

Molar-incisor enamel hypomineralization cross-sectional prevalence evaluation in oral-breathing allergic children

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ABSTRACT | *Objective:* Molar-incisor hypomineralization (MIH) is a highly prevalent dental development disturbance caused by disrupted ameloblast maturation. This condition affects up to 44% of children around the world and several systemic conditions have been associated with MIH, including Mouth-Breathing. It is important to show that MIH has multifactorial etiology and is associated with allergic mouth-breathing children. *Methods:* To evaluate MIH prevalence in MBCS children with positive and negative allergic response to the skin prick test, a cross-sectional quantitative and qualitative comparative assessment was conducted in 23 mouth-breathing children and 25 sex/age-matched siblings. Enamel defects were classified by the modified rate of FDI Development Defects of Enamel. Statistical Student's t tests were applied to verify the relevance of the data. *Results:* MIH prevalence showed significant statistical differences in the comparison between molars, independently of individual age ($p = 0.01513474$). MBCS children under 5 years old had higher statistical prevalence of MIH ($p = 0.00594$). MBCS children with positive skin reactions to the prick test had higher prevalence of MIH ($p = 0.023$). MBCS children had statistically significant higher prevalence of demarcated opacity ($p = 0.00012$). *Conclusions:* Finally, MBCS children with positive skin reactions to the prick test had higher prevalence of MIH ($p = 0.023$), indicating that mouth-breathing allergy-responsive children had higher MIH prevalence. Our results corroborate our previous hypothesis that MBCS children have increased MIH prevalence in comparison to their siblings, with statistical significance ($p = 0.01513474$). Further investigations with larger samples may enhance and confirm the accuracy of our results.

DESCRIPTORS | Hypomineralization; Enamel Hypoplasia; Molar-incisor Hypomineralization; Pediatric Dentistry; Oral Breathing; Allergy.

RESUMO | **Avaliação da prevalência transversal da hipomineralização incisivo-molar do esmalte em crianças alérgicas com respiração oral** • *Objetivo:* Hipomineralização incisivo-molar (HIM) é um distúrbio de desenvolvimento dentário altamente prevalente devido à maturação interrompida do ameloblasto. Esta condição afeta até 44% das crianças ao redor do mundo e várias condições sistêmicas têm sido associadas à HIM, incluindo a respiração oral. É importante mostrar que HIM tem etiologia multifatorial e está associada com crianças alérgicas com respiração bucal. *Métodos:* Para avaliar a prevalência da HIM em crianças com SRBI com resposta alérgica positiva e negativa para testes de escarificação, uma avaliação transversal quantitativa e qualitativa foi realizada em 23 crianças com respiração oral e 25 irmãos com idade/sexo correspondentes. Defeitos de esmalte foram classificados de acordo com o índice de defeitos de esmalte da FDI. Teste t de Student foi aplicado para verificar a relevância dos dados. *Resultados:* A prevalência de HIM mostrou diferenças estatísticas significativas na comparação entre molares, independentemente de idade individual ($p = 0,01513474$). Crianças com SRBI menores de 5 anos apresentaram maior prevalência estatística de HIM ($p = 0,00594$). Crianças com SRBI que obtiveram reações positivas para os testes de escarificação apresentaram maior prevalência de HIM ($p = 0,023$). Crianças com SRBI apresentaram maior prevalência estatística de opacidade demarcada ($p = 0,00012$). *Conclusões:* Crianças com SRBI que obtiveram reações positivas para os testes de escarificação apresentaram maior prevalência de HIM ($p = 0,023$), indicando que crianças alérgicas com respiração oral tiveram maior prevalência de HIM. Nossos resultados corroboram nossa hipótese anterior que crianças com SRBI demonstram maior prevalência de HIM em comparação com seus irmãos, com significância estatística ($p = 0,01513474$). Investigações com amostras populacionais maiores podem reforçar e confirmar a exatidão dos nossos resultados

DESCRITORES | Hipomineralização; Hipoplasia de esmalte; Hipomineralização incisivo-molar; Odontopediatria; Respiração oral; Alergia

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INTRODUCTION

Background

Molar-Incisor hypomineralization (MIH) is a set of qualitative enamel defects affecting one to four molar teeth, with or without analogous incisors' affection¹⁻³ resulting from disrupted ameloblasts' maturation leading to qualitative enamel defects.⁴ MIH prevalence has been reported to range from 2.9 to 44% around the world⁵⁻⁷ presenting itself clinically as asymmetric white/opaque, yellow or brown discoloration with clear distinction from healthy enamel^{8,9} often affecting occlusal and buccal surface.^{1,5,9-12} Increased prevalence of dental caries has been associated with MIH due the presence of sites for the adhesion and colonization of aciduric bacteria.^{9,10,13,14}

Several systemic conditions have been associated⁷, including prenatal complications, pre-term birth, low birth-weight, nutritional deficiencies, celiac disease, sickle cell anemia, fever, metabolic disorders of calcium and phosphate, renal insufficiency, stem-cell hematopoietic transplantation, chemical and/or radiotherapy, neurological disparities, hypoparathyroidism and head trauma.^{6,15,16} The association between respiratory diseases and MIH has been extensively investigated during the last decade.^{11,17} Several authors have found a positive correlation between allergic respiratory diseases and the severity of MIH.^{1,5,12,16,17}

Mouth-breathing children syndrome (MBCS) is a childhood breathing pattern disturbance characterized by mixed or oral air inhalation. MBCS is associated with disorders of the speech and is generally combined with facial deformities, with the potential to progress to cardiorespiratory, endocrine diseases and sleep disturbances that can impair their mental and physical development.¹⁸⁻²² Furthermore, this syndrome has been related to genetic factors, unhealthy oral habits and nasal obstructions of varying degrees of severity and duration and has also been associated with pediatric allergy-related otorhinolaryngology complaints.^{2,15,23}

Also, MBCS patients are more prone to having caries, tooth erosion, malocclusion, improper dental and craniofacial growth and development, bruxism and increased dental trauma incidence. MBCS effects on MIH have been previously investigated, however, there are no investigations of MIH prevalence among MBCS children with or without positive reaction to the skin prick test.

Objective

The goal of this study is to investigate through a cross-sectional case-control the prevalence of MIH among allergic mouth-breathing children.

METHODS

Study design

A cross-sectional case-control clinical comparison of MIH prevalence in MBCS and non-MCBS children.

Setting

Cases and age and sex-matched controls were selected at the Mouth Breathing Center of the Federal University of São Paulo's Medicine School, from December 2001 to December 2011.

All the ethical principles expressed in the World Medical Association Declaration of Helsinki were followed in this study and all the parents of the children, after they received oral and written explanations of the experimental protocol and the study's aims, gave their written informed consent. The approval for this study was obtained from the ethical committee of the Federal University of São Paulo Medicine School.

Sample selection

Study group

The study group was composed by 23 mouth-breathing children, between 5 and 17 years old,

recruited from the Federal University of São Paulo's Medicine School. The parents gave their respective signed agreement for voluntary participation. Each child had their breathing pattern diagnostic after a thorough physical exam performed by a trained orthodontologist.

Control group

The control group was composed by 25 children similarly distributed by age and sex. Medical history was assessed, and a physical exam was performed to confirm their nasal breathing pattern.

Prick test

To determine the childrens' allergic predisposition to specific allergenic air particles, skin prick tests were undertaken in both groups. Dermic responses were evaluated by a trained allergist.

DENTAL EXAMINATIONS

Molar-incisor hypoplasia evaluations

The quantitative and qualitative assessment of MIH prevalence was performed through a careful clinical exam conducted by a pediatric dentist who evaluated all four first molars, central and lateral incisors. The teeth were evaluated under an artificial lighting reflector immediately after the cleaning and air drying of the dental elements to classify enamel defects according to the modified Development Defects of Enamel index^{20,24-28} according to FDI.^{29,30}

Statistical Analyses

Descriptive statistical analysis (means, standard deviations, percentages) were calculated using Excel (Microsoft for Mac 15.24). The data comparison of statistical associations (p-values) were assessed using Student's *t*-test to verify the statistical significance of MIH prevalence among mouth-breathing and nasal-breathing children ($p < 0.05$). To verify the correlation between positive skin reaction

to the prick test and MIH prevalence, Student's *t*-test was employed as well ($p < 0.05$). Exact Fisher's test was used to verify the type of enamel defect and breathing pattern ($p < 0.05$).

RESULTS

The case group was composed by 23 mouth-breathing children and 25 nasal-breathing children with mean age of 14.2 years old (Table 1).

Enamel hypomineralization in molar teeth was significantly more prevalent in MBCS children, independently of individual age ($p = 0.01513474$) (Figure 2). Also, there was significant statistical difference in MIH prevalence between oral-breathing and nasal-breathing children when only those below 5 years old at the time of the exam were compared ($p = 0.0054904$) (Table 2).

There was no statistical significance in the prevalence of MIH and positive skin reaction to the prick test, though borderline value was seen in the comparison between molars (0.0691). However, MBCS children with positive skin reactions to the prick test had higher prevalence of MIH ($p = 0.023$), indicating that mouth-breathing allergy-responsive children had higher MIH prevalence.

The type of enamel defect and breathing pattern was also evaluated through Fisher's Exact Test. Mouth-breathing children showed a statistically significant higher prevalence of demarcated opacity ($p = 0.00012$), though all other MIH-pre-determined enamel defects were considered outliers since there was not enough volume of data for statistical analyses.

DISCUSSION

MIH is the qualitative development of enamel defect found in 19.8% of Brazilian children, with strong evidence indicating positive correlation between MIH and the prevalence of dental caries.^{3,6,7,10,14,29} Despite the high prevalence, there is no conclusive data about MIH's etiology, though several systemic factors of early childhood are known

to impair the activity of ameloblasts through enamel production and mineralization. In all possibilities, the relevance of each event is difficult to establish as many of them can happen more than once during early childhood.^{12,16,17,31}

In this study, the prevalence of MIH in MBCS children, with or without positive skin reaction to allergic prick test, was investigated following the mDDE classification. This index has been employed previously with consistent and comparable results,^{13,32} notwithstanding the known low-specificity issues of this classification. To assure acceptable variability in this investigation, all the patients and control volunteers were evaluated by a single calibrated pediatric dentist, minimizing variations caused by different viewers. A newer method to classify and compare MIH was proposed by EAPD in 2003⁸, aiming to provide a more precise classification which also worked as a reproducible method; it was not considered in the present study due to the dissemination of a higher mDDE index.^{2,6,7,13,33}

Mouth-breathing caused by the obstruction of the upper airways in early childhood affects several aspects of the children's growth, including disturbances in orofacial development, and several other associated issues with several long-term effects and quality of life impairment.^{18,34-36} Also, MBCS children are at a higher risk of developing allergic responses, though the exact mechanisms are not fully elucidated. The relationship between mouth-breathing patterns and increased prevalence of dental caries has already been established. However, despite the clinical observance of augmented presence of enamel hypoplasia, there have been no previous investigations of MIH in MBCS children.^{9,10,37} Our results corroborate our previous hypothesis that the latter exhibit increased MIH prevalence in comparison to their siblings, with statistical significance ($p=0.01513474$).

The negative impacts of mouth-breathing in early childhood have been extensively investigated.

Several authors evidenced impairments in speech, snoring, chewing, and abnormal craniofacial growth in MBCS children.^{18-20,22,25,27,38} Our results confirm the extensive list of local and systemic impairments associated with improper breathing pattern.^{27,39,40} Age was also described as a negative modifying factor of MIH prevalence, being statistically significant ($p=0.00594$).

Although there were statistically significant results in the type of enamel hypoplasia and breathing pattern, there are several restraints regarding these results, since there were a high number of outliers and grouped MIH. Also, previously published data cannot be compared with these results since different MIH evaluation methods and cases have been used. Among the limitations of the present work, the authors believe that further investigations with this group of patients should be carried out, mostly due to the power of the evaluated sample being too weak to reveal consistent results.

CONCLUSIONS

Molar-incisor hypoplasia seems to be more prevalent in mouth-breathing children, although no statistical significance could be established between MIH and allergic prick-test responsive MBCS children. Larger population studies may enhance and confirm the accuracy of our results.

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