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Knowledge, experience and perception regarding Molar Incisor Hypomineralisation (MIH) among pediatric dentists in Manaus, Amazonas

Conhecimento, experiência e percepção de odontopediatras de Manaus, Amazonas acerca da Hipomineralização Molar-Incisivo (HMI)

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ABSTRACT

To assess the knowledge and perceptions about MIH among pediatric dentists, a cross-sectional study was carried out by the application of online questionnaires to 50 pediatric dentists registered at Amazonas Council of Dentistry which were divided, according to the place of work, into two groups: Group I-Private offices, university and public service of Primary Health Care and Group II -Dentistry Specialized Centers -CEOs. Most participants were female (94.0%), with a mean age of 42.3 years (±8.3) and professional experience ≥15 years. Although almost all respondents knew MIH (98%) and performed treatment in affected patients (96%), 95.9% said they were not prepared to complete the differential diagnosis, and only 4.1% were confident in defining the treatment. The most clinical challenges faced in treating a patient with MIH were the longevity of restorations (73.5%) and tooth sensitivity (63.3%). The total mean score of the professionals' knowledge was 25.9. There was no difference between the two groups' knowledge of MIH. The perception of MIH of pediatric dentists in Manaus was good. Still, there is an urgent need to clinically train dentists about MIH to ensure confidence in diagnosing this enamel defect early.
Keywords: Dental Enamel Hypomineralization; Knowledge; Dentists.

RESUMO

Para avaliar o conhecimento e a percepção acerca da HMI entre odontopediatras, realizou-se um estudo transversal por meio da aplicação de questionários *online* a 50 odontopediatras cadastrados no Conselho de Odontologia do Amazonas, divididos, de acordo com o local de atuação, em 2 grupos: Grupo I - Consultórios privados, universitários e serviço público de Atenção Primária à Saúde e Grupo II- Centros Especializados em Odontologia - CEOs. A maioria dos participantes era do sexo feminino (94,0%), com idade média de 42,3 anos (±8,3) e experiência profissional ≥15 anos. Apesar de quase todos os entrevistados conhecerem a HMI (98%) e realizarem tratamento em pacientes acometidos (96%), 95,9% afirmaram não estar preparados para estabelecer o diagnóstico diferencial, e apenas 4,1% sentiam-se confiantes em propor tratamento. Os maiores desafios clínicos enfrentados foram a longevidade das restaurações (73,5%) e a sensibilidade dentária (63,3%). O escore médio total do conhecimento dos profissionais foi de 25,9, não havendo diferença entre os dois grupos. A percepção dos investigados acerca da HMI foi boa. Ainda assim, há urgência em treinar clinicamente dentistas para assegurar o diagnóstico precoce desse defeito de esmalte.

Palavras-chave: Hipomineralização do Esmalte Dentário; Conhecimento; Odontológos.

INTRODUCTION

Molar-Incisor Hypomineralization (MIH) is a qualitative, complex, and dynamic developmental defect of dental enamel, of multifactorial origin, with a genetic component, which affects at least one permanent first molar and may involve the incisors (BUSSANELI et al., 2022; JEREMIAS et al., 2021). The enamel of affected teeth is more porous, with lower density and mineral content, and presents inferior mechanical properties compared to healthy ones (ELHENNAWY et al., 2017). Clinically, the defect can be identified by demarcated white/cream to yellow/brown opacities, which with masticatory force, become susceptible to suffering fractures, with consequent hypersensitivity and higher prevalence of dental caries, and the affected teeth may have restorations atypical or be extracted early (AMERICANO et al., 2017; FATTURI et al., 2019; RAPOSO et al., 2019).

The presence of MIH has been reported as a strong predictor for the appearance of hypomineralization in other permanent teeth, such as canines and second molars (KEVREKIDOU et al., 2021). Therefore, it is currently recommended that the nomenclature MIH be replaced by Molar Hypomineralization (HM), which would translate the now accepted phenotype of this defect characterized by the presence of demarcated opacity in any molar, which may involve other teeth, from the deciduous or permanent dentition (DE FARIAS et al., 2022; HANAN, DE FARIAS and SANTOS PINTO, 2023; HUBBARD, PEREZ and GANSS, 2021).

Dental fear and anxiety, negative impact on quality of life, greater need for treatment and reinterventions, difficulty in achieving adequate analgesia, and aesthetic and functional compromise make MIH a challenge for patients, their guardians, and dentists (ALMUALLEM and BUSUTTIL-NAUDI, 2018; DANTAS-NETA et al., 2016; RAPOSO et al., 2019).

Early diagnosis of MIH leads to adequate treatment at an ideal time. If the early detection of MIH is carried out soon after the eruption of the affected tooth, the possibility arises of instituting preventive measures, with consequent preservation of the dental structure and greater engagement of parents/guardians and professionals in the longitudinal follow-up of the treatment of these children (VIEIRA and KUP, 2016). Late diagnosis can lead to more radical treatments, such as endodontics and extraction, considering that the severity of the defect increases with age. Thus, the best time to assess the presence of MIH is at eight years of age, when it is expected that all the first permanent molars have already erupted, as well as most of the permanent incisors (WEERHEIJM et al., 2003).

From a clinical point of view, it is essential to emphasize that marked hypomineralization in deciduous second molars increases the child's chance of presenting MIH by six times. Once diagnosed at deciduous dentition, the patients could be monitored periodically, at shorter intervals of time, until the eruption of the first permanent molars, aiming at the early diagnosis of MIH and the institution of preventive measures, with consequent preservation of the affected teeth (GAROT et al., 2018).

MIH has enormous clinical relevance, having captured the attention of dentists over the last decade. Its clinical diagnosis can still raise doubts and be very variable due to mistakes in the face of so many enamel alterations common to the dental crown, such as fluorosis and imperfect amelogenesis (TEIXEIRA et al., 2018).

Since MIH is currently recognized worldwide as a public health problem (LEAL, 2021), with an increasing incidence and global prevalence of approximately 13.1% (SCHWENDICKE et al., 2018), and the scarcity of studies in Manaus about the perception of pediatric dentists in the public and private sectors, about the factors associated with the development and clinical characteristics of the condition, it is essential to carry out a study that evaluates the knowledge and perceptions of pediatric dentists regarding MIH, to improve dental care for affected children.

METHODOLOGY

This study was designed following the guidelines of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).

Participants

After approval of this cross-sectional study protocol by the Research Ethics Committee of the Federal University of Amazonas under n.5.454.926 and authorization from the Municipal Health Secretary of Manaus, all 106 pediatric dentists registered at the Regional Council of Dentistry of Amazonas were invited to participate in the study from June to August 2022, once

all the inclusion and exclusion criteria of the research have been respected. The survey was sent to the specialist dentists by direct mail. The signature of each participant's free and informed consent term was obtained after the due explanations about the nature, objectives, benefits, and possible risks of the study.

The professionals were divided into Group I (worked in a private office/clinic, university, and public service - Primary Health Care) and Group II (worked in the dentistry specialized public service - CEOs) to compare knowledge and perception of MIH.

Individuals registered with the title of Specialist, Master of Science (MsC), or Doctor in Pediatric Dentistry who has been working in Manaus for at least six months were included. Individuals who did not sign their infomed consent term or who, for some reason, delivered the incomplete questionnaire were excluded from the study.

Assessment of demographic, socioeconomic conditions, and knowledge and perceptions about MIH

The evaluation of the participants' socioeconomic and demographic conditions was carried out through a self-administered online semi-structured questionnaire, available on the Google platform, completely free of charge, consisting of 7 questions containing information about sex, age, time of professional experience, place and time of acting, adapted from Gambetta-Tessini et al. (2016). Prior knowledge and clinical experience regarding MIH and associated enamel defects (also adapted from Gambetta-Tessini et al., 2016) were assessed using a self-administered online structured questionnaire, consisting of 13 questions about the following domains: clinical diagnosis, etiology, and treatment. Each question of the applied instrument was assigned a score totaling 36. The higher the total score, the greater the knowledge and perception of the investigated MIH.

Statistical analysis

Data were tabulated in Microsoft Excel and analyzed in the R statistical software version 4.0.2, using R studio version 1.1.4 (R Foundation for Statistical Computing, Vienna, Austria). For categorized data, frequencies, and percentages were presented. For the quantitative data analysis, the mean and the standard deviation were calculated, and the t-student test was applied when accepting the hypothesis of normality through the Shapiro-Wilk test. The chi-square test with Yates' correction and Fisher's exact test were used in categorical data analysis. The significance level adopted was 5%.

RESULTS

Out of 106 pediatric dentists invited, 56 were excluded: 18 moved to other states of the Federation; 7 started to practice a new profession; 1 had died; 7 had retired; 4 worked only in other municipalities of Amazonas; and 19 did not accept to participate, totaling 50 professionals (response rate of 47.2%), of which 94% were female, and only 6.0% were male. Respondents' ages ranged from 30 to 60 years, with a mean of 42.3 ± 8.3 years.

As for the professional training of the investigated pediatric dentists, the majority had graduated for 15 years or more (58%), from public educational institutions (70%), had specialization as their major title (72%), worked for 15 or more years (56%), predominantly in a private office or clinic (42%), public service (36%) or universities (22%). When asked if they knew what MIH was, 96% (n=49) answered yes.

The absolute and relative frequencies of the pediatric dentists' responses can be seen in Tables 1 and 2. Regarding the means of learning, 77.6% (n=38) of the professionals stated that they had obtained information about MIH in courses of improvement, 61.2% (n=30) in lectures, and 53.1% (n=26) in dentistry journals. As for the diagnosis of MIH, 61.2% said they were prepared, and 26.6% were very prepared, recognizing its clinical characteristics (79.6%). Despite this, 91.8% said they felt moderate to extreme difficulty differentiating it from other developmental defects of tooth enamel. The age considered necessary for the diagnosis of MIH was up to 8 years old by most respondents (83.7%).

Among the factors involved in the etiology of MIH, maternal and child health problems (89.8%), genetics (49%), as well as the use of medication (32.6%) and nutrition (32.6%) were the most pointed out.

Regarding contact with the defect at the clinic, 93.9% reported seeing a patient with MIH every six months (44.9%) or annually (28.6%).

As for the treatment, 42.8% feel at all or need more confidence to define adequate conduct, and 73.5% have a clinical protocol.

About the clinical challenges faced in the treatment of a patient with MIH, the most indicated were the difficulty in achieving long-term success of the restorations (73.5%), tooth sensitivity (63.3%), and aesthetics (57.1%).

Table 1 - Distribution according to the results of responses to the second part of the instrument by pediatric dentists in the city of Manaus - Amazonas.

Variables (n = 49)	**f_i**	**%**
Information source of MIH		
Graduation	12	24.5
Courses	38	77.6
Lectures	30	61.2
Dentistry magazines and/or journals	26	53.1
Internet	23	46.9
Books	24	49.0
Prepared for diagnosis		
Little prepared	6	12.2
Prepared	30	61.2
Very prepared	13	26.6
Difficulty for differential diagnosis		
No difficulty	2	4.1
Little difficulty	2	4.1
Moderate difficulty	19	38.8
Much difficulty	20	40.8
Extreme difficulty	6	12.2
Ideal age for diagnosis		
≤ 8	41	83.7
8 ---| 10	8	16.3
Clinical features of MIH		
Diffuse opacity	1	2.0
Rough enamel and affects the entire dentition	6	12.2
Opacities with smooth and rounded edge	2	4.1
Opacities at the cervical margin	1	2.0
Demarcated opacities, hypersensitivity and fractures	39	79.6
Possible etiologic factors		
Genetic	24	49.0
Environmental	20	40.8
Maternal and child health	44	89.8
Antibiotic and other drugs	16	32.6
Childbirth problems	8	16.3
Nutrition	16	32.6
Performed treatment in patients with MIH	46	93.9

Source: The authors themselves

Table 2 - Distribution according to the results of responses to the second part of the instrument by pediatric dentists in the city of Manaus – Amazonas.

Variables (n = 49)	**f_i**	**%**
Frequency of diagnosis		
Daily	2	4.0
Weekly	4	8.2
Monthly	4	8.2
Semester	22	44.9
Yearly	14	28.6
Do not know	3	6.1
Did you feel safe to establish the treatment		
I have no security	1	2.0
Unsafe	20	40.8
Very safe	2	4.1
Do not know	26	53.0
Did you have clinical protocol		
Yes	36	73.5
No	4	26.5
Protocol Type		
Preventive	8	16.3
Preventive and restorative	31	63.3
Preventive, restorative and extractions	10	20.4
Challenges regarding a tooth with MIH		
Early Diagnosis	12	24.5
Differential diagnosis	14	28.6
Anesthesia	10	20.4
Cooperation	12	24.5
Sensitivity	31	63.3
Aesthetics	28	57.1
Material selection	10	20.4
Longevity Restorations	36	73.5

Source: The authors themselves

Tables 3 and 4 compare responses to the adapted Gambetta-Tessini instrument concerning the investigated groups of professionals. There was no statistically significant difference between the groups, except for the age of the participants and in the section on information sources of knowledge about MIH.

Table 3 - Comparison of sex age, education, title and working time in relation to the groups of pediatric dentists in the city of Manaus - Amazonas.

Variáveis	Groups					
	I (n = 42)		II (n = 7)			
	f_i	%	f_i	%	Total	p
Sex						0.999*
Male	3	7.1	-	-	3	
Female	39	92.9	7	100.0	46	
Age						***0.007***
Media ± SD	41.1 ± 7.9		50.1 ± 6.9			
Institution that awarded degree						0.414*
Public	28	66.7	6	85.7	34	
Private	14	33.3	1	14.3	15	
Degree Level						***
Specialty	29	69.1	6	85.7	35	
MsC	3	7.1	1	14.3	4	
Doctor	10	23.8	-	-	10	
Years of practice						0.171*
< 10	12	28.6	-	-	12	
≥ 10	30	71.4	7	100.0	37	

Source: The authors themselves; SD: Standard Deviation; * Fisher's exact test; ** t-student test; *** It is not possible to apply the test statistic due to the restrictions of the chi-square test; fi = simple absolute frequency. P-value in bold italics indicates statistical difference at the 5% significance level.

Table 4 - Comparison of MIH perception, and clinical appearance according to study participants in relation to the groups of pediatric dentists in the city of Manaus – Amazonas.

Variables	Groups					
	I (n = 42)		II (n = 7)			
	f_i	%	f_i	%	Total	p*
Information source of MIH						
Graduation	11	26.2	1	14.3	12	0.665
Courses	35	83.3	3	42.9	38	***0.036***
Lectures	26	61.9	4	57.1	30	0.999
Dentistry magazines and/or journals	22	52.4	4	57.1	26	0.999
Internet	20	47.6	3	42.9	23	0.999
Books	21	50.0	3	42.9	24	0.999
Prepared for diagnosis						0.347
Little prepared	4	9.5	2	28.6	6	
Prepared	26	61.9	4	57.1	30	
Very prepared	12	28.6	1	14.3	13	
Difficulty for differential diagnosis						**
No difficulty	2	4.8	-	-	2	
Little difficulty	2	4.8	-	-	2	
Moderate difficulty	15	35.7	4	57.1	19	
Very difficulty	18	42.9	2	28.6	20	
Extreme difficulty	5	11.9	1	14.3	6	
Ideal age for diagnosis						0.999
≤ 8	35	83.3	6	85.7	41	
8 ---| 10	7	16.7	1	14.3	8	
Did you treated patients with MIH	39	92.9	7	100.0	46	0.999
Clinical features of MIH						
Diffuse opacity	1	2.4	-	-	1	0.999
Rough enamel and affects the entire dentition	4	9.5	2	28.6	6	0.199
Opacities with smooth and rounded edge	2	4.8	-	-	2	0.999
Opacities at the cervical margin	1	2.4	-	-	1	0.999
Demarcated opacities, hypersensitivity and fractures	34	81.0	5	71.4	39	0.620

Source: The authors themselves;* Fisher's exact test; ** It is not possible to apply the test statistic due to the restrictions of the chi-square test; fi = simple absolute frequency. P-value in bold italics indicates statistical difference at the 5% significance level

Table 4 - Comparison of MIH perception, and clinical appearance according to study participants in relation to the groups of pediatric dentists in the city of Manaus – Amazonas.

Variables	Groups					
	I (n = 42)		II (n = 7)			
	f_i	%	f_i	%	Total	p*
Possible etiologic factors						
Genetic	20	47,6	4	57,1	24	0,702
Environmental	18	42,9	2	28,6	20	0,685
Maternal and child health	37	88,1	7	100,0	44	0,999
Antibiotic and other drugs	14	33,3	2	28,6	16	0,999
Childbirth problems	8	19,0	-	-	8	0,581
Nutrition	15	35,7	1	14,3	16	0,402
Frequency of diagnosis						**
Daily	2	4,8	-	-	2	
Weekly	4	9,5	-	-	4	
Monthly	2	4,8	2	28,6	4	
Semester	19	45,2	3	42,9	22	
Yearly	12	28,6	2	28,6	14	
Do not know	3	7,1	-	-	3	
Did you feel safe to treat						**
I have no security	1	3,4	-	-	1	
Unsafe	14	33,3	6	85,7	20	
Very safe	2	4,8	-	-	2	
Do not know	25	59,5	1	14,3	26	
Have clinical protocol	29	69,0	4	57,1	33	0,825
Protocol Type						**
Preventive	8	19,0	-	-	8	
Preventive and restorative	22	52,4	5	71,4	27	
Preventive, restorative and extractions	8	19,0	2	28,6	10	
Challenges regarding a tooth with MIH						
Early Diagnosis	11	26,2	1	14,3	12	0,665
Differential diagnosis	10	23,8	4	57,1	14	0,091
Anesthesia	10	23,8	-	-	10	0,319
Cooperation	10	23,8	2	28,6	12	0,999
Sensitivity	26	61,9	5	71,4	31	0,999
Aesthetics	26	61,9	2	28,6	28	0,122
Material selection	7	16,7	3	42,9	10	0,140
Longevity Restorations	31	73,8	5	71,4	36	0,999

Source: The authors themselves; * Fisher's exact test; ** It is not possible to apply the test statistic due to the restrictions of the chi-square test; fi = simple absolute frequency. P-value in bold italics indicates statistical difference at the 5% significance level

When comparing the average of the total scores of the instrument applied among the pediatric dentists, no statistically significant difference was observed between groups I and II (p=0.408), with the general knowledge of the investigated population (mean score 25.9) considered good, as shown in Table 5.

Table 5- Comparison of the average scores of the Gambetta-Tessini instrument in relation to pediatric dentists in the city of Manaus - AM.

	Scores				
Group	n	Min.	Media	SD	Max.
I	42	12	26.2	5.4	35
II	7	22	24.2	1.5	26
Total	49	12	25.9	5.1	35

Source: The authors themselves; p = 0.408 (t-student test); SD: Standard Deviation.

DISCUSSION

This study was the first to investigate the knowledge and perception of pediatric dentists in Manaus (Amazonas) about MIH. The recognition of MIH as a clinical problem from the perspective of pediatric dentists is extremely important in approaching this condition, especially in areas where real population estimates of this defect are scarce or non-existent. Exploring dentists' awareness and knowledge of the MIH is the basis for planning treatment strategies in order to provide high-quality and efficient oral health care to children.

Knowledge of MIH is essential in clinical practice, as it is a condition that mainly affects children, with symptoms and impacts on oral health and quality of life (CARNEIRO et al., 2022). However, it is known that many families need the purchasing power to take children to private offices or clinics, thus seeking treatment in the public service, in Primary Health Care, and, in the face of greater complexity, are referred to CEOs. In Manaus, 4 CEOs are specializing in pediatric dentistry, distributed in different zones of the city, and thus named: CEO North Dr. Rubim Sá, CEO South Dr. José Fornutato de Oliveira, CEO East Dr. Jair Machado Santos da Rocha and CEO West Dr. João Luís Ribeiro Mendonça, where seven specialists work, who care for children up to 6 years old (MANAUS HEALTH MUNICIPAL SECRETARY, 2022).

In line with the data presented, it was observed in the present study that most pediatric dentists learned about MIH in improvement courses, lectures, and dentistry journals, similar to what was found with pediatric dentists in Paraíba, who reported having heard about MIH in congresses (CARNEIRO et al., 2022), considering that the academic training of professionals

from Manaus and Paraiba did well before the clinical recognition of this condition, which has been studied in the scientific literature for a relatively short time.

It is imperative to analyze the interviewees' training year since the term MIH was introduced in 2001 in Europe to describe a clinical entity, defined as systemic hypomineralization of 1 to 4 permanent first molars, often associated with incisors (WEERHJEIM, 2003). It is an enamel defect defined two decades ago; however, it was studied in Brazil for the first time around 2008, having been implemented in the curricular matrix of undergraduate courses in Dentistry in our country from 2010 onwards; therefore, many of the interviewees could still experience difficulties knowing the subject and clinically recognizing such a condition.

Early diagnosis of teeth with MIH enables the adoption of preventive measures to avoid post-eruptive fractures of the hypomineralized enamel, reducing the possibility of developing carious lesions, dentin sensitivity, and endodontic problems, among others (KUHNISCH et al., 2018). Thus, the best moment to assess the presence of MIH is at eight years of age, similar to what was observed in our study, when it is expected that all the first permanent molars have already erupted, as well as most of the permanent incisors (WEERHEIJM, 2003). Furthermore, the accurate identification of MIH is a significant factor in making appropriate management decisions and avoiding pain or other consequences of this condition. However, the challenge is confidently diagnosing MIH in the first permanent molar, particularly in young children whose permanent teeth are still erupting and where the distribution of any enamel defect may not be evident (NEGRESCU et al., 2022).

The difficulty of the differential diagnosis of MIH has been discussed in the literature and is particularly confused with amelogenesis imperfecta, fluorosis, and early carious lesions (CARNEIRO et al., 2022; CRAVEIA et al., 2020; SILVEIRA et al., 2021), agreeing with what was exposed by the vast majority of pediatric dentists in our study. In contrast, Rathi et al. (2022) investigated the knowledge of 90 pediatric dentists working in Central India, of whom 81% reported being able to differentiate MIH from other enamel developmental defects, as did most of the Norwegian dentists investigated by Skaare et al. (2021) and those working in Kuwait (ALANZI et al., 2018) and in the United States (TAGELSIR et al., 2018).

MIH presents a moderately current approach in Dentistry, constituting one of the most prevalent enamel development defects worldwide (SCHWENDICKE et al., 2018). Of uncertain etiology, it becomes a challenge for the dentist, due to its diagnostic complexity, compared to other similar conditions and its treatment, which demands exceptional care and materials that suit the peculiarities of the affected enamel (ARAÚJO, 2019).

The majority of participants selected more than one possible etiological factor that supports the common belief that MIH is a multifactorial condition with systemic, environmental and genetic components (CARNEIRO et al., 2022; FATTURI et al., 2019; GAROT et al., 2018; SAVIN et al., 2017; TEIXEIRA et al., 2018). In the present study, more than two-thirds

(approximately 90%) pointed to the mother or child's chronic/acute health disorders as essential factors in MIH (BRASHIER, 2021; SILVEIRA et al., 2021). It should also be emphasized that around 50% of the participants reported that genetic factors play an essential role in the cause of MIH, consistent with the literature (CARNEIRO et al., 2022; RATHI et al., 2021; YEHIA, ABDELAZIZ, and BADRAN, 2021). All respondents in this study seemed confident that fluoride exposure does not contribute to the MIH condition, which coincides with the survey's findings by Brashier et al. (2021). Unlike our findings, 40.5% of those investigated by Sajadi et al. (2021) and 15% of those included in the study by Upadhyay et al. (2018) pointed out fluoride as one of the causative factors of MIH.

Almost all of the investigated pediatric dentists stated that they had already seen a patient with MIH on a biannual or annual basis, corroborating the findings of Tagelsir et al. (2018), Brashier et al. (2021) and Delgado et al. (2022). Most respondents to the studies by Baroni et al.(2017), Alanzi et al. (2018), and Silveira et al. (2021) also found MIH in clinical practice, however, monthly. About 72.73% of Spanish pediatric dentists and 58% of Irish dentists stated that they attend to patients with MIH weekly in the studies by Serna-Muñoz et al. (2020) and Wall and Leith (2020).

In addition to diagnosis, the clinical management of patients with MIH is another challenge faced by many pediatric dentists. Although most respondents in the current study felt confident in diagnosing MIH, less than 5% expressed confidence in their treatment, similar to what was found by Brashier in his research (2021), where despite more than half of those investigated feeling confident in diagnosing MIH (53%), only 25% expressed confidence regarding their treatment. Iranian pediatric dentists reported needing more confidence in diagnosing and treating patients with MIH and exposed the lack of knowledge about treating this condition (SAJADI et al., 2021). In contrast, Rathi et al. (2021) and Wall and Leith (2020) observed that most pediatric dentists investigated felt confident in diagnosing and treating MIH.

Despite having an established clinical protocol, most respondents listed the longevity of restorations and tooth sensitivity as the primary clinical challenge encountered in treating patients with MIH, similar to the studies by Tegelsir et al. (2018) and Brashier (2021). There is a frequent fracture of restorations due to the porous nature of enamel with MIH, making restoration durability a critical factor, as evidenced by participant responses (UPADHYAY et al., 2018). The difficulty in behavioral management and obtaining adequate local anesthesia for patients with MIH were pointed out by Alanzi et al. (2018), Serna Muñoz et al. (2020), Wall and Leith (2020), and Skaare et al. (2021) as barriers to clinical treatment. Patients affected by MIH may have a greater need for dental treatment, which is often recurrent, compared to other children without the defect, and some of these may be anxious and uncooperative during dental care due to previous appointments where anesthesia was not satisfactorily achieved (RAPOSO et al., 2019). Another

difficulty in treating MIH pointed out by the dentists investigated by Sajadi et al. (2021) was the "difficulty in promoting esthetics", when anterior teeth are affected.

As for data related to sex, mean age, and length of professional experience, the results of this study confirm the findings of Serna Muñoz et al. (2020) and Skaare et al. (2021), respectively, in Spain and Norway. However, Yehia, Abdelaziz, and Badran (2021), when analyzing the knowledge and perception of Egyptian pediatric dentists and general practitioners, observed that two-thirds of respondents were aged 30 years or less. Unlike the present study, the predominance of males was found by Baroni et al. (2017), Tagelsir et al. (2018), Craveia et al. (2020), and Sajadi et al. (2021) among American, Italian, French, and Iranian pediatric dentists, respectively.

In the current study about knowledge related to MIH, all professionals participating claimed to have some knowledge about this condition; however, difficulties regarding the differential diagnosis were observed. According to the study by De-Deus-Moura et al. (2018), where dentists' knowledge about MIH was analyzed, similar results were found. Although they claimed to know how to diagnose the enamel defect presented, it is observed that there is still difficulty in establishing the correct diagnosis. This could be explained by the fact that the diagnosis of MIH is a complex process, requiring knowledge of the clinical characteristics of this alteration and an understanding of its classification so that other enamel alterations with similar traits are discarded.

The knowledge and perception of pediatric dentists in Manaus regarding MIH were good, in line with what was found by Tegelsir et al. (2018) and Brashier (2021), since the general average score of the applied instrument corresponded to approximately 72% of the maximum score to be obtained, with no statistical difference between the investigated groups, except about the source of information "courses improvement." Differently, Delgado et al. (2022) found a low average of knowledge among pediatric dentists in Portugal.

In the current study, there was also no association between the knowledge of pediatric dentists, age, title, and time since training and professional experience, unlike what was found by Baroni et al. (2017), Savin et al. (2017) and Craveia et al. (2020). This may have occurred due to the homogeneity in the personal and professional data (sex, title, training, and working time) of the responding specialists, despite the professionals working in the CEOs being older, in addition to the fact that most of them seek continuous updating in other sources such as lectures, internet, magazines, etc. Despite this, the investigation showed difficulties in diagnosing and treating teeth affected by MIH. Thus, as MIH is a frequent finding in the clinical practice of specialists, the importance and deepening of this theme and its evidence since graduation are highlighted, requiring continuing education and greater clinical training.

This finding is significant, as it will be the specialists working in the CEOs who will probably attend to young children, in need of more complex dental treatment or difficult behavioral management, soon after the eruption of the first permanent molars; thus, because of

the presence of MIH, they would be able to make an early diagnosis, instituting preventive measures to prevent the occurrence of post-eruptive fractures and dental caries in these teeth. Even those found exclusively in the deciduous dentition and, perhaps, present hypomineralization in the second molars and deciduous canines can be monitored because of the greater risk of developing MIH (GAROT et al., 2018). But what about those children with low purchasing power, over 6 years of age with MIH, who have more complex dental treatment or difficult behavioral management, and who cannot be assisted in CEOs, since this is the maximum age for dental care in these places, they will not have the same luck, because either they will be attended in the public network by dentists who are not pediatric dentists and probably do not have clinical experience in the diagnosis and treatment of MIH, or, if there is professional common sense, they will be referred for treatment at universities.

Within the limitations of our study, there is the sample size and non-response bias of 52.8%, which decreases the representativeness of the sample, corroborating with that of other studies with similar methodology (ALANZI et al., 2018; BRASHIER, 2021; GAMBETTA TESSINI et al., 2016; NEGRESCU et al., 2022; SERNA MUÑOZ et al., 2020; TAGELSIR et al., 2018; UPADHYAY et al., 2018). The response rate has often been considered a measure of the quality of work, but there is no scientifically accepted minimum response rate. Non-response bias, meaning that respondents do not represent the target population, is more of a problem in general population surveys than in specific groups, as in our case, dentists (SERNA MUÑOZ et al., 2020). Thus, the results may be less conclusive, requiring a more extensive confirmatory study involving other general dentists and other specialties, which is one of the recommendations of this investigation. Response rates to email surveys have declined since the late 1980s and can only approach 25% to 30% if there is no follow-up email and reinforcements (CRAVEIA et al., 2020). The increasing demand from dentists to participate in online questionnaires due to the COVID-19 pandemic and the one-time mailing could explain our low response rate between the two groups' knowledge of MIH.

CONCLUSION

Pediatric dentists in Manaus showed good knowledge about MIH, despite demonstrating a certain degree of inconfidence in the differential diagnosis and treatment of this defect. There was no statistically significant association between the understanding shown by the specialists of the two groups about MIH, regardless of sex, degree, time graduation, and professional experience. It is urgent to clinically train dentists about MIH to ensure confidence in diagnosing this enamel defect early when it can be better managed.

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