

Prevalence and severity of molar-incisor hypomineralisation with relation to its etiological factors among school children 7- 9 years of Al-Najaf governorate

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ABSTRACT

Background: Molar Incisor hypomineralisation (MIH) is one of the biggest challenges with great clinical interest. Currently, the etiology of MIH remains unclear. There is no previous study concerning school children aged 7 – 9 years in Al-Najaf governorate in order to estimate the prevalence and severity of molar incisor hypomineralisation and the possible associated risk factors. This study aimed to estimate the prevalence, severity and the possible associated etiological factors of molar incisor hypomineralisation and also to study the correlation between body mass index and molar incisor hypomineralisation.

Material and Methods: Across sectional study conducted at Al-Najaf Governorate. A total of 600 children were enrolled those who did not met the inclusion criteria were excluded. A structured self-administered validated Arabic language questionnaire and an examination sheet were used for data collection. Body weight and height were measured and the body mass index was calculated. Dental material and supplies were used in examination. The demarcated hypomineralization was recorded according to the 10 point scoring system depended on the EAPD evaluation criteria The severity was assessed according to the clinical evaluation of the examiner and the presence of opacities.

Results: The response rate was 84.7% and the highest was in the 9-year-old children, the participants were 532 children, the prevalence of hypomineralisation defect was 22.9%. The prevalence of demarcated hypomineralisation was increased concomitantly with the age, and the 9-year-old children were the more affected. The overall prevalence of MIH among boys was lower than girls; (17.3%) and 22.6%, respectively. The severely affected teeth were 33/1464 teeth, represented 2.3%, severely affected molars were 25 (5.1%) and the severely affected incisors were 8 (0.8%). More severely affected teeth were found in obese and overweight children were also increased with the age of child.

Conclusions: The prevalence of Molar Incisor Hypomineralisation in this study was 22.9%, MIH was more prevalent among girls, the 9-year-old, normal body weight and urban residents children. The severely affected teeth represented 4.5% of the total number of teeth, molars were more severely affected than incisors, obese and overweight children and older children have more severe MIH. Further studies are suggested.

Key words: Molar incisor hypomineralization, prevalence, severity. (J Bagh Coll Dentistry 2015; 27(3):169-173)

INTRODUCTION

Molar Incisor Hypomineralization (MIH) is a developmentally derived dental defect that involves hypomineralization of one to four permanent first molars frequently associated with similarly affected permanent incisors ⁽¹⁾.

MIH is defined as "hypomineralization of one to four permanent first molars, frequently associated with affected incisors". Generally the defects of the incisors are milder than those of the molars since masticatory forces are absent. ⁽²⁾ In 2003 the term molar incisor hypomineralization (MIH) was introduced by Weerheijm *et al.* to describe white or yellow-brown demarcated opacities on first permanent molars, frequently associated with affected permanent incisors ⁽³⁾.

Nowadays, MIH is one of the biggest challenges with great clinical interest for dental practice because MIH has a great impact on the oral health as consequently, on the quality of life of children and adolescents ⁽²⁾.

In many countries, researchers have established the prevalence of MIH in healthy children. The reported prevalence varies between 2.4% and 40.2% ⁽⁴⁾.

Currently, the etiology of MIH remains unclear and is thought to be acquired via multifactorial, systemic disturbances during amelogenesis ⁽⁵⁾. Different factors might associated with the development of MIH and different studies concerned with this subjects these factors including, prenatal factors such as mother's diseases, medications and treatments received during pregnancy are sometimes implicated ⁽⁶⁾, perinatal factors including the gestational age, mode of delivery, birth weight, duration of labor, neonatal comorbidities, admission to neonatal intensive care unit. or postnatal factors such as feeding type, medication and vaccinations during the first 3 years of child life, in addition to socioeconomic factors and nutrition during same period ^(6,7).

Moreover, a combination of these variables increased the risk to develop severe demarcated opacities by more five times ⁽⁸⁾. Effect of body mass index on MIH was the concern of many

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researchers but much interest was on very low birth weight children that can be susceptible to dental caries due to biological and socioeconomic factors⁽⁴⁾. Developmental enamel defects are more prevalent in VLBW children who require prolonged oral endotracheal intubation. These defects typically persist at least 10 years into childhood. A significant association was found between caries and enamel^(6,8) hypoplasia in the primary dentition of VLBW children⁽³⁾.

Clinically, the problems are related to unexpectedly rapid caries development in the erupting first permanent molar and unpredictable behavior of apparently intact opacities and rapid breakdown of tooth structure may occur, giving rise to acute symptoms and complicated treatments⁽⁶⁾. The child will experience pain, sensitivity and complain about and suffering from toothache during teeth brushing⁽⁹⁾. Early diagnosis and immediate treatment for MIH should be obtained carefully.⁽²⁾ The management of MIH could include diet counseling for dietary modifications to avoid dental caries dental erosion and dental sensitivity recommended a tooth paste with a fluoride, application of fissure sealants, bleaching with carbamide peroxide, microabrasion with either 18% hydrochloric acid or 37% phosphoric acid and pumice for 60s⁽⁶⁾.

Use of glass ionomer cements and in mild and moderate MIH cases composite restorations using self-etching primer adhesive bonding systems is the treatment of choice⁽⁹⁾ and may last for many years until indirect restorations would be placed⁽⁶⁾. In severecases, transitional treatment for function and aesthetics can be provided until adolescence. Cast restorations have also been used⁽⁶⁾. Any extraction of first permanent molars should only be carried out with consideration of the possible orthodontic implications⁽¹⁰⁾.

MATERIALS AND METHODS

Across sectional conducted at Al-Najaf Governorate, data were collected during the period from January to the end of April 2014. Study population included the primary school children aged, 7-9 years of both genders of Al-Najaf governorate. Children having amelogenesis imperfecta, Tetracycline staining or undergoing orthodontic treatment at the time of study, those with completely broken crowns of the first permanent molars, or those whose parent/guardians refused to filled missed data or not get back the questionnaire were excluded from the study.

Sample size for was calculated according to the standard equation and a total of 600 children were enrolled. A structured self-administered

validated Arabic language questionnaire and an examination sheet were performed. Body weight and height were measured and the body mass index was calculated according to the standards. Dental material and supplies were used in examination. Prior to the clinical examination the participating children were given a toothbrush and fluoridated toothpaste to brush their teeth thoroughly under the supervision of the researcher.

The demarcated hypomineralization was recorded according to the 10 point scoring system depended on the EAPD evaluation criteria The severity was assessed according to the clinical evaluation of the examiner and the presence of opacities. Data of the studied group were entered and analyzed by using the statistical package for social sciences (SPSS) version 21 and appropriate statistical tests were used to assess the differences and correlations between variables.

RESULTS

Out of the 532 participants, 395 (74.2%) were not affected, and 137 (25.8%) having at least one permanent index tooth with an enamel developmental defect. Out of the 137 children with an enamel developmental defect, 122 children (89.1%) had a demarcated hypomineralisation in at least one of their index teeth; of them, 17 had demarcated hypomineralisation lesion in incisor teeth only giving a prevalence of IH of (3.2%), 58 children (10.9%) had MH and 47 (8.8%) children had both MH and IH. According to these values, the prevalence of hypomineralisation defect in at least one index tooth was 22.9% and according to the definition of MIH, 105 children had demarcated hypomineralisation in at least one first molar tooth or first molars and incisors, this giving an overall prevalence of MIH of (19.7%), (Table 1).

As it shown in table 2, boys were 56 represented (45.9%) and girls were 66 represented (54.1%), this indicated, generally, that girls were more affected with demarcated hypomineralisation than boys. The prevalence of demarcated hypomineralisation was increased concomitantly with the age, and the 9-year-old children were the more affected; 50 (41.0%), than children of 7-year-old and 8-year-old. The distribution of affected children according to the body mass index (BMI) categories revealed that 8 children (6.6%) were underweight, 63 (51.6%) had normal BMI, 16 (13.1%) were overweight and 35 (28.7%) were obese. Urban resident children were more affected than rural, (13.2%) and (9.8%), respectively.

The overall prevalence of MIH among boys was lower than girls; (17.3%) and 22.6%, respectively and the prevalence of at least one index tooth affected was also lower in boys than girls; 56 (19.4%) and 66 (27.2%), respectively (Table 3).

Regarding the distribution by age; Table 4 shows that the prevalence of MIH was increased with the age; in those aged 7 years the prevalence was 19.2%, in those aged 8 years it was 19.6% and in those aged 9 years it was 20.3%. Similar trend was found regarding the prevalence of at least one index tooth affected; 21.2%, 22.8% and 24.2%, respectively.

Severity of demarcated Hypomineralisation

By application of the criteria of scoring of MIH of the European academy of paediatric dentistry, the total number of severely affected teeth was 33 teeth (Incisor and molars) these teeth were found in 24 children where some children had more than one severely affected teeth, the prevalence of severely affected among the 122 children with demarcated hypomineralisation was 19.7% and when calculated from the total 532 children, the prevalence was 4.5%.

Table 1. Prevalence of MIH among study population

Involved teeth	No.	Prevalence (%)
IH only	17	3.2%
MH only	58	10.9%
Both IH and MH	47	8.8%
At least one first molar tooth or first molars and incisors (MIH)	105	19.7%
At least one index tooth	122	22.9%

Table 2. Demographic characteristics of 122 children with demarcated hypomineralisation

Variable		No.	% From affected (N=122)	% From total study sample (N=532)	P
Gender	Boys	56	45.9	10.5	0.36 NS
	Girls	66	54.1	12.4	
Age	7-year-old	31	25.4	5.8	0.11 NS
	8-year-old	41	33.6	7.7	
	9-year-old	50	41.0	9.4	
BMI (kg/m ²)	Underweight	8	6.6	1.5	< 0.001 S
	Normal	63	51.6	11.8	
	Overweight	16	13.1	3.0	
	Obese	35	28.7	6.6	
	Mean ± SD	18.8 ± 4.4			
	Range	13 - 29			
Residence	Urban	70	57.4	13.2	0.10 NS
	Rural	52	42.6	9.8	

NS: non-significant, S: significant.

Table 3. Distribution and prevalence of demarcated hypomineralisation lesions in the permanent index teeth according to gender

Teeth involvement	Boys (N= 289)		Girls (N=243)		Total		P
	No.	Prevalence %	No.	Prevalence %	No.	Prevalence %	
Single Incisor	3	1.0	8	3.3	11	2.1	0.24
Multiple Incisor	22	7.6	25	10.3	47	8.8	0.61
IH only	6	2.1	11	4.5	17	3.2	0.75
Single molar	5	1.7	9	3.7	14	2.6	0.35
Multiple molar	21	7.3	31	12.8	52	9.8	0.60
MH	26	9.0	40	16.5	66	12.4	0.52
MIH	50	17.3	55	22.6	105	19.7	0.55
At least one index tooth	56	19.4	66	27.2	122	22.9	0.36

NS: non-significant, S: significant

Table 4: Distribution and prevalence of demarcated hypomineralisation lesions in the permanent index teeth according to age

Teeth involvement	Prevalence n (%)				P
	7 years (N= 146)	8 years (N=179)	9 years (N=207)	Total	
Single Incisor	5 (3.4)	1 (0.6)	5 (2.4)	11 (2.1)	0.43NS
Multiple Incisor	11 (7.5)	17 (9.5)	19 (9.2)	47 (8.8)	0.74NS
IH only	4 (2.7)	7 (3.9)	6 (2.9)	17 (3.2)	0.45 NS
Single molar	3 (2.1)	5 (2.8)	6 (2.9)	14 (2.6)	0.25 NS
Multiple molar	17 (11.6)	13 (7.3)	22 (10.6)	52 (9.8)	0.21 NS
MH	20 (13.7)	18 (10.1)	28 (13.5)	66 (12.4)	0.43 NS
MIH	28 (19.2)	35 (19.6)	42 (20.3)	105 (19.7)	0.10 NS
At least one index tooth	31 (21.2)	41 (22.8)	50 (24.2)	122 (22.9)	0.72 NS

NS: non-significant, S: significant

Table 5: Distribution and prevalence of demarcated hypomineralisation lesions in the permanent index teeth according to BMI

Teeth involvement	Underweight (N=8)		Normal (N=63)		Overweight (N=16)		Obese (N=35)		P
	No.	%	No.	%	No.	%	No.	%	
Single Incisor	1	0.8	5	4.1	1	0.8	4	3.3	0.37 NS
Multiple Incisor	4	3.3	20	16.4	11	9.0	12	9.8	0.22 NS
IH only	1	0.8	6	4.9	4	3.3	6	4.9	0.45 NS
Single molar	1	0.8	6	4.9	4	3.3	3	2.5	0.18 NS
Multiple molar	3	2.5	27	22.1	6	4.9	16	13.1	0.39 NS
MIH	7	5.7	57	46.7	12	9.8	29	23.8	0.40 NS
At least one index tooth	8	6.6	63	51.6	16	13.1	35	28.7	0.26 NS

NS: non-significant

DISCUSSION

The present study indicates that MIH is a widely spread condition amongst Iraqi children in Al Najaf governorate. The reported prevalence of (22.9%), although higher, it is still comparable to that observed in Jordan and Iran, but is far greater than that reported for Libya⁽¹¹⁾. The present study reported 22.9% hypomineralization in at least one index tooth and 19.7% hypomineralization in at least one first molar tooth or first molars and incisors, this finding agreed and close to that reported by Ghanim *et al.* in Al Mosul (Iraq) who found 21.5% and 18.6%, respectively⁽⁷⁾. This slight increase might be due to methodological and technical differences between the two studies or may refer to increase in the problem inside Iraqi community. This high percentage of MIH appears to be more than the expected 'true' prevalence of the defect indicating a variation between countries, depending on the various etiological factors involved. Girls in present study were affected more than boys. This finding is consistent with results of Salih study in Iraq⁽¹⁾.

Conversely, this finding disagreed that of Allazzam study in Saudi Arabia that showed the predominance of male gender⁽¹²⁾. This inconsistency might be due to difference in

sample size between the two studies (smaller sample size of Saudi study as 267), genetic bases and environmental factors. This study revealed increase demarcated hypomineralization with increase age of children to reach 41% of affected 9 year-old children. Ghanim study⁽⁷⁾ revealed similar findings among Iranian children. Mean BMI of the studied children was 18.8 ± 4.4 Kg/m², approximately half of them were with normal BMI and one third of them were obese. This finding is similar to results of Heatmüller study in Germany⁽¹³⁾.

Urban residents among children with demarcated hypomineralization were more than rural which is similar to results of Biondi study in Argentina⁽¹⁴⁾. According to the criteria of scoring of MIH of the European academy of pediatric dentistry recommendations, 27.7% of molars had white creamy opacities without PEB and 15.2% of incisors had white creamy opacities without PEB on the other hand, 3.5% of molars had white creamy opacities with PEB and 0.8% of incisors had white creamy opacities with PEB. These results were lower than that reported by Allazzam study in Saudi Arabia⁽¹²⁾ that showed the percentage of demarcated opacities as 56.5% and opacities with PEB as 8.7%. This may partly be explained by the inclusion of older children in Saudi study, as some of the demarcated opacities

may break down over time. This explanation is supported by findings of Wogelius et al. who reported an increased prevalence of posteruptive breakdown by increasing age⁽¹⁵⁾.

Only 2.3% of involved teeth were severely affected by MIH, molars were severely affected than incisors. This finding is consistent with results of Lygidakis study in Greece⁽¹⁶⁾. Posteruptive enamel breakdown is present and frequently occurs as the tooth is emerging, there is a history of dental sensitivity, often widespread caries is associated with the affected enamel, crown destruction can readily advance to involve the dental pulp, defective atypical restoration is present, aesthetic concerns are expressed by the patient or parent. In severe cases transitional treatment for function and aesthetics can be provided, using the various modalities now available until adolescence when permanent prosthetic approach with crowns in molars and veneers in incisors can be initiated⁽¹⁷⁾.

As conclusions; the prevalence of MIH among school children in Iraqi of Al Najaf governorate was 22.9%. Demarcated Hypomineralisation was more prevalent among girls. The prevalence increased concomitantly with the age, and the 9-year-old children were the more affected. Urban residents school children were more affected School children with normal BMI were the predominant among the affected children. Molars were more affected with demarcated hypomineralization than incisors. The prevalence of severely affected teeth was 4.5%. Molars were more severely affected than incisors. Obese children had more severely affected teeth.

Further studies are suggested concerning the prevalence of MIH in relation to socioeconomic status, water fluoridation, the morphological, etiological, epidemiological and clinical considerations, and management of MIH.

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