Abstract

Molar Incisor Hypomineralisation syndrome (MIH) is a clinical disease that affects permanent molars and/or permanent incisors and is characterized by the presence of some demarcated opacities (with white to yellow-brownish discolorations within the enamel structure) and by reduced mechanical properties and resistance of the enamel. In the literature of the field, MIH prevalence in various countries ranges from 2.8% to 44%. This syndrome has a multifactorial etiology (including environmental, medical, genetic, systemic factors). MIH represents a challenging disease due to the serious problems that it can raise for both paediatric dentists and child and due to its interdisciplinary approach (general practitioner, paediatric dentist, physician, psychologist, etc.).

**Keywords:** child, MIH, diagnosis.

In paediatric dentistry care, an important role is played by patients’ illness experience and by their relation to treatment, being well known that, over the last years, special stress has been laid on the relation between children oral health status and their quality of life, and also on the one between individual appearance (facial look/appearance) and the way in which children are perceived by others (peers, parents, etc.) [1]. In the last 12 years, a lot of studies have been analyzed and explored the impact of dental diseases, malocclusions, dental or cranial anomalies on the quality of life [2-4].

Molar Incisor Hypomineralisation syndrome (MIH) is a clinical disease that affects – as its name suggests – permanent molars and/or permanent incisors, being characterized by the presence of some demarcated opacities (with white to yellow-brownish discolorations within the enamel structure) and by reduced mechanical properties and resistance of the enamel. The first description of this clinical entity was done in 1987, as an “idiopathic enamel hypomineralisation” and was reported in Sweden [5]. The term “Molar Incisor Hypomineralisation”, first cited by Weerkheijm et al. in 2001, was defined as “a hypomineralisation of systemic origin of one to four permanent molars frequently associated with the affected incisors” [6].

Usually, hypomineralisation is related to deficiency in the quality of enamel or of the entire enamel thickness, mostly frequently occurring in the maturation phase of tooth development.

In the Molar Incisor Hypomineralisation syndrome, the dental lesions are in most of the cases rough and plaque retentive, the risk for rapid caries development is high, as well as the risk of post-eruptive breakdown of the tooth structures and the installation of hypersensitivity.

Prevalence of MIH syndrome

In the literature of the field, MIH prevalence in various countries ranges from 2.8% to 44% [5-14].

It is difficult to compare the results of different studies because of the different criteria used, examination variability, different recording methods and different age groups involved [15].

The MIH syndrome distribution between sexes is equal [9,16,17] in most of the studies. It must be also mentioned that there is no conclusive evidence concerning the fact that the maxillary molars are more susceptible to develop MIH than the mandibular one, or vice-versa. Most of the studies failed to find any predilection for...
MIH defects for a specific arch (upper/lower)/hemiarch (right/left) [9,16-19].

**Etiology of MIH syndrome**

The syndrome has a multifactorial etiology (environmental, medical, genetic, systemic factors), all etiological elements acting additionally or even synergistically [20-22], with genetic predisposition (due to the fact that tooth development is under a strict genetic control).

Even if no conclusive data concerning a specific etiology of MIH syndrome are available, it seems that the etiological factors may be related to prenatal, perinatal and postnatal periods of child development, as follows:

A. **Prenatal factors**
- maternal disorders and infections, such as [20, 23-25]:
  - Hypocalcemia
  - A and D hypovitaminosis
  - *Diabetes mellitus*
  - Rubella
  - Urinary tract infections

B. **Perinatal factors** [20,23,25-27]:
- Caesarian section
- Prolonged delivery
- Premature birth
- Twin delivery
- Infant hypoxia
- Very low birth weight
- Neonatal hypocalcemia
- Cyanosis, etc.

C. **Postnatal factors** [7,20,24-26,28,29]:
- Children with a general disease
- Prolonged breast feeding (exposure to dioxin)
- Hypocalcemia
- Nutrition problems
- Chicken pox, measles, rubella and other viral infections with high fever development
- Respiratory diseases (asthma, lung problems)
- Antibiotics administration (*e.g.*, amoxicillin)
- Anti-asthmatic medication
- Otitis media
- Thyroid and parathyroid disturbances

**Clinical features in MIH syndrome**

Clinical examination should be undertaken on clean, wet teeth. The optimum age for examination is 8 years, as the four permanent molars and the permanent central incisors are erupted at least by half. At the clinical exam, the paediatric dentist can notice the following elements:

- limited opacities at permanent molar/molars level and/or incisor level
- variation in enamel color: white à yellow à brownish
- enamel loss in permanent molars
- hypomineralised enamel is soft, porous, brittle, chalk like, old Dutch cheese-like
- post eruptive enamel breakdown (PEB) à image of hypoplasia, yet the borders to normal enamel are irregular
- sharp demarcation between sound and affected enamel
- dental sensitivity or hypersensitivity to cold food, cold temperature, brushing à pain
- poor oral hygiene
- caries
- pulp involvement
- aesthetic problems

According to the European Academy of Paediatric Dentistry (EAPD) (2010), MIH it can be classified into the following forms [15]:

**Mild**
- isolated opacities
- discoloration of permanent incisors
- demarcated enamel opacities without breakdown of the enamel
- sensitivity to external stimuli occasionally present (*e.g.* sensitivity to air/water but not to brushing)
- aesthetic concerns from the part of the parent/child are mild

**Severe**
- demarcated enamel opacities with breakdown of the enamel
- hypersensitivity – persistent/spontaneous
- caries
- crown destruction à pulp involvement
- function alteration
- intense aesthetic concerns from the part of the parent/child à psycho-social impact
Diagnosis in MIH syndrome

Diagnostic criteria for MIH, as proposed by EAPD in 2010, stipulate that at least 1 to all 4 permanent molars must present enamel hypomineralisation and that the permanent incisor can be simultaneously affected (the presence of opacities on permanent central incisors is not mandatory for MIH diagnosis). The higher the number of affected molars is, the higher the risk that incisors will be also affected [19,30]. Each tooth should be recorded for:

- demarcated opacities
  - at the occlusal and buccal part of the crown
  - opacities may vary in size (small defect (more than 1mm) à defect extended to a major part of tooth) and color (white, creamy, yellow to brownish)
- enamel disintegration (PEB)
  - due to the hypomineralisation of the tooth, a varying degree of porosity will appear in the permanent molars that, in cases with severe affected enamel, may lead to enamel breakdown, dentin exposure and rapid caries progression
- atypical restoration
  - extensions towards buccal or palatal smooth surfaces at the level of first permanent molars and central incisors that may indicate to the clinician a previous MIH syndrome
  - associated with tendency of opacities at the margins
- tooth sensitivity
  - mild to spontaneous hypersensitivity
  - difficult to anaesthetize
- extracted tooth due to MI
  - notes in the clinical observation chart/records
  - other molars present opacities due to MIH syndrome

Differential diagnosis in MIH syndrome

1. Fluorosis
   - history of fluoride intake
   - number of teeth involved depending on fluoride exposure time
   - diffused opacities
   - caries resistant opacities
2. Amelogenesis Imperfecta (AI)
   - all teeth are involved
   - family history present
   - on radiological investigation àtaurodontia
3. Hypoplasia
   - smooth borders to normal enamel
   - a quantitative enamel defect

MIH syndrome is a dental disease with an increasing prevalence and a large impact on treatment needs. Therefore, it is highly recommended to increase the regular checkup for children with history of repeated illness in the first year of life during the eruption of first permanent molars. In the same time, MIH represents a challenging disease, due to the serious problems that it can provoke for both paediatric dentists (teeth opacities, REB, rapid caries development, lack of local anesthesia) and child (pain, hypersensitivity, aesthetic complains, dental fear, dental anxiety, dental phobia) and due to its interdisciplinary approach (general practitioner, paediatric dentist, physician, psychologist, etc.)

References


