UNIVERSIDADE DE SÃO PAULO

FACULDADE DE ODONTOLOGIA DE BAURU

ALINY BISAIA

Influência da gravidade da Hipomineralização Molar-Incisivo no acúmulo de placa dentária e sangramento gengival

Influence of the severity of Molar-Incisor Hypomineralization on the accumulation of dental plaque and gingival bleeding

BAURU

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Versão Corrigida

Dissertação apresentada a Faculdade de Odontologia de Bauru da Universidade de São Paulo para obtenção do título de Mestre em Ciências no Programa de Ciências Odontológicas Aplicadas, na área de concentração Odontopediatria.

Orientadora: Profa. Dra. Daniela Rios Honório

Versão Corrigida

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"Só é possível conhecer a realidade, quando nos libertamos

destas influências culturais e sociais, ou seja,

quando saímos da caverna."

(O mito da caverna)

Platão

ABSTRACT

Influence of the severity of Molar-Incisor Hypomineralization on the accumulation of dental dental plaque and gingival bleeding

Molar-Incisor Hypomineralization (MIH) is a qualitative defect of the enamel that affects the first permanent molar and may or may not affect the permanents incisors. MIH occurs during the amelogenesis process in which there is a reduction in the percentage of the mineral matrix, making the dental enamel porous and may be susceptible to the accumulation of plaque. The aim of this study was to assess whether the severity of MHI can influence the accumulation of dental plaque in teeth with MIH. A total of 476 children between 6 and 10 years of age enrolled in municipal schools in the city of Bauru, São Paulo, were evaluated. From this, a sample of 490 permanent teeth with MIH was obtained, which were classified according to the HMI-SSS index and analyzed the visible plaque and the gingival bleeding indexes. After obtaining the data, the statistics were performed using the Binominal Logistic Regression test. The results obtained were that age and gender do not influence the accumulation of plaque in teeth with MIH, however the posterior region is 5.13 times more likely to have plaque on the dental surface and the greater the severity unit, it decreases by 9.01% of chances of the patient having dental plaque. Regarding the visible bleeding index, gender, age, and severity were not statistically relevant, but the posterior region is more likely to have gingival bleeding in 98.9% compared to the anterior region. Therefore, the results of the present study showed that the degree of severity of Molar-Incisor Hypomineralization did not influence on the presence of gingival bleeding, however patients with higher MIH index severity presented lower presence of plaque. In addition, for both outcomes (visible plaque and gingival bleeding) the posterior region was more affected than the anterior region.

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Key words: Dental plaque; Dental plaque; Dental Enamel

RESUMO

Hipomineralização Molar-Incisivo (HMI) é um defeito qualitativo do esmalte que acomete o primeiro molar permanente, podendo ou não acometer os incisivos. Ela ocorre durante o processo de amelogênese em que há uma redução da porcentagem da matriz mineral, tornando o esmalte dentário poroso, podendo ser susceptível ao acúmulo de placa. O objetivo deste estudo é avaliar se a severidade da HMI pode influenciar no acúmulo de placa dentária desses dentes. Foram avaliadas 476 crianças entre 6 e 10 anos de idade matriculadas em escolas municipais de Bauru, São Paulo. A partir disso, foi obtida uma amostra de 490 dentes permanentes com HMI, os quais foram classificados de acordo com o índice HMI-SSS e analisados usando o índice de placa visível e o índice de sangramento gengival. Após a obtenção dos dados a estatística foi realizada com o teste de Regressão Logística Binominal. Os resultados obtidos foram que a idade e o gênero não influenciam no acúmulo de placa em dentes com HMI, porém a região posterior tem 5,13 vezes mais chances de ter placa na superfície dentária e quanto maior a unidade da severidade diminui em 9,01% de chances de o paciente ter placa dentária. Em relação ao índice de sangramento visível, não teve relevância estatística o gênero, a idade e a severidade, porém a região posterior é mais provável de ter sangramento gengival em 98,9% comparado a região anterior. Portanto, os resultados do presente estudo mostraram que o grau de gravidade da Hipomineralização Molar-Incisivo não influenciou na presença de sangramento gengival, porém os pacientes com maior índice de gravidade MIH apresentaram menor presença de placa. Além disso, para ambos os desfechos (placa visível e sangramento gengival) a região posterior foi mais afetada do que a anterior.

Palavras-chave: Placa dentária; Esmalte Dentário; Dentina; Saúde Oral.

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MIH   Molar- Incisor Hypomineralization

VPI   Visible Plaque Index

GBI   Gingival Bleeding Index

SUMÁRIO

1 INTRODUCTION

1 INTRODUCTION

The Molar-Incisor Hipomineralization (MIH) was described for the first time by Wheerjim in 2001 and its definition is an enamel qualitative defect that obligatory affects the permanent first molar and might also affect the permanent incisor (WEERHEIJM et al., 2001, 2003; WEERHEIJM; JALEVIK; ALALUUSUA, 2001). For this reason, there was a significant increase in studies regarding the prevalence, etiology, and consequences of this condition. Among these topics, the presence of dental plaque is a relevant issue in MIH, since the absence of enamel and the increased porosity of this tissue increases the susceptibility to the accumulation of dental plaque, favoring the development of caries and periodontal diseases (QUIRYNEN; BOLLEN, 1995).

Recent studies about the prevalence of MIH have been carried out worldwide, indicating the occurrence of this defect in the population. Swendicke et al. (2018) published a systematic review in which the prevalence of MIH was evaluated in 43 countries, showing the importance of this enamel defect at the moment (SCHWENDICKE et al., 2018). In Brazil, studies have shown that the prevalence of MIH varies according to the geographic region where each research takes place. In São Luis-MA, for example, MIH prevalence was around 2.5%, being the lowest, while in Vila Velha-ES this condition affected 21.1% of the population, being the highest (MEDINA, 2014)(RODRIGUES et al., 2015). Hence, this enamel defect has a significant prevalence, demanding further studies about its repercussion on the overall oral health.

The etiology of MIH is still unknown; however, there are some hypotheses about its development. Among these cause, figures a possible systemic origin, prenatal and perinatal complications, disease in early childhood, use of antibiotics, genetics and even environmental

factors (WEERHEIJM, 2004)(CARVALHO; SOUZA, 2007a). Another hypothesis is that the constant use of medications during early childhood increases the chances of the patient developing molar incisor hypomineralization in the permanent dentition (BAHAR, 2018).

The MIH occurs during the amelogenesis process, stage in which the enamel is being produced. In individuals with MIH, the enamel will be produced with a lower percentage of calcium ions compared to a healthy one, figuring as a qualitative defect (CARVALHO; SOUZA, 2007b). The clinical appearance is an enamel with a located opacity varying between white/yellow and brown/opaque. In severe cases, the hypomineralized structure might wear out in areas of occlusal or masticatory impact (ELFRINK et al., 2012; FARIAS et al., 2018).

It should be noted that the porosity of the enamel, typical of this condition, expose the dentinal tubules to the oral cavity. As a result, the patient with MIH may present sensitivity, regardless of the severity of the defect (DA CUNHA COELHO et al., 2019; FATTURI et al., 2019). The consequence of this is that there may be hypersensitivity due to chemical and thermal stimuli both by food consumption and the mechanical stimuli during the oral hygiene, so teeth with MIH are more susceptible to the development of dental plaque accumulation (GAROT; MANTON; ROUAS, 2016; SILVA et al., 2016).

Dental plaque is a community of microorganisms that colonize the tooth surface, arranged tree-dimensionally and included in a extracellular matrix (BOWEN, 2002; MARSH, 2004). The formation of the oral dental plaque is initiated by the adsorption of salivary proteins, followed by the bacterial adhesion (called "planar colonization"). The increase of the number of bacteria leads to the succession of bacterial species that tolerate the anaerobic environment and produce acids as a subproduct of its metabolism. A dental plaque with low pH and with specific bacterial species is able to demineralize the tooth and cause inflammation in gingival tissues (ARWEILER; NETUSCHIL, 2016). In MIH, enamel presents higher surface roughness,

caused by the low amount of inorganic components. According to studies such as Quirynen et al. (1995), higher surface roughness increases the risk to accumulate dental plaque (QUIRYNEN; BOLLEN, 1995; CROMBIE et al., 2013). However, no study has correlated the presence of MIH with the presence of dental plaque, which is an important factor for scholar children, who form their oral microbiota in early childhood.

All in all, the lack of evidence regarding the correlation between MIH and dental plaque accumulation, the present study aims to evaluate the level of dental plaque in scholar children with MIH. There are no research showing that patients with MIH have a greater probability of developing caries lesions due to the accumulation of dental plaque on teeth with MIH, on account its porosity. Therefore, the aim of this research was to evaluate the prevalence of dental plaque in teeth of the patients with MIH.

2 ARTICLE

2 ARTICLE

The article presented in this Dissertation was written according to the Journal of Dentistry instructions and guidelines for article submission.

- **Influence of the severity of Molar-Incisor Hypomineralization on the accumulation of dental dental plaque and gingival bleeding**

Abstract

Objective: The aim of this study was to assess whether the severity of MIH can influence the accumulation of dental plaque. *Methods:* A total of 476 children between 6 and 10 years of age enrolled in municipal schools in the city of Bauru, São Paulo, were evaluated. From this, a sample of 490 permanent teeth with MIH was obtained, which were classified according to the HMI-SSS index and analyzed using the visible plaque index and the gingival bleeding index. After obtaining the data, the statistics were performed using the Binominal Logistic Regression test. *Results:* The results obtained were that age and gender do not influence the accumulation of plaque in teeth with MIH, however the posterior region is 5.13 times more likely to have plaque on the dental surface and the greater the severity unit, it decreases by 9.01 % of chances of the patient having dental plaque. Regarding the visible bleeding index, gender, age, and severity were not statistically relevant, but the posterior region is more likely to have gingival bleeding in 98.9% compared to the anterior region. *Conclusion:* The results of the present study showed that the degree of severity of Molar-Incisor Hypomineralization did not influence on the presence of gingival bleeding, however patients with higher MIH index severity presented lower presence of plaque. In addition, for both outcomes (visible plaque and gingival bleeding) the posterior region was more affected than the anterior region.

Key words: Dental Plaque; Dental Enamel, Dentin; Oral Health.

1. Introduction

Molar- Incisor Hypomineralization (MIH) is an enamel qualitative defect that occurs during the amelogenesis process and affects permanent first molars and in some cases also permanent incisors (1–3). In MIH affected tooth, the enamel presents around 5% mineral reduction and the percentage of mineral matrix has deficits of up to 19% and 20% (4–6) when compared to a healthy one, with disorganized crystals (5,7). In addition, MIH affected enamel presents between 5% to 25% more porosities and reduced microhardness in relation to non-affected enamel (8).

MIH can present different levels of severity, which will influence on enamel color and degree of porosities (9,10). It is known that porous and irregular areas are more susceptible to the accumulation of dental plaque (11). Molars with yellow-brownish opacities are more porous and have more chances to have post- eruptive breakdown when compared with white- creamy opacities (8,9), resulting in greater chances to have niches for the accumulation of dental plaque, as fractured teeth increase the irregularity of the tooth surfaces (8,11).

It is hypothesized that depending on the severity of MIH, the tooth can show more risk to accumulate dental plaque. However, there are no studies in the literature that evaluated the impact of the severity of MIH on the dental plaque accumulation. Therefore, the aim of this study was to evaluate if the degree of severity of Molar-Incisor Hypomineralization influenced the dental plaque accumulation.

2. Methods

2.1 Ethics Aspects

This study was approved by the Research Ethics Committee of Bauru School of Dentistry - University of São Paulo (CAAE 24745919.5.0000.5417).

The guardians of the research participants were informed in appropriate language about the objectives and methods of the research and provided written informed consent.

2.2 Study Design

This research was a cross-sectional study. The population-based study was composed of all children aged 6 to 10 years enrolled in urban public elementary schools in the city of Bauru, São Paulo ($n = 7,026$). To estimate the number of children needed for this study, the formula described by Naing et al., (2006): (n) = [Z 2 x P (1-P)] / d2, in which: z = 1.96; d = 5% and P = 17.6% was used. The prevalence used to calculate the sample was described in a study carried out in Brazil by Costa Silva et. al. (2010), who found a prevalence of HMI in the urban area of 17.6%. For this study, a total of 476 children with Molar-Incisor Hypomineralization of four schools, which were eventually distributed in North, South, East, and West regions of Bauru, and a total of 490 teeth with MIH was evaluated.

2.3 Calibration

The calibration was initially performed using photographs of teeth with MIH, showing different levels of severity of the defect by the index proposed by CABRAL et al.(2020), MIH-SSS index. In addition, pictures of teeth affected by other enamel defects (Amelogenesis, Hypoplasia and Fluorosis) were included, to reduce the risk of overestimating the diagnosis of MIH. All photographs were reevaluated by one examiner after 15 days and there was intra examiner agreement greater than 85%.

In a second step, 20 patients of the Pediatric Dentistry Clinic of Bauru School of Dentistry were submitted to a clinical examination. The evaluation was repeated after 15 days to certify that the training and calibration of the examiner were satisfactory, in accordance with the index proposed for the epidemiological studies on MIH. The clinical evaluation also achieved a substantial Kappa agreement value greater than 85%.

The MIH- SSS index is described below (12):

0- Normal enamel translucency.

1- White/creamy opacity. White/creamy demarcated opacity involving an alteration of enamel translucency.

2- Yellow/brown opacity. Yellow/brown demarcated opacity involving an alteration of enamel translucency.

3- Post-eruption breakdown restricted to enamel. Defect indicates loss of enamel structure after tooth eruption. Defect is associated with white/creamy opacity.

4- Post-eruption breakdown restricted to enamel. Defect indicates loss of enamel structure after tooth eruption. Defect is associated with yellow/brown opacity.

5- Post-eruption breakdown with exposed dentin. Defect with exposure of dentin. The dentin is hard.

6- Post-eruption breakdown with exposed dentin. Defect with exposure of dentin. The dentin is soft.

7- Atypical restoration without marginal defect. Size and location of restoration are atypical. Opacity may be detected at the border of the restoration.

8- Atypical restoration with marginal defect. Size and location of restoration are atypical. Opacity may be detected at the border of the restoration. Secondary caries or faulty restoration margins.

9- Extraction due to MIH. Diagnosis based on the absence of a first permanent molar, and on the presence of demarcated opacities with or without post-eruption breakdown in other first molars or incisors.

10- Unerupted cannot be examined.

2.4 Visible Plaque Index (VPI)

The visible plaque index (VPI) was assessed by visual inspection, without the use of dyes to show dental plaque on the buccal surfaces of permanent first molars and upper permanent central incisor and upper permanent lateral incisor; lower permanent central incisor and lower

permanent lateral incisor (13). Score 0 was given for absence and 1 for the presence of dental plaque. .

2.5 Gingival Bleeding Index (GBI)

The gingival bleeding index was also assessed. The presence or absence of gingival bleeding was assessed using the WH CPI- Community Periodontal Index probe (sphere-shaped tip, 0,5mm in diameter) on the buccal surfaces of permanent first molars and permanent incisors (upper central incisor and upper lateral incisor; lower central incisor and lower lateral incisor), according to the criteria of Ainamo and Bay (14) . In cases where bleeding occurs up to 10 seconds after probing, a score of 1 (gingival bleeding) was considered. When bleeding was not observed, it corresponded to score 0 (absence of gingival bleeding).

2.6 Clinical examination

Considering that some children had previously brushed their teeth at home and others had not, the present study has standardized that all participants brushed the teeth prior to evaluation with a toothbrush and a standard amount of fluoride toothpaste simulating their home toothbrushing. Then, examiners evaluated the teeth gently dried with a gauze, with artificial light, a dental mirror, and a dental explorer. The MIH diagnosis for each volunteer was recorded. Other two examiners rated plaque and bleeding index.

Children under 6 years old and over 10 years old, children whose guardians did not provide written informed consent, and patients that did not have 4 permanent first molars with at least one of them presenting MIH were excluded from the sample.

2.7 Statistical analysis

Binominal logistic regression analysis was conducted using main background factors and the parameters that had significant associations ($p > 0.05$) in the analysis, 95% confidence interval was considered and level of significance were reported and compared in all models (plaque and bleeding). The MIH did not enter the analysis, due to the relationship of collinearity with the severity. In the analyses the plaque and bleeding were considered a dependent variable and the independent variables were age, sex, region, and severity. Statistical analysis was performed with SigmaPlot version 12.3 (2011 Systat Software, Germany).

3. Results

A total of 476 children were analyzed, being 248 girls and 228 boys, the average age was around to 8 years old and sample standard deviation around 1.37. A total of 490 teeth with Molar- Incisor Hypomineralization was obtained: with 108 permanent incisors (region anterior) and 382 first permanent molars (region posterior). Figure 1 shows the distribution of teeth in percentage according to the severity of MIH. The HMI-SSS index 2 (yellow/brown opacity involving an alteration of enamel translucency) showed the highest percentage (50%) and the HMI-SSS index 3 (post-eruption breakdown restricted to enamel associated with white/creamy opacity) the lowest percentage (0.41%). The presence of dental plaque and gingival bleeding according to the distribution of MIH severity in each tooth is presented on Figure 2 and Figure 3, respectively.
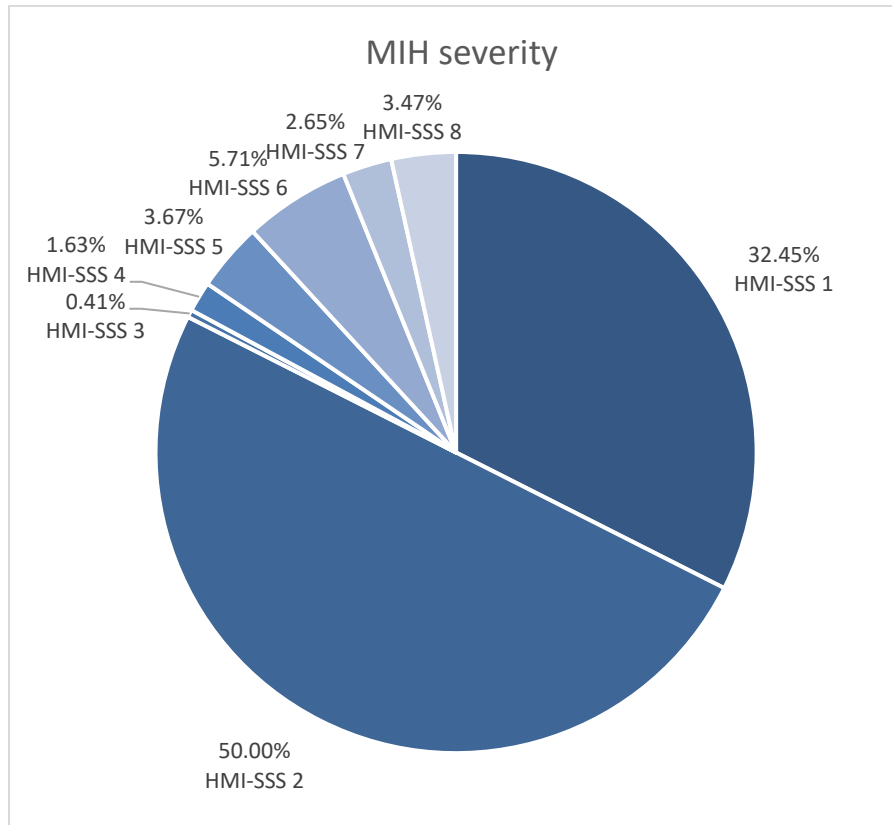
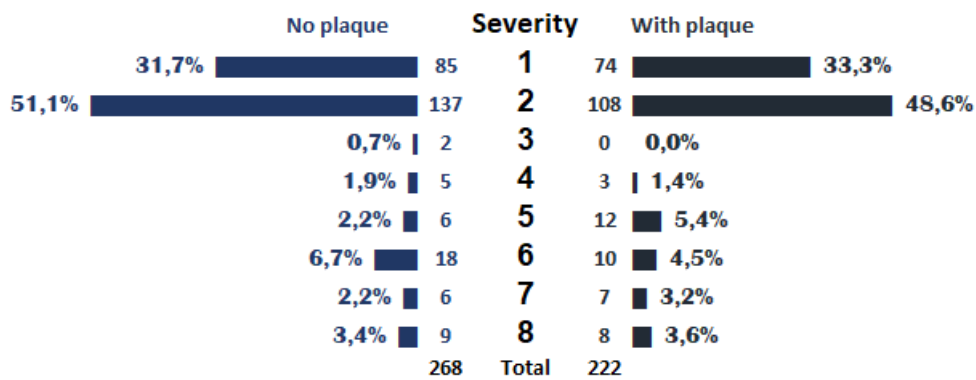**Figure 1.** Percentage of the distribution the MIH severity.

Figure 2. Relationship between accumulate of plaque and the levels of severity in percentage.
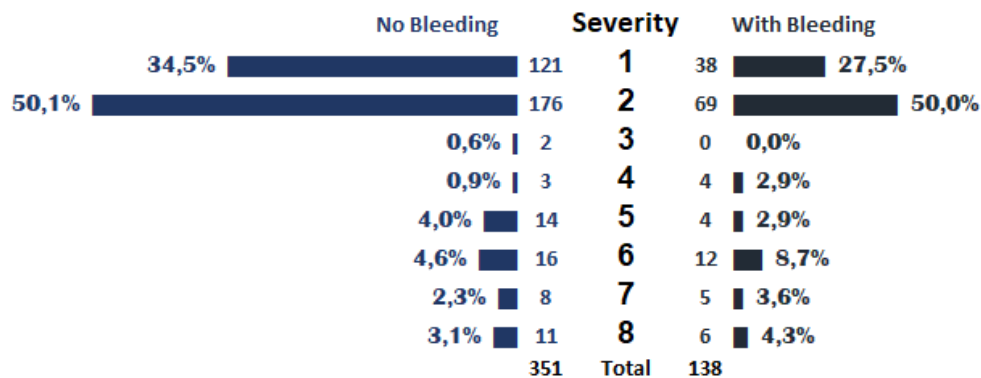
Figure 3. Relationship between bleeding and levels of severity in percentage.

The evaluation of the impact of age, gender, tooth region and levels of MIH severity on the presence of dental plaque (Table 1) showed that the gender and age had no influence; and the posterior region was 5.13x more likely to have plaque than the anterior region. Additionally, patients with higher index severity presented lower presence of plaque, with a decrease of 9.01% of plaque index for each level of severity.

Table 1. Statistics results (p values) for plaque accumulation. All testes assumed level of significance of 95%.

Predictor	Estimate	SE	Z	p	Odds ratio	95% Confidence Interval	
						Lower	Upper
Intercept	-0.99619	0.6528	-1.5260	0.127	0.369	0.103	1.328
Region:							
posterior – anterior	1.63588	0.2533	6.4581	< .001	5.134	3.125	8.435
gender:							
M – F	0.17414	0.1953	0.8917	0.373	1.190	0.812	1.745
age	0.00631	0.0705	0.0895	0.929	1.006	0.876	1.155
severity	-0.10420	0.0520	-2.0054	0.045	0.901	0.814	0.998

Note. Estimates represent the log odds of "plaque = S" vs. "plaque = N"

Regarding the GBI index, the gender, severity, and age had no influence on the presence of gingival bleeding (Table 2). The results showed that posterior region is 98.9% more likely to have bleeding than the anterior region (Table 2).

Table 2. Statistics results (p values) for bleeding index. All testes assumed level of significance of 95%.

Predictor	Estimate	SE	Z	p	Odds ratio	95% Confidence Interval	
						Lower	Upper
Intercept	-2.1513	0.7057	-3.0486	0.002	0.116	0.0292	0.464
region:							
posterior – anterior	0.6876	0.2873	2.3934	0.017	1.989	1.1326	3.493
gender:							
M – F	-0.0168	0.2082	-0.0807	0.936	0.983	0.6539	1.479
age	0.0621	0.0753	0.8248	0.409	1.064	0.9180	1.233
severity	0.0621	0.0539	1.1521	0.249	1.064	0.9574	1.183

Note. Estimates represent the log odds of "bleeding = S" vs. "bleeding = N"

4. Discussion

When bleeding index outcome was considered, the present study showed no correlation between MIH severity and dental plaque. On the other hand, visual plaque index outcome presented an inverse relation with MIH severity, with less plaque for the severe cases of MIH, contrary to the literature (15,16). Two previous studies evaluated the plaque index before and after restorations in teeth affected by MIH with different levels of severity and sensitivity and found out that high degrees of severity increases the chances of sensitivity in affected teeth, consequently, favoring dental plaque accumulation (15,16).

A possible explanation to the unexpected result found in the present study regarding visual plaque is the method used.

In our study we used a new MIH severity scoring system (MIH-SSS) which provides detailed information about MIH severity according to its clinical characteristics into 9 codes. However, in previous study, severity was divided into only 3 codes and the moderate stage of the classification (16,17), categorizes demarcated opacities without post-eruptive breakdown in the same code of post eruptive breakdown, which can have different impacts on plaque accumulation. In addition, our sample was mainly composed by low severity MIH (around 80% of MIH-SSS codes 1 and 2), without post-eruptive enamel breakdown, what could have influenced the results.

The dental plaque accumulation was also measured using different methodologies, Ebel at al. (2018), and Fütterer et al. (2019), used Quigley Hein Index, which evaluates plaque distribution from degrees 1-5 after applying a plaque revelator. Our study evaluated only the presence or not of dental plaque by visual examination, which might have not detected differences in the amount and localization of dental plaque among MIH severity groups (18). Dental plaque indexes have the limitation of being evaluated only one time, what can have an impact on whether or not the toothbrushing was performed only on the day of exam, not considering the daily oral hygiene practcess. To reduce this bias, toothbrushing was performed by the children previously to the exam to standardize the condition of the participants. In addition, bleeding gingival index was also considered an dependent variable for the regression analyses, since gingivitis corresponds to a long-term indicator of inadequate oral hygiene and presence of inflammation (20).

According to Raposo et.al. (2019), the prevalence of sensitivity is around 34.7% in teeth with MIH, nevertheless, the author concluded that lower sensitivity was prevalent in mild cases of MIH (29.8%) (20). In our study, most of the participants presented opacity without loss of

structure as a symptom of MIH, therefore the chances of these patient having sensitivity were considered lower. Although, the sensitivity of the participants was not evaluated in the present study, 82.45% of the sample presented mild cases of MIH with only opacities on enamel without structure loss, indicating that major percentage of these participants probably did not suffer from pain during brushing (20,21).

Three previous studies concluded that teeth located in posterior region are more apt to accumulated plaque than anterior region and in the present study this result was observed (18,22,23). Such difference between posterior and anterior region may attributed to the difficulty of accessing and visualizing the posterior region as compared to the anterior region during toothbrushing (19,23). Regarding age, the present study showed no statistical difference between older and younger children, even though previous studies presented different findings. Age has been previously associated with brushing improvements, due to slight variation in age difference and the development of manual dexterity as children become older (22). In addition, the standard deviation of age was considerably low (1.37), showing a small variability in the age of the sample, resulting in the absence of statistical difference. This present study has some limitations, due to the lack of measurement of the sensitivity of individuals with MIH and for not having assessed the presence of dental plaque in the development of caries, assessing whether patients with MIH are more likely to have caries development.

5. Conclusions

The results of the present study showed that the degree of severity of Molar-Incisor Hypomineralization did not influence on the presence of gingival bleeding, however patients with higher MIH index severity presented lower presence of plaque. In addition, for both outcomes (visible plaque and gingival bleeding) the posterior region was more affected than the anterior region.

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3 DISCUSSION

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There are many studies that positively relate to MIH and the development of caries lesions (WEERHEIJM; JALEVIK; ALALUUSUA, 2001; LYGIDAKIS et al., 2010; AMERICANO et al., 2017). However, if the current concepts of caries disease are considered, may be concluded that the presence of dental plaque may not be correlates with the highest risk of caries, as the dental plaque may be present and be in balance with the oral environment, being cariogenic from the moment that imbalance occurs with the consumption of sucrose (PALARETI et al., 2016) . Thus, the presence of dental plaque itself is not the reason for assessing whether children are in the risk group for dental caries.

When bleeding index outcome was considered, the present study showed no correlation between MIH severity and dental plaque. On the other hand, visual plaque index outcome presented an inverse relation with MIH severity, with less plaque for the severe cases of MIH, contrary to the literature (EBEL et al., 2018; FÜTTERER et al., 2020). Two previous studies evaluated the plaque index before and after restorations in teeth affected by MIH with different levels of severity and sensitivity and found out that high degrees of severity increases the chances of sensitivity in affected teeth, consequently, favoring dental plaque accumulation (EBEL et al., 2018; FÜTTERER et al., 2020). A possible explanation to the unexpected result found in the present study regarding visual plaque is the method used.

In our study we used a new MIH severity scoring system (MIH-SSS) which provides detailed information about MIH severity according to its clinical characteristics into 9 codes. However, in previous study, severity was divided into only 3 codes and the moderate stage of the classification (WRIGHT, 2015; FÜTTERER et al., 2020), categorizes demarcated opacities without post-eruptive breakdown in the same code of post eruptive breakdown, which can have

different impacts on plaque accumulation. In addition, our sample was mainly composed by low severity MIH (around 80% of MIH-SSS codes 1 and 2), without post-eruptive enamel breakdown, what could have influenced the results.

The dental plaque accumulation was also measured using different methodologies, Ebel at al. (2018), and Fütterer et al. (2019), used Quigley Hein Index, which evaluates plaque distribution from degrees 1-5 after applying a plaque revelator. Our study evaluated only the presence or not of dental plaque by visual examination, which might have not detected differences in the amount and localization of dental plaque among MIH severity groups (SCHULZ-WEIDNER et al., 2021). Dental plaque indexes have the limitation of being evaluated only one time, what can have an impact on whether or not the toothbrushing was performed only on the day of exam, not considering the daily oral hygiene practcess. To reduce this bias, toothbrushing was performed by the children previously to the exam to standardize the condition of the participants. In addition, bleeding gingival index was also considered an dependent variable for the regression analyses, since gingivitis corresponds to a long-term indicator of inadequate oral hygiene and presence of inflammation (RAMBERG; LINDHE; GAFFAR, 1994; SREENIVASAN; PRASAD, 2017).

Raposo et.al. (2019) did a study evaluating sensibility and according this study, the prevalence of sensitivity in is around 34.7% in teeth with MIH, 78.7% of the total sample had a mild cases MIH, being 29.8% of the mild cases MIH had sensitivity (RAPOSO et al., 2019a). As in this study previously carried out, in our study, 82.45% of the participants presented opacity without loss of structure (Figure 1), therefore the chances of these patient having sensitivity were considered lower, according Raposo et al. (2019). Although, did not measure the sensitivity of the participants, most of the sample presented mild cases of MIH with only an opacity of enamel, indicating that

these participants did not suffer from pain during brushing (KÜHNISCH et al., 2018; RAPOSO et al., 2019a). Americano et al. (2016) , made a systematic review on MIH and dental caries, in which the author explanation that MIH severity influences tooth brushing, and therefore plaque accumulation (AMERICANO et al., 2017). Although, the present study showed that there is no statistical difference between the accumulation of plaque and the severity of the enamel defect. This can be justified by the fact that the most population with MIH has low severity, as showed in some sample studies on MIH(DA COSTA-SILVA et al., 2010; RAPOSO et al., 2019b; HUMPHREYS; JARAD; ALBADRI, 2021).

Three previous studies concluded that teeth located in posterior region are more apt to accumulated plaque than anterior region and in the present study this result was expected (RAZAK, 1985; DAS; SINGHAL, 2009; SREENIVASAN; PRASAD, 2017). Such difference between posterior and anterior region may attributed to the difficulty of accessing and visualizing the posterior region as compared to the anterior region during toothbrushing (RAZAK, 1985; SREENIVASAN; PRASAD, 2017). Regarding age, the present study showed no statistical difference between older and younger children, even though previous studies presented different findings. Age has been previously associated with brushing improvements, due to slight variation in age difference and the development of manual dexterity as children become older (DAS; SINGHAL, 2009). In addition, the standard deviation of age was considerably low (1.37), showing a small variability in the age of the sample, resulting in the absence of statistical difference. This present study has some limitations, due to the lack of measurement of the sensitivity of individuals with MIH and for not having assessed the presence of dental plaque in the development of caries, assessing whether patients with MIH are more likely to have caries development.

4 CONCLUSION

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The results of the present study showed that the degree of severity of Molar-Incisor Hypomineralization did not influence on the presence of gingival bleeding, however patients with higher MIH index severity presented lower presence of plaque. In addition, for both outcomes (visible plaque and gingival bleeding) the posterior region was more affected than the anterior region.

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