

Prevalence of Molar Incisor Hypomineralization (MIH) in Brazilian children and investigation with respiratory diseases or premature births

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Abstract: Molar Incisor Hypomineralization (MIH) is described as a qualitative enamel development defect that affects at least one permanent molar and may or may not affect the permanent incisors. The prevalence reported in the world literature ranges from 2.8% to 44%. Its etiology is still unclear, with prenatal, perinatal and postnatal factors often associated. Objectives: evaluate the prevalence of HMI in patients attended at a Dental School in the city of Vitória-ES and its association with causal factors. Methods: 302 children with the presence of first permanent molars, aged between 5 and 14 years, were clinically evaluated under ideal conditions at the Children's Clinic of the Faculty of Dentistry of MULTIVIX and a questionnaire was applied. Results: 66 children (21.85%) had HMI. There was no significant difference between the sexes and there was no association with childhood respiratory diseases and preterm birth. Conclusion: High prevalence of MIH was found in Brazilian children and no association with respiratory diseases or premature births. It is suggested that further studies be carried out with standardized criteria to determine the prevalence and its relationship with causal factors.

Key words: Molar Incisor Hypomineralization, Epidemiology, Respiratory Tract Diseases, Premature Birth.

Prevalência de Hipomineralização Molar Incisivo (HMI) em crianças brasileiras e investigação com doenças respiratórias ou partos prematuros

Resumo: A Hipomineralização Molar Incisivo (HMI) é descrita como um defeito qualitativo no desenvolvimento do esmalte que afeta pelo menos um molar permanente, podendo ou não afetar os incisivos permanentes. A prevalência relatada na literatura mundial varia de 2,8% a 44%. Sua etiologia ainda é incerta, estando frequentemente associados fatores pré-natais, perinatais e pós-natais. **Objetivos:** avaliar a prevalência de HMI em pacientes atendidos em uma Faculdade de Odontologia da cidade de Vitória-ES e sua associação com fatores causais. **Métodos:** 302 crianças, com presença de primeiros molares permanentes, de idade entre 5 e 14 anos foram avaliadas clinicamente em condições ideais na Clínica Infantil da Faculdade de Odontologia da MULTIVIX e foi aplicado questionário. **Resultados:** 66 crianças (21,85%) apresentaram HMI. Não houve diferença significativa entre os sexos e não houve associação com doenças respiratórias na infância e parto prematuro. **Conclusão:** Alta prevalência de HMI foi encontrada em crianças brasileiras e nenhuma associação com doenças respiratórias ou partos prematuros. Sugere-se que novos estudos sejam realizados com critérios padronizados para determinar a prevalência e sua relação com fatores causais.

Palavras-chave: Hipomineralização Incisivo Molar, Epidemiologia, Doenças Respiratórias, Nascimento Prematuro.

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Prevalencia de Hipomineralización Molar-Incisiva (HMI) en niños brasileños y asociación con enfermedades respiratorias o nacimientos prematuros

Resumen: La Hipomineralización Molar Incisiva (HMI) se describe como un defecto cualitativo en el desarrollo del esmalte que afecta al menos a un molar permanente, pudiendo o no afectar a los incisivos permanentes. La prevalencia reportada en la literatura mundial varía del 2,8% al 44%. Su etiología aún es incierta, y frecuentemente se asocia con factores prenatales, perinatales y posnatales. **Objetivos:** evaluar la prevalencia de HMI en pacientes atendidos en una Facultad de Odontología en la ciudad de Vitória-ES y su asociación con factores causales. **Métodos:** se evaluaron clínicamente 302 niños con presencia de primeros molares permanentes, con edades comprendidas entre 5 y 14 años, en condiciones ideales en la Clínica Infantil de la Facultad de Odontología de MULTIVIX, y se les aplicó un cuestionario. **Resultados:** 66 niños (21,85%) presentaron HMI. No hubo diferencias significativas entre los sexos y no se encontró asociación con enfermedades respiratorias en la infancia ni parto prematuro. **Conclusión:** se encontró una alta prevalencia de HMI en niños brasileños y ninguna asociación con enfermedades respiratorias o partos prematuros. Se sugiere realizar nuevos estudios con criterios estandarizados para determinar la prevalencia y su relación con factores causales.

Palabras clave: Hipomineralización Molar Incisivo, Epidemiología, Enfermedades Respiratorias, Nacimiento Prematuro.

Introduction

Molar-Incisor Hypomineralization (MIH) is a qualitative enamel defect that affects one or more permanent molars and may or may not involve permanent incisors.¹ This condition was first reported in Sweden in the 1970s², and in 2001, Weerheijm, Jalevik, and Alaluusua³ suggested the use of the term “Molar-Incisor Hypomineralization” to describe the condition. Worldwide literature reports a prevalence ranging from 2.8%⁴ to 40.2%⁵. In Brazil, studies in children have shown a prevalence of 14.3% in Araraquara, SP⁶ 15.5% in Teresina, PI⁷, and 40.9% in Montes Claro, MG.⁸

The etiological cause of MIH remains uncertain, but there are assumptions regarding the influence of environmental factors that may be related to the prenatal, perinatal, and early childhood periods.⁹ Complications during these periods can interfere with enamel formation and cause MIH, such as prematurity, low birth weight, high fever, respiratory diseases, and vitamin deficiency.¹⁰

In patients with this condition, the dental enamel presents altered coloration, ranging from white, yellow, to brown, and it is more porous and fragile, which can increase the likelihood of fractures. The affected enamel surface can vary according to the affected tooth. For example, in incisors, MIH tends to manifest on the labial surface, and usually, there are no fractures, unlike molars, which, due to masticatory forces, have a higher risk of presenting this problem.¹¹ Moreover, there is a higher possibility of reporting sensitivity, which becomes a complicating factor in maintaining oral hygiene, consequently increasing the risk of developing dental caries lesions.¹²

It is known that MIH is one of the most prevalent developmental defects in daily clinical practice.^{5,6,7,13} The treatment for this condition should consider the degree of severity, coloration, extent, hypersensitivity, and location of the defect. In mild cases, the treatment is preventive, with oral hygiene instructions, use of fluoride toothpaste with more than 1000 ppm of fluoride, professional applications of fluoride varnish, as well as the use of resin infiltrant and sealants. In moderate cases, composite resin or

glass ionomer restorations can be performed.¹⁰ In severe cases, restorations, endodontic treatment, and extractions may be necessary.¹⁴

Given this context, the purpose of this study is to evaluate the prevalence of this condition in a population of patients treated at a dental clinic in a college in Vitória, ES, and its association with age, gender, dentition type, preterm birth, and respiratory diseases.

Material and methods

A cross-sectional study was conducted, including 302 children with the presence of first permanent molars, aged 5 to 14 years, who were treated during the second semester of 2019 at the Pediatric Integrated Clinic Discipline of Multivix College in Vitória, ES.

The study was approved by the Ethics and Research Committee of Plataforma Brasil. Inclusion of children in the study required prior authorization from their respective guardians through an informed consent form.

The evaluation of MIH prevalence in children was performed during a clinical examination by three previously calibrated examiners according to the criteria proposed by the European Academy of Pediatric Dentistry (EAPD). The clinical examination consisted of direct visual observation of the oral cavity after dental prophylaxis, with the teeth dried using an air jet and well-illuminated. MIH were considered if the child had at least one permanent molar involved, which may or may not affect the permanent incisors.

In the presence of MIH, the data were recorded in a questionnaire considering the affected teeth, the color of the alteration, the affected surfaces, and the clinical outcome observed during the evaluation (post-eruptive fractures, atypical restorations, carious lesions, and extractions).

For data analysis, descriptive statistical analysis was performed to characterize the sample. Absolute and relative frequencies were calculated for categorical variables, as well as measures of central tendency and variability for quantitative variables. Then, association analyses between the occurrence of MIH and other variables were performed using Pearson's chi-square test (or Fisher's exact test when appropriate) for categorical variables, and Student's t-test for quantitative variables. The significance level was set at $p < 0.05$. All analyses were conducted using IBM SPSS Statistics software, version 20.0, with a 95% confidence interval.

Results

As described in Table 1, the mean age of the participants was 9.17 years ($SD = 2.69$). The majority were male ($n = 152$; 50.3%), had no history of preterm birth ($n = 272$; 90.1%), did not have respiratory diseases ($n = 228$; 75.5%), and were in the mixed dentition phase ($n = 236$; 78.1%). The prevalence of MIH was 21.9% ($n = 66$), with a mean of 6.82 affected teeth ($SD = 3.68$).

According to Table 2, no statistically significant differences were found in the prevalence of MIH based on age ($p = 0.742$), gender ($p = 0.370$), prematurity ($p = 0.642$), and respiratory diseases

Table 1. Descriptive characterization of the investigated variables

Variables	n	%
Age [302]		
Mean: 9,17		
Standard deviation: 2,69		
Gender [302]		
Female	150	49,7
Male	152	50,3
Pre-term [302]		
No	272	90,1
Yes	30	9,9
Respiratory diseases [302]		
No	228	75,5
Yes	74	24,5
Dentition [302]		
Permanent	78	25,8
Mixed	224	74,2
MIH [302]		
No	236	78,1
Yes	66	21,9
Amount of teeth with MIH [66]		
Mean: 6,82		
Standard deviation: 3,68		

Note. Values in [] indicate the total number of valid cases for each variable

($p = 0.418$). Regarding the dentition type, a higher prevalence of MIH was observed in children with mixed dentition ($p = 0.015$).

Discussion

The prevalence of MIH among the patients in this study was 21.9%, similar to the study by Garcia-Margaret¹⁵ with 21.8% conducted in Spain, as well as the studies in Araraquara,

Table 2. Descriptive characterization of the investigated variables

Age	HMI						p-value
Mean (SD)	Si		No		Total		
	n	%	n	%	n	%	
Age							
Media (DE)	9,08	(2,14)	9,20	(2,83)	9,17	(2,69)	0,742 ⁽³⁾
Gender							0,370 ⁽¹⁾
Female	36	24,0	114	76,0	150	100,0	
Male	30	19,7	122	80,3	152	100,0	
Preterm							0,642 ⁽¹⁾
No	61	22,4	211	77,6	272	100,0	
Yes	5	16,7	25	83,3	30	100,0	
Respiratory diseases							0,418 ⁽¹⁾
No	47	20,6	181	79,4	228	100,0	
Yes	19	25,7	55	74,3	74	100,0	
Dentition							0,015 ^{(2)*}
Permanent	10	12,8	68	87,2	78	100,0	
Mixed	56	25	168	75	224	100,0	

Note. ⁽¹⁾ Pearson chi-square test; ⁽²⁾ Fisher's exact test; ⁽³⁾ Student's t-test; * $p < 0.05$.

SP⁶, and Teresina, PI⁷, with 14.3% and 15.5% respectively. The discrepancy in studies ranging from 2.8%⁴ to 40.2%⁵ probably occurs due to the lack of standardization in the methodological criteria of clinical examination, which hinders the comparison of results. For example, in the present study, the teeth were evaluated after dental prophylaxis and drying with an air jet, which differs from the procedure adopted in Soviero's study⁵, where patients performed dental brushing and used gauze for moisture control, and Cho's study⁴, which evaluated wet teeth.

Regarding gender, no statistically significant differences were observed in this study, similar to the majority of previous surveys^{4-7,13}, although some studies report a higher predisposition for girls.^{13,16}

When evaluating respiratory issues in childhood, Allazzam *et al*¹⁷, Mulic *et al*¹⁶, and Mejia *et al*¹⁸ report statistical significance in relation to the presence of MIH. However, most surveys do not identify this association,^{1,4,9,13} which is in line with the results of the present study. Despite this, the literature suggests that theoretically upper airway respiratory problems can affect ameloblastic activity during enamel mineralization due to the direct influence of the disease or due to hypoxia, hypocalcemia, fever, and/or malnutrition caused by the disease.¹⁹

Regarding preterm birth, this factor was statistically associated with MIH in the studies by Allazzam¹⁷ and Mejia¹⁸, but it was not observed in the present study. However, most surveys do not identify this association,^{1,4,9,13} corroborating the results of the present study.

It is important to note that while the prevention of this condition is still unknown, teeth affected

by MIH have increased tooth sensitivity,²⁰ decreased bonding of restorations,²¹ decreased bonding of orthodontic appliances,²¹ a higher risk of caries due to post-eruptive fractures, and esthetic impairments in incisors.¹⁴

Conclusion

A prevalence of 21.85% of MIH was found among the children included in the study. There was no significant difference between genders, and no association was found with respiratory diseases in childhood or preterm birth. Further studies with standardized methodological designs are needed to investigate the prevalence of MIH in different population groups and its relationship with various causal factors.

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