

Molar Incisor Hypomineralization and Self-perception of Mother's Positive Oral Health - a Comparative Cross-sectional Study

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Abstract

Background

Molar Incisor-Hypomineralization (MIH) is an enamel defect with numerous clinical consequences. It has the potential to impact not only patients but also the lives of their caregivers, especially mothers. However, further research is needed to fully understand the impact of this oral finding on mothers' perceptions of their oral health. The objective of this work is to analyze the association between MIH in children and their mothers' self-perception of positive oral health.

Methods

A comparative cross-sectional study was conducted with 111 mothers and their children, aged 6 to 12 years, who underwent clinical examination. The mothers were asked to complete a self-administered questionnaire concerning their socio-demographic characteristics, medical history, and the Brazilian version of the Positive Oral Health and Well-Being (B-POHW) index. The B-POHW is a measure of the positive interpretation of oral health. Unadjusted and adjusted Poisson regression was used ($p < 0.05$).

Results

Mothers who had more than 8 years of education being 1.21 times more likely to have better self-perception of positive oral health (95% CI = 1.11–1.37). Furthermore, mothers of children with severe MIH showed a 23% lower prevalence of positive self-perception of oral health (95% CI = 0.65–0.91), while mothers of children with mild MIH showed a 13% lower prevalence (95% CI = 0.75–0.99), when compared to mothers of children without MIH.

Conclusions

Mothers with more than 8 years of schooling showed a higher self-perception of positive oral health, while mothers of children with MIH showed a lower self-perception of positive oral health.

INTRODUCTION

Molar Incisor-Hypomineralization (MIH) is a qualitative enamel defect of systemic origin that affects one or more first permanent molars, and it is often associated with permanent incisors.^{1,2} There is a reduced mineral percentage in these teeth and, therefore, they are more porous and have greater irregularities^{3,4}. This leads to higher fragility and post-eruptive breakdown, resulting in greater biofilm accumulation, higher chances of developing carious lesions and pulp involvement when the patient has a cariogenic diet^{1,2,5}. Approximately 37.5% of patients with MIH report increased pain, typically described as

hypersensitivity to thermal and mechanical stimuli, even when the enamel is clinically intact, which makes cleaning, eating, and dental care difficult.^{1,4,5,6,7,8,9} It has been suggested that these teeth may appear as white, yellow-brown demarcated opacities, particularly when they affect the incisors.^{1, 2, 5,8} The result is an aesthetic unconformity and an impact on the social well-being.^{10,11} Individuals affected by the condition may require 4 to 10 times more retreatment than individuals without MIH.⁵

The etiology of MIH is multifactorial with a genetic component, associated with systemic conditions that occur in the pre-, peri, and post-natal periods.^{3,12,13} In Brazil, its prevalence in children between 7 and 14 years old is approximately 14.5%¹⁴. and worldwide is around 13,5¹⁵, with one in every five children being affected by the condition¹⁶. MIH clinical characteristics corroborates with a negative impact on the oral health related quality of life of patients and their families due to aesthetic and functional factors, such as chewing difficulties, eating/aesthetic impact, sleeping difficulties, socialization, greater experience of dental caries, sensitivity, and bullying^{10,11,17,18}. Subjective measurements are increasingly recognized as essential tools to evaluate how individuals perceive and experience their own oral health, as they consider personal awareness, feelings, and lived experiences beyond clinical parameters. One such approach is the concept of positive health, rooted in positive psychology, which emphasizes the potential to be and become healthy even in the presence of disease.¹⁹ Within this framework, the Positive Oral Health and Well-Being (POHW) instrument was developed as the first, and so far the only, tool specifically designed to assess positive oral health.²⁰ Unlike traditional index that focus on deficits or disease, the POHW measures subjective and functional aspects of oral health and aims to capture how positive individuals perceive their oral health status.²⁰ The instrument is conceptually robust, drawing on theoretical foundations from Locker²¹ e Seligman¹⁹ is structured into three main domains: subjective-psychological, functional-social, and biological-physical. As a relatively recent construct in dentistry, positive oral health represents an important paradigm shift, broadening the assessment of oral conditions to include not only the absence of disease but also the presence of well-being and positive experiences related to oral health.^{20,22} MIH is a complex condition and, in many cases, difficult to treat, particularly due to the financial burden it entails and its potential impact on the oral health-related quality of life of the entire family.²³ Psychological characteristics can influence patients' and families' health and behavior, and children's oral problems may trigger different emotions in their parents, especially mothers. The way mothers perceive and interpret these problems can directly affect how they cope with them and how such experiences are reflected in their own oral health.²⁴ In this context, the Positive Oral Health and Well-Being (POHW) instrument provides an important framework to assess not only the absence of oral disease but also the presence of positive perceptions and experiences regarding oral health, broadening the understanding of maternal self-perception.

Therefore, the present study aimed to analyze the association between MIH in children and their mothers' self-perception of positive oral health.

MATERIAL AND METHODOLOGY

Ethical aspects

The study was approved by the Research Ethics Committee of the Federal University of Minas Gerais (#5,955,070). All parents and children signed an Informed Consent form. The study was reported according to the Helsinki declaration and followed the STROBE guidelines.²⁵

Study design and location

This cross-sectional study was conducted using a convenience sample of children aged 6 to 12 years who were receiving dental treatment at the Pediatric Dentistry clinics of the School of Dentistry, Federal University of Minas Gerais (UFMG), Brazil, and their respective mothers. The UFMG School of Dentistry, located in Belo Horizonte, Minas Gerais, is a major referral center for dental care and receives patients from Belo Horizonte and surrounding municipalities. Data collection was carried out between August 2023 and May 2024.

Inclusion criteria and studied groups

The inclusion criteria comprised children aged 6 to 12 years, of both sexes, undergoing dental treatment at the pediatric dentistry clinics of UFMG, and their respective mothers. Children who were caries-free or who presented only non-cavitated caries lesions (International Caries Detection and Assessment System - ICDAS²⁶ scores 1 and 2) were included, as these early-stage lesions are difficult for caregivers to detect. Children with satisfactory restorations in other teeth were also considered eligible for inclusion. This information was collected from the children's dental records and confirmed by a single trained examiner. Mothers aged 18 years or older who spent most of the time with the child were also included in the study.

The exclusion criteria were children with systemic conditions (such as hypertension, diabetes, heart diseases, autoimmune disorders), children undergoing orthodontic treatment, children with cavitated carious lesions (i.e., ICDAS scores 3, 4, 5, and 6 in teeth other than those identified as MIH index teeth)²⁶ and children who doesn't live in the same household as their mothers. The child's health and housing conditions were based on the mothers' reports. To this, after clinical examination, two different groups of children were characterised: 27 children with MIH (including different severity classifications on the MIH index teeth²⁷) and children without MIH (children with non-cavitated caries lesions and without signs of MIH)

Calibration process

The theoretical stage consisted of a discussion of the diagnostic criteria for MIH²⁷ and dental caries.²⁶ The examiner independently evaluated the images for the assessment of inter-examiner agreement in comparison with a more experienced researcher. MIH severity was classified according to established

criteria, in which mild MIH was defined by the presence of demarcated opacities of variable appearance, whereas severe MIH was characterized by post-eruptive enamel breakdown, atypical caries, atypical restorations, or tooth extraction attributable to MIH. The practical step was performed to MIH with clinical images of enamel lesions, including other enamel defects. For caries, the following ICDAS codes were used: Code 0 – Sound Tooth Surface (No Caries), 1 – First Visual Change in Enamel, 2 – Distinct Visual Change in Enamel/Dentin, 3 – Localized Microcavity or Enamel Breakdown, 4 – Underlying Dark Shadow from Dentin, 5 – Cavity with Exposed Dentin, 6 – Extensive Cavity with Exposed Dentin. Two weeks later, the examiner performed a second evaluation to calculate intra-examiner agreement. The Kappa coefficient for MIH diagnosis was 0.96, indicating almost perfect agreement. For dental caries assessment, the Kappa coefficient was 1.0, indicating perfect agreement.

Pilot study

Pilot study

A pilot study was conducted with 10 children in a clinical setting at the Pediatric Dentistry Clinic of UFMG to test the proposed methodology. Following the pilot study, it was concluded that no methodological adjustments were necessary. The children who participated in the pilot study were not included in the final sample.

Data collection

Clinical examinations were carried out in a dental chair by a single researcher. The examinations were conducted with respect for the child's privacy and comfort, using a dental mirror, a WHO periodontal probe, and a triple syringe for drying the teeth. All materials were properly sterilized and Personal Protective Equipment was used. In addition, a self-administered questionnaire was applied to collect information on the maternal medical history during pregnancy, the child's health in the first months of life, and the child's medical history up to the present time, a sociodemographic with maternal age (≤ 39 years old and > 39 years old), child's age (under or over 8 years), number of children (more or less than 2 children), mothers' marital status (married or single), parents' and mothers' education level (elementary education, secondary education, higher education, postgraduate education), race, type of housing (own or rented), family income and maternal income (monthly minimum wage on 2024: R\$ 1.412,00) and economic aspects were applied to the children's mothers while they were in the waiting room.

Moreover, mothers answered the version of the Brazilian Positive Oral Health and Well-Being (B-POHW), translated and adapted to Brazil by Perazzo et al. (2022)²². This was used to measure how positively mothers see their oral health through sociodemographic, general well-being, and self-reported outcomes towards their oral health. The answers to the 15 statements in the questionnaire vary from “completely agree, totally disagree, I partially agree, I partially disagree” and at the end there is a score between 0 and 35. Higher scores determine greater positive oral health. This variable was treated as a quantitative variable in the statistical analyses.

A descriptive analysis of the independent variables and the outcome was initially performed using absolute and relative frequencies, as well as means and standard deviations. Analyses were then conducted using unadjusted and adjusted Poisson regression with robust variance, in order to estimate prevalence ratios (PR) and their respective 95% confidence intervals (95% CI). The independent variables that presented $p < 0.20$ in the unadjusted model were inserted into the adjusted model. The significance value adopted was 5% and the confidence interval was 95% and the Statistical Package for Social Sciences (SPSS for Windows, version 25.0, IBM Inc, Armonk, NY, USA) was used for the analyses.

Power sample size

The sample size and power calculation were performed using the OpenEpi software. The calculation was based on the comparison of two independent groups: children with MIH ($n = 67$; mean = 32.0; standard deviation = 8.0) and children without MIH ($n = 44$; mean = 26.0; standard deviation = 10.0). Considering a significance level of 5% (95% confidence level), the study achieved a statistical power of 91.6%, indicating that the sample size was sufficient to detect significant differences between the groups and reducing the likelihood of a type II error.

RESULTS

A total of 202 children were evaluated; 91 did not meet the eligibility criteria, and 111 children and their mothers were included in the study. Of the children, 55.9% were female, the average age was 8.8 years (± 1.8). The MIH prevalence in the population was 40.5%, with the majority presenting severe MIH (21.6%). Family income was up to 2 Brazilian minimum wages (R\$1.412,00/US\$228,41) (72.1%). (Table 1)

Table 1. Sample characterization, ($n = 111$), Belo Horizonte, Brazil, 2024.

Variables	N (%)
Child's Sex	
Male	49 (44.1)
Female	62 (55.9)
Child's age – average (SD)	8.83 (1.858)
Maternal age*	
> 39 years old	51 (49.5)
≤ 39 years old	52 (50.5)
Maternal marital status	
Married	73 (65.8)
Not married	38 (34.2)
Family income	
>2 minimum wage	31 (27.9)
≤2 minimum wage	80 (72.1)
Maternal level of education	
>8 years of study	39 (35.1)
≤ 8 years of study	72 (64.9)
Number of children	
>2 children	38 (34.2)
≤ 2 children	73 (65.8)
MIH	
Severe MIH	24 (21.6)
Mild MIH	21 (18.9)
Without MIH	66 (59.5)

*Lost data; SD = standard deviation

Unadjusted regression showed that maternal education greater than 8 years ($p=0.001$) was significantly associated with better self-perception of positive oral health. Furthermore, children with severe MIH had a lower prevalence of positive maternal self-perception of oral health ($p = 0.002$). After adjustment, maternal education and the presence of MIH remained associated with positive maternal oral health, with mothers who had more than 8 years of education being 1.21 times more likely to have better self-

perception of positive oral health (95% CI = 1.11-1.37). Regarding MIH, mothers of children with severe MIH showed a 23% lower prevalence of positive self-perception of oral health (PR = 0.77; 95% CI = 0.65-0.91), while mothers of children with mild MIH showed a 13% lower prevalence (PR = 0.87; 95% CI = 0.75-0.99), when compared to mothers of children without MIH. No statistically significant associations were observed for maternal age, marital status, family income, or number of children ($p > 0.05$). (Table 2)

Table 2 - Unadjusted and adjusted analyses of factors associated with positive maternal oral health, Brazil, 2024.

	Positive maternal oral health			
Variables	Mean (SD)	PR Unadjusted (CI95%)	PR Adjusted (CI 95%)	P value
Maternal age				
> 39 years old	31.83 (9.42)	1.09 (0.96-1.22)*	1.09 (0.97-1.23)	0.153
≤ 39 years old	29.31 (9.48)	1.00	1.00	
Maternal marital status				
Married	29.89 (9.35)	1.04 (0.92-1.18)	-	-
Not married	31.08 (10.34)	1.00		
Family income				
>2 minimum wage	31.81 (8.29)	1.12 (0.98-1.29)*	1.08 (0.95-1.22)	0.224
≤2 minimum wage	28.86 (10.69)	1.00	1.00	
Maternal level of education				
>8 years of study	34.08 (7.80)	1.21 (1.09-1.35)*	1.22 (1.11-1.37)	<0.001
≤ 8 years of study	28.25 (10.01)	1.00	1.00	
Number of children				
>2 children	28.03 (10.51)	0.89 (0.78-1.02)*	0.95 (0.84-1.06)	0.353
≤ 2 children	31.48 (9.05)	1.00	1.00	
MIH				
Severe MIH	24.75 (10.57)	0.75 (0.63-0.909)*	0.77 (0.65-0.91)	0.003
Mild MIH	28.52 (9.15)	0.87 (0.75-1.01)*	0.87 (0.75-0.99)	0.040
Without MIH	32.88 (8.59)	1.00	1.00	

Poisson regression; SD = Standard deviation; PR = Prevalence ratio; CI = Confidence interval; The p-value in bold indicates a statistically significant association.

DISCUSSION

In the present study, it was observed that mothers of children with MIH reported more negative perceptions of their own oral health. This finding indicates that the severity of children's MIH is directly associated with maternal self-perception of oral health, reflecting not only clinical concerns but also the emotional and psychological burden associated with managing an oral condition that compromises the child's quality of life. The literature has consistently shown that common symptoms of MIH—such as dental hypersensitivity, esthetic impairment, increased susceptibility to enamel breakdown, and selective eating—interfere with children's daily activities and well-being, with repercussions that extend to the family context dynamics.^{8,12,28,29} These challenges often demand increased parental involvement, frequent dental visits, ongoing vigilance, concerns about treatment complexity, long-term prognosis, and increased financial resources, which may intensify emotional distress among caregivers.

Moreover, oral conditions that impact family life may include school and work absenteeism, as children experiencing pain or discomfort may miss school days, while caregivers may need to miss work to attend dental appointments or manage acute episodes²⁴. This absenteeism can contribute to financial strain, reduced productivity, and heightened stress within the household²⁴, reinforcing the notion that pediatric oral conditions such as MIH are not isolated clinical issues but rather conditions with broader social and economic implications. One study highlighted the negative emotions experienced by mothers regarding their children's hypomineralized teeth, especially due to visible opacities, even when only posterior teeth were affected³⁰ emphasizing the psychosocial dimension of the condition and its effect on parental well-being.

The construct Brazilian Positive Oral Health and Well-Being (B-POHW) represents a paradigm shift in the assessment of oral health, incorporating dimensions that go beyond the mere absence of disease, such as satisfaction, self-esteem, and well-being. By considering functional, aesthetic, and psychosocial aspects, the B-POHW provides a broader understanding of how oral conditions influence the lives of individuals and their families^{19,20,22}. Within this framework, MIH emerges as a condition capable of undermining not only the child's oral health-related quality of life but also the emotional balance and self-perceived health of caregivers, particularly those who assume primary responsibility for care, usually the mothers who frequently assume the role of primary caregivers and decision-makers regarding their children's health. As a result, mothers may experience elevated levels of stress, frustration, guilt, or helplessness when faced with their children's discomfort and aesthetic concerns³⁰, which may negatively influence their own perception of health and well-being as in the results of the present work.

Another relevant finding of this study was the association between lower maternal education and more negative perceptions of oral health. This result aligns with previous evidence indicating that educational level plays a crucial role in access to health information, utilization of dental services, and adoption of preventive behaviors, ultimately influencing health perceptions and outcomes.³¹ Thus, maternal education can be considered a protective factor that favours the development of more positive perceptions of oral health.

It is important to highlight, as a limitation of this study, the use of a convenience sample, which restricts the generalizability of the findings to the broader population. However, the use of a clinical sample does not invalidate the observed associations, although caution is required when generalizing the findings. Therefore, the results should be interpreted carefully when extrapolated to other settings and populations. Despite this limitation, the statistical power analysis demonstrated that the sample size was sufficient to detect the investigated associations, reducing the likelihood of a type II error and supporting the robustness of the statistical analyses. Additionally, no clinical oral examination was performed on the mothers; only their positive self-perception of oral health was assessed. Consequently, it was not possible to determine whether this perception corresponded to their actual clinical oral health status. Future studies incorporating both subjective measures and clinical oral health assessments of mothers are needed to provide a more comprehensive understanding of the relationship between children's oral health and maternal oral health.

It is important to highlight that the results of the present study reinforce the importance of incorporating the perspective of the primary caregiver, particularly mothers, when assessing the impact of pediatric oral conditions. Although MIH is a condition that directly affects children, its impacts may extend beyond the affected individual and influence how caregivers perceive their own health. Thus, the present study broadens the understanding of the determinants of oral health self-perception by considering the potential influence of children's clinical characteristics on maternal outcomes.

From a clinical standpoint, understanding the family burden associated with MIH can support dentists in adopting more empathetic, family-centered approaches, improving communication, adherence to treatment, and long-term outcomes. Furthermore, the use of instruments such as the B-POHW enables clinicians to identify not only clinical needs but also psychosocial vulnerabilities, thereby contributing to more comprehensive and humanized care.^{20,22}

From a public health perspective, the results underscore the need for policies that recognize MIH as a condition with implications beyond oral structures, affecting family quality of life, productivity, and social well-being. Preventive strategies, early diagnosis, professional training, and equitable access to care should be prioritized within pediatric oral health programs.

Additionally, the scarcity of studies employing similar methodologies limits broader comparisons with existing literature. Nevertheless, this study adds to the growing body of evidence demonstrating that MIH has multidimensional repercussions that extend beyond clinical manifestations, influencing caregivers' perceptions of their own health. These results reinforce the importance of comprehensive, family-centered approaches in pediatric dentistry, integrating clinical care with broader public health strategies.

CONCLUSION

Mothers of children with MIH exhibited a poorer self-perception of positive oral health, particularly when their children presented severe forms of the condition. These findings suggest that the impact of MIH extends beyond the affected child, influencing maternal perceptions and well-being. Furthermore, higher maternal educational attainment was associated with a more positive perception of oral health. The results underscore the importance of adopting a family-centered approach in the management of MIH, considering not only the clinical needs of children but also the psychosocial implications for their caregivers. Understanding these broader effects may contribute to the development of more comprehensive preventive and supportive strategies aimed at improving oral health-related well-being within families.

Abbreviations

MIH

Molar Incisor-Hypomineralization

B-POHW

Brazilian version of the Positive Oral Health and Well-Being

UFMG

Federal University of Minas Gerais

ICDAS

International Caries Detection and Assessment System

Declarations

Ethics approval and consent to participate: The study was approved by the Research Ethics Committee of the Federal University of Minas Gerais (#5,955,070). All parents and children signed an Informed Consent form.

Consent for publication: Not applicable

Availability of data and materials: The datasets generated and/or analysed during the current study are not publicly available due to participant privacy and confidentiality considerations but are available from the corresponding author on reasonable request.

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Authors' contributions:

-LCS: Conceived the ideas, collected the data, statistical analysis, led the writing.

-SMP: Conceived the ideas.

- JMB: Conceived the ideas, statistical analysis;
- RGVA: Conceived the ideas, supervised the research, statistical analysis;
- MABP: Conceived the ideas, supervised the research.

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