PREVALENCE OF MOLAR INCISOR HYPOMINERALIZATION AMONG A GROUP OF EGYPTIAN CHILDREN: A CROSS SECTIONAL STUDY

Shahinda Abdeen Osman*, Eman Sayd Elmasry**, and Randa Youssef Abd Al Gawad***

ABSTRACT

Objective: The aim of the study was to determine the Prevalence of MIH in a group of Egyptian children attending the Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Cairo University, Investigate morphological characteristics and any associated causes of MIH and Investigate the relationship of MIH to dental caries.

Material and methods: This study was conducted in Outpatient clinic at Pediatric and Dental Public Health Department, Faculty of Dentistry; Cairo University. The entire patients who attended the outpatient clinic on the days of examination were included in the study sample. Examined patients were primarily screened based on the eligibility criteria determined before the study begins. Then fill questionnaire.

The clinical examination to assess the presence / absence of MIH and its severity based on EAPD criteria which will be followed by (Weerheijm & Mejàre 2003,2009) Questionnaire are carefully constructed after the thorough literature review to identify all possible etiological conditions associated with MIH and related to the child or parental history, specially the mother.

The questionnaire is filled out during a face-to-face interview with the accompanying parent.

Results: Prevalence of MIH among in this study was 14.2%, with no gender predilection, The prevalence of MIH is significantly associated with childhood illnesses during the first year of life (asthma, tonsillitis, fever, and antibiotics intake). Also this study shown a relationship between increased DMF-T and children with MIH compared to those without MIH.

Conclusion: Prevalence of MIH among in this study was 14.2% with no gender predilection and the most common degree of severity of MIH in this studied population was mild degree.

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INTRODUCTION

Structural dental anomalies are associated with alterations occurring during the normal process of odontogenesis and may be related to hereditary, local or systemic factors. According to the time, either affects primary dentition, permanent dentition or both.

Molar incisor hypomineralization (MIH) is defined as ‘demarcated, qualitative defects of enamel of systemic origin, affecting one or more permanent molars usually the first permanent molars with involvement of the incisor teeth (Weerheim, et al., 2001).

The severity of MIH varies among different teeth in the same patient, because not all permanent first molars and incisors are affected or have lesions of the same degree, even though they are formed during the same period (William, et al., 2006).

To date, few data have been published regarding the prevalence of MIH in the Egyptian children. Such lacking of data compromise achieving accurate diagnosis of the problem, good prevention and management plane.

For that, this study was held as the part of coinciding studies in Egyptian children, to determine the prevalence of MIH and any associated causes in group of Egyptian children aged from 8-12 years old, and also to investigate the relationship of MIH to dental caries.

MATERIALS AND METHODS

Sample size Calculation

Sample size was determined by the Center of Evidence Based at the Faculty of Dentistry, Cairo University. o Based on previous paper by Sönmez, et al., 2013, Yannam et al., 2016. Molar incisor hypominalization in Hong Kong Chinese children. International Journal of Paediatric Dentistry 2008; 18: 348– 352. The prevalent of MIH was 9.7% o Convenient sampling method was applied to recruit all eligible candidates in a period of one year.

Selection of Samples

Participants were selected from Outpatient clinic at Pediatric and Dental Public Health Department, Faculty of Dentistry, Cairo University according to the following inclusion and exclusion criteria:

Patient eligibility criteria

Inclusion criteria:
1. Egyptian Children age from eight to twelve years.
2. Medically free.
3. Children whose parents signed informed consent.
4. Both sexes are included
5. Parent and children cooperation.

Exclusion criteria:
2. Children having restorations or crowns.
3. Children with orthodontic bands on the first permanent molars. Preparation of Samples:

Before the beginning of the study basic education regarding MIH and its possible differential diagnosis of other enamel defects took place in the form of detailed definitions and diagnostic criteria along with methods to differentiate between them clinically, all were saved in a power point presentation that was available for the single final evaluator who was Master Degree student in Pediatric Dentistry and Public Health Department.

Screening

The entire patients who attended the outpatient
clinic on the days of examination were included in the study sample. Examined patients were primarily screened based on the eligibility criteria determined before the study begins. Then fill questionnaire (appendix 2).

The clinical examination to assess the presence / absence of MIH and its severity based on EAPD criteria which will be followed by (Weerheijm & Mejäre 2003,2009). The questionnaire is filled out during a face-to-face interview with the accompanying parent; the questionnaire was originally formulated in English and then translated into Arabic.

**Enrolled patients:**

- Patients were either both free of MIH and got dismissed yet contributed in being part of the sample, or diagnosed with MIH which was confirmed by the calibrated evaluator only when at least one the FPM show any of diagnostic criteria of MIH according to modified index developed in line with EAPD criteria.

Clinical examination of all children was performed by examiner on a dental chair using mirror, dental explorer to clean the molar fissures. Prior to performing dental examinations, index teeth including eight incisors and four first permanent molars were cleaned using prophylactic paste, rotary brush and cotton roll as index teeth should be wet as suggested by FDI,1992.

**Scoring of MIH**

The examiner carefully inspected the coronal part of the four first permanent molars (16,26,36,46) and eight permanent incisors (11,12,21,22,31,32,41,42) for demarcated opacities in each child and evaluated them according to modified index developed in line with EAPD criteria. At least one affected first permanent molar was required for a diagnosis of MIH.

**Statistical Analysis**

Statistical analysis was performed using a commercially available software program (SPSS 19; SPSS, Chicago, IL, USA).

**RESULTS**

Prevalence of MIH among study sample: In this study 1000 children with mean age 10.15±1.32 years were included, 142 children were diagnosed with MIH and so the prevalence of MIH was 14.2% (Figure 1).

The flow chart of the patients showing MIH distribution in the following diagram in (Figure 2).

<table>
<thead>
<tr>
<th>Subject with MIH (n =142)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>girls=72</td>
<td>Boys =70</td>
</tr>
<tr>
<td><strong>Incisors</strong></td>
<td><strong>Incisors</strong></td>
</tr>
<tr>
<td>20.3% No defect</td>
<td>19.8% No defect</td>
</tr>
<tr>
<td>79.7% Mild MIH</td>
<td>80.2% Mild MIH</td>
</tr>
<tr>
<td>0% Moderate MIH</td>
<td>0% Moderate MIH</td>
</tr>
<tr>
<td>0% Severe MIH</td>
<td>0% Severe MIH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Molars</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3% No defect</td>
</tr>
<tr>
<td>38.9 % Mild MIH</td>
</tr>
<tr>
<td>19.5 % Moderate MIH</td>
</tr>
<tr>
<td>41.3 % Severe MIH</td>
</tr>
</tbody>
</table>

Demographic data:

The gender distribution of participants with MIH included in the present study: The number and
percentage of girls 72 (50.7%) respectively and the number and percentage of boys participants were 70 (49.3%) respectively as presented in (Table 1)

**TABLE (1) Gender distribution among subject with MIH**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency (N)</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls</td>
<td>72</td>
<td>50.7</td>
</tr>
<tr>
<td>Boys</td>
<td>70</td>
<td>49.3</td>
</tr>
<tr>
<td>Total</td>
<td>142</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**Distribution of MIH scores in affected first permanent molars and incisors:**

<table>
<thead>
<tr>
<th></th>
<th>Incisor</th>
<th>Upper right molar</th>
<th>Upper left molar</th>
<th>Lower right molar</th>
<th>Lower left molar</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No defect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>(0)</td>
<td>228</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>231</td>
</tr>
<tr>
<td>%</td>
<td></td>
<td>20.1%</td>
<td></td>
<td>1.4%</td>
<td>0.7%</td>
<td>0.5%</td>
</tr>
<tr>
<td><strong>Mild</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>(1,2)</td>
<td>908</td>
<td>52</td>
<td>63</td>
<td>55</td>
<td>1141</td>
</tr>
<tr>
<td>%</td>
<td></td>
<td>79.9%</td>
<td>36.6%</td>
<td>44.4%</td>
<td>38.7%</td>
<td>41%</td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>(3a,3b)</td>
<td>0</td>
<td>22</td>
<td>35</td>
<td>30</td>
<td>123</td>
</tr>
<tr>
<td>%</td>
<td></td>
<td></td>
<td>15.5%</td>
<td>24.6%</td>
<td>21.1%</td>
<td>21.7%</td>
</tr>
<tr>
<td><strong>Severe</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>(3c,4,5)</td>
<td>0</td>
<td>68</td>
<td>44</td>
<td>55</td>
<td>209</td>
</tr>
<tr>
<td>%</td>
<td></td>
<td></td>
<td>47.9%</td>
<td>31.0%</td>
<td>38.7%</td>
<td>36.8%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td></td>
<td>1136</td>
<td>142</td>
<td>142</td>
<td>142</td>
<td>1704</td>
</tr>
<tr>
<td>%</td>
<td></td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table (3) Severity of MIH in molars:

<table>
<thead>
<tr>
<th></th>
<th>Upper right molar</th>
<th>Upper left molar</th>
<th>Lower right molar</th>
<th>Lower left molar</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No defect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>%</td>
<td></td>
<td></td>
<td>1.4%</td>
<td>.7%</td>
<td>0.5%</td>
</tr>
<tr>
<td><strong>Mild</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>52</td>
<td>63</td>
<td>55</td>
<td>63</td>
<td>233</td>
</tr>
<tr>
<td>%</td>
<td>36.6%</td>
<td>44.4%</td>
<td>38.7%</td>
<td>44.4%</td>
<td>41%</td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>22</td>
<td>35</td>
<td>30</td>
<td>36</td>
<td>123</td>
</tr>
<tr>
<td>%</td>
<td>15.5%</td>
<td>24.6%</td>
<td>21.1%</td>
<td>25.4%</td>
<td>21.7%</td>
</tr>
<tr>
<td><strong>Severe</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>68</td>
<td>44</td>
<td>55</td>
<td>42</td>
<td>209</td>
</tr>
<tr>
<td>%</td>
<td>47.9%</td>
<td>31.0%</td>
<td>38.7%</td>
<td>29.6%</td>
<td>36.8%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>142</td>
<td>142</td>
<td>142</td>
<td>142</td>
<td>568</td>
</tr>
<tr>
<td>%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
**Comparison between molars:**

Severe MIH was observed more frequently in upper right molars (47.9%), followed by lower right molar (38.7%), then upper left molar (31%), with the least occurrence in lower left molar (29.6%).

Chi square test revealed that the difference between molars was statistically significant (p=0.0415).

**Prevalence of DMF According to severity of MIH**

Children with MIH showed a significantly higher DMF-T value (p= 0.000*). The number and percentage of MIH children who had dental caries was 112 (78.7 %). The number and percentage of children with ‘MIH who had no dental caries was 30 (21.1%). Regarding to the severity MIH, the number and percentage of children who had dental caries mild MIH was 42 (29.6%), moderate MIH 36 (25.4%) and severe MIH was `recorded 63 (44.4%). Chi square test revealed that the difference in DMF-T score according to MIH in FPM was statistically significant (p=0.000), (Fig. 2)

![Bar Chart](image)

Fig. (3) Bar chart showing distribution of DMF scores according to MIH

**DISCUSSION**

The presented study is an observational Cross-sectional study. It was conducted to determine the prevalence and severity of MIH among a group of Egyptian children seeking dental treatment in Pediatric and Dental Public Health Department at the Faculty of Dentistry, Cairo University.

Results from the current study revealed moderate prevalence of MIH among study sample compared to previous studies, (14.2%). Previous studies done by Koruyucu et al.,2018 and Zagdwan et al., 2002 reported comparable prevalence (14.2%) in Turkey, (14.6%) England in and children respectively. Result that were comparable between different studies may have been due to similar methodologies used as matching age group.

Whereas these result were lower compared with Wogelius et al., 2008; Soviero et al., 2009; Balmer et al., 2005 studies showing the prevalence of (37.5%) in Denmark, (40%)in Brazilin and (44. %) in Australian children respectively. Lower result of MIH were observed among German children in the study conducted by Preussser et al., 2007, (5.9%), Fleita et al., 2006 (2.9%) in Libya children and Saber et al., 2015(2.3%) in Egyptian children respectively.

The total number of children with MIH included in this study was 142 participants. The number and percentage of female participants with MIH was 72 and 50.7%, respectively; the number and percentage of male participants with MIH was 70 and 49.3, respectively. Male and female participants diagnosed with MIH equal in number (Alaluusua et al. 1996).

This study showed that a significantly higher percentage of children with MIH had histories of illnesses during the first four years of their childhood.

Assessing the causes association with presence of MIH in this study sample, the highest associated disease was upper respiratory tract infections (88.8%) tonsillitis (79.9%) followed by asthmatic bronchitis (29.1%), nutritional defects (4.5%).

A statistically significant difference was found among children have medical problem during first year’s old of life. This result meets that finding
of (Alaluusua, 2009, Alazzam, 2014), but it counters the finding of (Whatling, 2008) where no association found.

The number and percentage of MIH children who had dental caries was 112 (78.7%) while the number and percentage of children with MIH who had no dental caries was 30 (21.1%).

CONCLUSIONS

From the results of this present study the following conclusions can be made:

- Prevalence of MIH among in this study was 14.2%. With no gender predilection.
- The prevalence of MIH is significantly associated with childhood illnesses during the first year of life (asthma, tonsillitis, fever, and antibiotics intake).
- There is no association between MIH and histories of birth prematurity, birth complications, low birth weight, or breast feeding duration.
- The most common degree of severity of MIH in this studied population was mild degree.
- The most prevalent defect reported in this study was demarcated opacity.
- This study shown a relationship between increased DMF-T and children with MIH compared to those without MIH.

- Limitation of the study:
  - Study setting may be contributing factor sample taken from university hospital is expected to show higher prevalence of oral and dental problem.
  - This was not possible in the present study as two permanent examiners at the study center would be necessary which could not be fulfilled.
  - Quality of obtained medical information not adequate because some of parents they did not remember full information.

- Recommendations:
  - Further population based studies to evaluate the prevalence of MIH in Egyptian children.
  - Further prospective studies to evaluate the effect of any disturbance occurring during the prenatal or postnatal periods on the occurrence of MIH in Egyptian children.
  - Increase the awareness of pediatric dentists about the prevalence of molar incisor hypomineralization in Egyptian children and how to manage such cases.
  - Future studies can overcome this shortcoming using the child’s in addition to parents’ recollection.
  - Improve the quality of obtained medical information although it may not contain information on minor illness or treatments not advised by the physician such as the use of over-the-counter medications.

REFERENCES


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