

PREVALENCE AND SEVERITY OF MOLAR INCISOR HYPOMINERALIZATION IN SCHOOL CHILDREN OF SUEZ CANAL REGION: CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: To investigate the prevalence and severity of molar incisor hypomineralization (MIH) in a group of school children aged 8-12 years in Suez Canal sector cities.

Subjects and Methods: A sample of 1312 students aged 8-12 years were selected from governmental schools in Ismailia, Port Said, and Suez cities. MIH was diagnosed clinically based on the diagnostic criteria established by the European Academy of Pediatric Dentistry (EAPD) 2003.

Results and conclusion: The prevalence of MIH varied widely among the 3 cities, with an average of 9.98 %.The severity of MIH was higher in girls 32.14% than boys 5.33%. The most prevalent defect reported in this study was opacities.

INTRODUCTION

Molar incisor hypomineralization (MIH) was first observed by Swedish dental workers.^[1] MIH is well-defined by *Weerheijm et al*^[2], as “hypomineralization of systemic origin of one to four permanent first molars frequently associated with affected incisors.” MIH is also termed as idiopathic enamel hypomineralization, cheese molars and non-fluoride hypomineralization in first permanent molars.^[3,4]

The prevalence varies widely (2.4-44%) between countries. The greatest prevalence was in

Sydney (Australia) while, the lowest was in Leeds (U.K)^[5-8] and in Indian study showed 9.2%^[9]. While in Egypt, a study on 1001 children at the same age, the prevalence was 2.3 %.^[10]

Children who have MIH complaining that their teeth are very sensitive and painful even with brushing (even when the enamel is intact). They also complain about the aesthetic appearance of their incisors. They often require rehabilitation due to the rapid breakdown of enamel and dentine^[11].

The MIH also raises the risk of dental caries and giving rise to acute symptoms^[12]. The enamel

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clinically varies in color from whitish, yellowish to brownish color, and these teeth usually show a sharp delineation among the defected enamel and sound enamel. The teeth erupt with full enamel thickness but under masticatory loads, enamel chip off (called post-eruption breakdown (PEB) which is characterized by bad aesthetic appearance and also sensitivity to different stimuli) ^[12].

After post-eruption breakdown, they look like enamel hypoplasia. But, the affected area boundaries are rough, but those in hypoplasia are even and smooth-edged. These demarcated lesions in MIH should also be differentiated from opaqueness of fluorosis in addition amelogenesis imperfecta characterized by generalized opacities, which differ than MIH ^[13].

The treatments of those cases are very complicated, the treatment varies from fluoride application, usage of aesthetic restorative procedures, or even the extraction accompanying with orthodontic treatment ^[14]. The researchers suggested that asymmetrical occurrence of MIH within individuals is due to the ameloblasts affection in different stages. Any systemic disorder during their developmental stages, such as environmental circumstances, respiratory tract diseases, and metabolic disorders, can cause MIH. ^[15,16]

This research was the first one which determines the prevalence of MIH in Suez Canal region.

Aim of The Study

The aim of this study was to determine the prevalence and severity of Molar Incisor Hypomineralization MIH in governmental school children in Suez Canal region (Ismailia, Port Said ,and Suez cities).

SUBJECTS AND METHODS

The present study was approved by the **Research Ethics Committee, Faculty of Dentistry, Suez Canal University(code 160/2019)** and from

Directorate of Education in the Governorate of Ismailia, Port Said, and Suez cities before starting the study.

Informed written consent obtained from parents of children who participate in the study after a complete explanation of the aim and clinical procedures.

This study included 1312 children of governmental primary school students in cities included in Suez Canal sector, Ismailia, Port Said, and Suez. The sample size for this study was calculated according to Thompson, (1987) ^[17] Those students numbers according to Ministry of Education Information Center^[18].

II- Patients Selection

II.1 Inclusion Criteria: ^[14]

1. Children aged 8 to12 years old.
2. Both boys and girls will be included.
3. All maxillary and mandibular first permanent molars and permanent incisors should be erupted.
4. At least one first permanent molar and one permanent incisor are MIH affected according to European Academy of Paediatric Dentistry(EAPD) *Weerheijm et al.*, ^[14] which are:

- a. Demarcated opacities
- b. Enamel disintegration post-eruption breakdown (PEB)
- c. Atypical restorations
- d. Extracted teeth

II.2 Exclusion Criteria:

- 1- Children with any enamel defect syndromes such as

- | | |
|-----------------------------|----|
| (Dental fluorosis (DF | -a |
| (Enamel hypoplasia (EH | -b |
| (Amelogenesis imperfect (AI | -c |

The differential diagnosis between these lesions and white spot lesions will be based on *Seow*.^[19]

Children are under orthodontic treatment during clinical examination

III- Clinical Procedures

- Clinical examination made using disposable diagnostic sets as mirror, and explorer.
- The children asked to rinse their teeth by water and to clean soft derbies prior to performing dental examination, index teeth including permanent incisors and 1st permanent molars cleaned using cotton rolls.
- A dental explorer further used for cleaning molar fissures.
- The inspector carefully inspected the clinical crown of the 1st permanent molars and permanent incisors for defined opacities.
- Examination sheet form taken for the student including his name, age, address, gender, school, date, medical health, and any previous dental treatment.

This study was performed by two calibrated pedodontists. The calibration exercise was

conducted between the two examiners through clinical examination and a lot of photographs of patients with MIH from the Department of Paediatric Dentistry and Preventive Department in Suez Canal University.

All patients had enamel defects (15 with MIH). To evaluate the calibration results, the examiners had to assess the same set of 20 pictures with different types of MIH teeth.^[20] A high inter-observer agreement was obtained.

IV-Statistical Analysis

Data will be tabulated, and the analysis conducted with Statistical Package for Social Sciences 16.0 for Windows (SPSS Inc., Chicago, IL, USA).

RESULTS

This study was performed on 1312 boys and girls (760 in Ismailia and 432 Port said and 120 in Suez cities), aged 8 to 12 years-old, who were present in the days of examination and whose were meeting the inclusion criteria.

The prevalence of MIH varied widely among the 3 cities, it was 12.36%, 5.5%, and 10.8% respectively. With an average of 9.98%

TABLE (1) Distribution of prevalence, severity, and gender in the different regions among children with MIH

Region	Ismailia			Portsaid			Suez		
MIH	total	affected	severity	Total	affected	severity	Total	affected	severity
No. of children	760	94(12.36%)	14(14.9%)	432	24(5.5%)	8(33.3%)	54	6(13.3%)	0(0%)
Gender									
boys	414	52(6.3%)	2(2.12%)	230	16(3.7%)	2(8.3%)	120	13(10.8%)	0(0%)
girls	346	42(5.7%)	12(12.7%)	202	8(1.8%)	6(25%)	66	7(10.6%)	0(0%)

The highest prevalence of MIH was 12.36% present in Ismailia while the least was 5.5% in Port Said.

The severity of MIH was highest in Ismailia (14.9%) while 0% in Suez.

TABLE (2) Distribution of Molar–Incisor–Hypomineralisation (MIH) characteristics according to gender

	Total	MIH	MIH severity
Boys	710	75(10.5%)	4(5.33%)
Girls	602	56(9.3%)	18(32.14%)

As regard to gender, the prevalence of MIH was 10.5 for boys and 9.3 in girls. The severity of MIH was higher in girls 32.14% than boys 5.33%.

Demarcated opacities was higher than severe MIH in all cities .

As regard severity, postoperative breakdown was the highest. while, there is no atypical restoration .

It was founded that, severity of MIH was highest in Ismailia , while it was zero in Suez.

TABLE (3) Distribution of MIH features among affected teeth.

Total	Demarcated opacities	Sever MIH			
			Post-eruptive breakdown	Atypical restoration	Missing Tooth
Ismailia 94	80(85%)	14(15 %)	10	-	4
Port said 24	16(66.6%)	8(33.33%)	6		2
Suez 13	13(100%)	0(0%)	-	-	-

TABLE (4) Association between second primary molar hypomineralisation and MIH

	MIH	Second primary molar
Numbers	131	8(6.1%)

It was found that the presence of hypomineralized second primary molar was 6.1% of MIH cases.

DISCUSSION

The first permanent molar has an absolutely important role in the development of occlusion and its early loss can have a considerable effect on dental health of the child in the future. Also, permanent incisors are of highly esthetic importance.

MIH examination should be start at age of 8 years , as at this age all permanent first molars and

most of the incisors are erupted. In addition, the permanent first molar teeth will be in a relatively good condition without excessive posteruptive breakdown.¹⁴

Index teeth are affected with the medical condition during the mother's pregnancy and child first years of life. Those index teeth eruption should closely be monitored since eruption and early diagnose any structural defects otherwise caries, early lose tooth structures and even extraction will happen, so awareness with MIH not only among specialized pediatric dentists but also among general practitioners.^[21]

Unfortunately there is increase observation of the clinical picture of MIH in outpatient clinic of Pediatric Dentistry and Preventive Department in Suez Canal University in addition to American dental Association recommendation^[22]

This study represented the first Egyptian MIH Study which was carried out in three Suez canal sector cities at the same time period and using the same diagnostic criteria.

The examiners applied the European Academy of Pediatric Dentistry (EAPD) 2003 criteria^[11]. Calibration and training of the examiners consistent with confirmed methods should be obligatory^[20].

For precise MIH judgment, a simple, reproducible index is needed. DDE Index [1992] was not acceptable and time consuming and also not include a score for Post eruptive Enamel Breakdown (PEB), which is regularly seen in MIH, although such a score can be found presented in the Enamel Defect Index (EDI), as suggested by Brook et al. [2001]^[23], but this index was not useful in MIH diagnosis. This is because the opacity score not specify demarcated opacity in MIH but also include diffuse opacities, which may be caused by high fluoride intake. In addition, in the EDI index any tooth surfaces affected by caries and large restorations are excluded. While caries can develop very rapidly in MIH molars, at young age, consequently resulting in a typical restoration, this does not seem appropriate when making a diagnosis of the condition.^[24]

In this study the prevalence of MIH varied widely among Ismailia, Port Said, and Suez cities, it was 12.36%, 5.5%, and 10.8% respectively. With an average of 9.98%. In other studies, the prevalence of MIH ranging from 2.8% to 40.2%, which may reveal differences between areas and countries^[5,6,7]. The prevalence varies widely due to the usage of different criteria, examination variability, procedures of recording, and altered age groups. In addition to the numerous indices used^[3].

As regard to gender, the severity of MIH was higher in girls 32.14% than boys 5.33% which disagree with *Takahashi et al*^[25].

It was found that demarcated opacities were the most frequent form of MIH, that in agreement

with the Egyptian study and Soviero et al and others^[3,4,10,26,27].

There was a progressive correlation between the number of affected teeth and the grade of severity (structural loss and atypical restorations) in agreement with Soviero et al, Jasulaityte et al and Martinez Gomez et al^[26,28,29].

We observed that there might be a relationship between hypomineralisation defects in the primary and the permanent dentition confirmed the study of Elfrink et al^[30].

CONCLUSION AND RECOMMENDATION

1. The prevalence of MIH varied widely among the 3 cities, with an average of 9.98%
2. The severity of MIH was higher in girls with affected teeth 32.14% than boys 5.33%.
3. The most prevalent defect reported in this study was opacities
4. More MIH prevalence studies with larger samples are needed

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