mandible	- 0.21	-0.12 – -0.33

The affection ratio of the first permanent molar in comparison with the incisor was 1/4 aproximatively.

Our results are similar to those of Weerheijm et al (2001) who defined the phenomenon as being hypo-mineralisation of the first permanent molar (from 1 to 4 teeth) with the affected incisors and he suggested the syndrome to nominate this syndrome, Molar Incisor Hypomineralisation (MIH) (6).

Our study revealed that the MIH lesions in the first permanent molar are frequently associated with lesions of the maxilla incisors and more rarely with mandible incisors (fig. 2) .

These associations denote a systemic problem in the child's first year of life, more specifically during the period when the crowns of the first permanent molars and incisors are mineralized (fig. 3). Due to the fact that the ocluzal forces do not action on the incisors opacities, their enamel

does not desintegrate immediately after the eruption. When more incisors are affected the risk of affected molars is bigger (3, 6, 8).

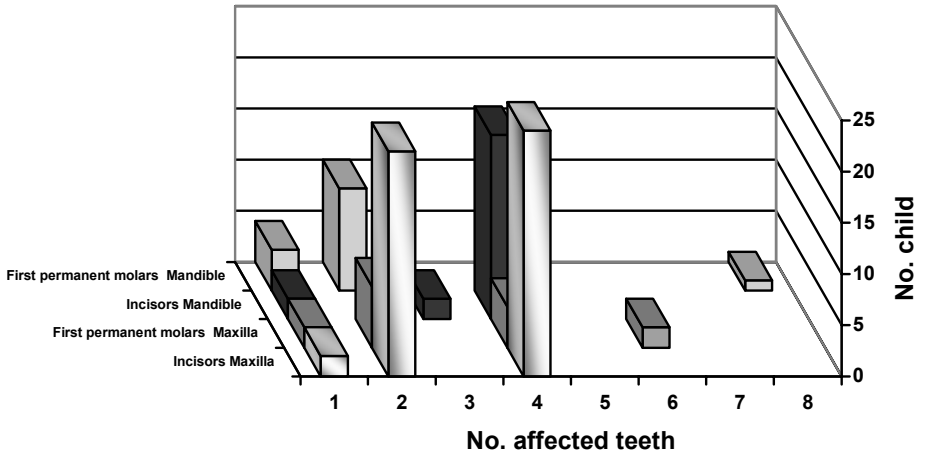

Fig. 2. Enamel defects distribution on the maxilla and mandible

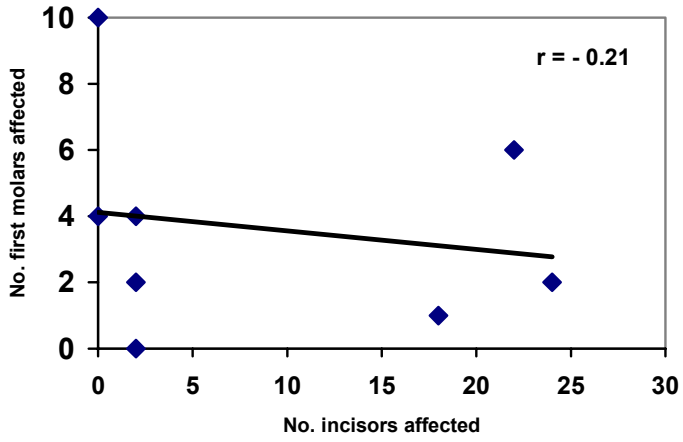

Fig. 3. The association between the number of affected incisors and affected first permanent molars

The association between affected molars and incisors suggests that when MIH syndrome exists, we confront ourselves with a specific influence in enamel development for a short period of time (tab. 3).

Table 3. Chronology of tooth development of permanent molars and incisors

Tooth	Calcification begins		Crown completed		Eruption	
	Maxilla	Mandible	Maxilla	Mandible	Maxilla	Mandible
I1	3 months	3 months	4 ½ years	3 ½ years	7 ¼ years	6 ¼ years
I2	11 months	3 months	5 ½ years	4 years	8 years	7 ½ years
M1	32 weeks in utero	32 weeks in utero	4 ¼ years	3 ¾ years	6 ¼ years	6 years

I1= permanent central incisor I2= permanent lateral incisor
M1= first permanent molar

Table 3 indicated a chronological development of the first permanent molars and incisors. The enamel formation is a sensitive process which could be didactically divided into several parts:

- the secretor phase, when the partially mineralized enamel is thick enough and
- the maturation phase.

Later, the organic material and the water from the enamel are removed to allow the additional influx of minerals. A disturbing factor that occurs in the maturation phase will be clinically interpreted as an enamel opacity (8). The literature in the field mention several possible causes of MIH such as environment changes (3,9). Some authors suggested that the breathing disorders and the low oxygen level in ameloblastes could produce the disease (8, 10, 11). Similarly, a decrease of oxygen associated with weight loss, calcium and phosphatase metabolisation troubles and associated disorders may be causes of MIH (8, 12, 13, 14). At the same time the vaccines during childhood have been suggested as possible causes but for the time being there are not data to certify this assumption.

CONCLUSIONS

In our study the MIH syndrome prevalence was 14.54%. The Enamel Defect Index (EDI) was used for the evaluation of MIH syndrome certifying as a suitable tool within population studies and research.

The correlation coefficient (r) between the permanent incisors and the first maxilla permanent molars was: r=-0.50 and on the mandible: r=0.22, that confirms the fact that MIH lesions on the first permanent molars are often associated to the maxilla incisors lesions and more rarely to those on the mandible.

The ratio of the affected first permanent molars in comparison with the incisors was approximately 1/4 .

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