Reduced Oxygenation Events of Early Childhood and Occurrence of MIH

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ABSTRACT

Purpose: Molar-incisor hypomineralization (MIH) is a common dental pathology characterized by a qualitative defect of enamel, affecting at least one permanent first molar with/without involvement of a permanent incisor. MIH etiology is uncertain, with literature pointing towards a multifactorial cause involving systemic exposures in the first three years of life and possibly a genetic origin. The purpose of this study is to analyze systemic exposures that potentially reduce oxygenation levels and its correlation with the occurrence of MIH in children presenting for dental care at a university-based clinic in a major metropolitan of Texas.

Methods: A total of 116, 6–10-year-old healthy, non-syndromic children were examined. The parent consented and completed a questionnaire to collect data on pre, peri and postnatal exposures affecting oxygenation levels in the first three years of life. One provider evaluated for presence/absence of MIH and obtained intraoral images of permanent molars and incisors. Data was analyzed by Chi-square and Fisher Exact tests, *P*<.10 considered marginal, and *P*<.05 considered significant.

Results: MIH prevalence was 20.6% (n=24 cases). Children with MIH experienced more episodes of asthma (20.8% versus 13%, *P*=.01) and respiratory illness (25% versus 6.5%, *P*=.02) compared to children without MIH. Mothers of children with MIH had a longer duration of labor that those without MIH (25% versus 8.7%, *P*=.04). There was a trend for children with MIH to experience more high fevers compared to children without MIH (58.3% versus 33.7%, *P*=.06). No other pre, peri, or postnatal event was associated with presence/absence of MIH (*P*>0.1).

Conclusions: Several systemic factors are implicated with MIH. Asthma, respiratory illness, experiencing more frequent febrile episodes in children and longer duration of labor in mothers are positively correlated with the occurrence of MIH.

BACKGROUND

- MIH is classified as a demarcated qualitative and quantitative developmental defect of the enamel of one or more first permanent molars with or without the involvement of the incisors.
- While its etiology remains unclear, it is hypothesized to have multifactorial origin where genetic and systemic exposures during the pre, peri and post-natal periods appear to play a role.
- The condition presents with hypersensitivity, pain, increased incidence of caries and post eruptive enamel breakdown.
- Determining the etiology of MIH will enable allowing identifying high risk groups where preventive strategies may be targeted.

This study aims to find the relationship between occurrence of MIH and presence of systemic exposures in a major metropolitan of the US using a comprehensive questionnaire compiled after reviewing other studies.

METHODS

- This study was approved by the UTHealth Houston Institutional Review Board (HSC-DB-23-0440).
- The study included all non-syndromic healthy children between 6-10 years of age seen at the UT Pediatric dentistry graduate clinic whose guardian consented to participating in the study and children signed an assent form.
- Guardians who could provide an accurate history of systemic exposures associated with reduced oxygenation to the child were asked to complete a questionnaire on qualtrics or paper format answering if child had experienced any reduced oxygenation event in the pre, peri or post-natal (birth to 3 years of age) life of the child (Figure 1). The questionnaire was available in English and Spanish.
- All participants were evaluated for presence of MIH on permanent first molars and permanent incisors.
- Intra-oral pictures of all first molars and permanent incisors were taken.
- Data was analyzed by Chi-square test and Fisher Exact tests. P<.10 was considered marginal and P<0.05 was considered significant.

Figure 1. Questionnaire

Questions 1-4 are pertaining to your YOU or YOUR pregnancy:

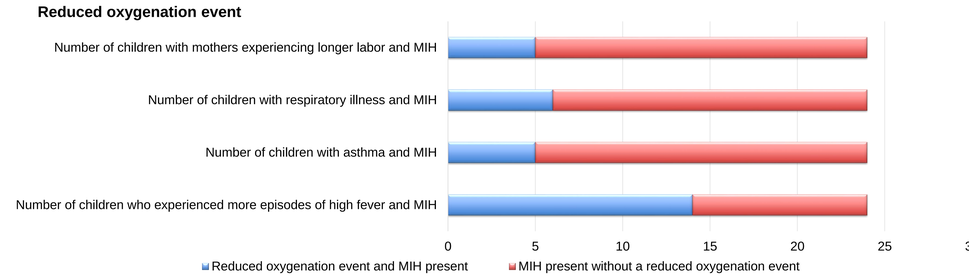
1. Have you ever been diagnosed with any of the conditions?
   a. Any blood disorders
   b. Diabetes
   c. Any autoimmune diseases If yes, which one:
2. Did you have any of the following medical conditions during pregnancy with this child?
   a. Gestational Diabetes
   b. Pre-eclampsia or high blood pressure
   c. Iron deficiency anemia
   d. Any infectious diseases including but not limited to influenza, COVID, Strep throat
3. Did you have any of the following issues during labor and delivery?
   a. Prolonged labor
   b. Pre-term labor
   c. Fetal distress
   d. Peri-natal asphyxia
   e. Uterine rupture
4. Did you smoke during pregnancy?
   a. Yes If yes, how many packs/day:
   b. No

Questions 5-12 are pertaining to YOUR CHILD'S medical history

5. Was your child diagnosed and treated for asthma during his/her first three years of life?
   a. Yes
   b. No
6. Did your child have any respiratory illnesses (Eg. Bronchitis, pneumonia, etc) during his/her first three years of life?
   a. Yes If yes please mention how many times:
   b. No
7. Did your child have any episodes of chronic diarrhea during his/her first three years of life?
   a. Yes If yes, please mention how many times:
   b. No
8. Did your child have episodes of otitis media/ ear infection during his/her first three years of life?
   a. Yes If yes, please mention how many times:
   b. No
9. Did your child have any urinary tract infection during his/her first three years of life?
   a. Yes If yes, please mention how many times:
   b. No
10. Did your child have any episodes of high fever greater than 101 Degrees during his/her first three years of life?
    a. Yes If yes, please mention how many times:
    b. No
11. Has your child had any episodes of febrile seizures during his/her first three years of life?
    a. Yes If yes, please mention how many times:
    b. No
12. How many times did your child need a prescription of antibiotics in his/her first three years of life?
    a. Never
    b. Less than 3 times
    c. More than 3 times but less than 6 times
    d. More than 6 times

RESULTS

- 116 patients were examined.
- Prevalence of MIH in this population was 20.6% (n=24 cases).
- Children with MIH experienced more episodes of asthma compared to children without MIH (20.8% versus 13%, *P*=.01).
- Children with MIH experienced more episodes of respiratory illness compared to children without MIH (25% versus 6.5%, *P*=.02).
- Mothers of children with MIH had a longer duration of labor that those without MIH (25% versus 8.7%, *P*=.04).
- There was a trend for children with MIH to experience more high fevers compared to children without MIH (58.3% versus 33.7%, *P*=.06).
- No other pre, peri or postnatal event was associated with presence or absence of MIH (P>0.1)



DISCUSSION

- The etiology of MIH is unclear. Our questionnaire was formed after reviewing other systematic reviews.
- We asked questions pertaining to blood disorders, gestational diabetes, diabetes, pre-eclampsia, iron deficiency anemia, infectious diseases and smoking during the prenatal period, prolonged labor, preterm labor, fetal distress, perinatal asphyxia, and uterine rupture during the perinatal period and asthma, respiratory illness, otitis media, episodes of high fever, febrile seizures, intake of antibiotics in the postnatal period pertaining to the first three years of life of the child.
- Prospective studies using a larger sample size and extracting data from medical records will enable the results to be comprehensive and without bias.

Limitations:

- Small sample size, similar to other studies that was evaluated to compile the questionnaire for this study.
- Recall Bias: Guardians were asked questions pertaining to pre, peri and postnatal events that could have significant recall bias as the questionnaire was completed 6-10 years after the episode.
- This study was not able to evaluate genetic or environmental factors that may have implications with reduced oxygenation events.

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REFERENCES