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Prevalence, Severity, and Correlation Between Dental Caries, Fluorosis, and Molar Incisor Hypomineralization among Children Aged 7 to 12 in Mehsana, Gujarat

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KEYWORDS	ABSTRACT:	
MIH (Molar Incisor Background: Molar Incisor Hypomineralization (MIH) is a clinical term that		
Hypomineralization),	systemic abnormality involving either or all First Permanent Molars (FPMs) and is	
Dental Fluorosis,	frequently associated with impacted incisors. It may have a substantial impact on the	
Dental Caries, and	quality of life of those influenced. MIH enamel defects are suggested to be the result of	
First Permanent	multifactorial process. Early identification of this defect is crucial because impacted	
Molars	teeth typically demonstrate post-eruptive breakdown, which is associated with a	
	predisposition for rapid caries progression and it is necessary to prevent future	
	complications. There have been very few studies examining the prevalence of MIH in	
	Indian populations, and there are no statistics accessible for the people of North Gujarat.	
	Aim: To examine the rate of occurrence, severity of MIH and Caries experienced by	
	children among the age group of 7 to 12 years belonging to community of Mehsana	
	region in Gujarat state of India.	
	Study Design: A descriptive cross-sectional study.	
	Material and Methods: Multistage sampling technique was utilized to examine the	
	prevalence, severity, and dental caries among 700 children, between age group of 7 to 12	
	years from the Mehsana district, Gujarat. Permanent first molars and incisors, which	
	function as index teeth, were checked using sterilized diagnostic equipment under direct	
	sunlight vision. The standards established by European Academy of Pediatric Dentistry	
	(EAPD) in 2014 were utilized for MIH diagnosis.	
	Result: MIH prevalence observed was found to be about 8.14 % in endemic Fluorosis	
	district of Gujarat with no gender predilection. MIH is often reported and linked to an	
	increased incidence of caries in permanent dentition and there is no noticeable	
	correlation between MIH and fluorosis.	
	Conclusion: MIH was significantly associated with the increased risk for dental caries	
	that will emphasizes the need for early diagnosis, prevention and control subsequent	
	dental caries and no statistically significant association between MIH and Fluorosis.	

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Introduction

Dental enamel is unique among mineralized tissue in that once produced, it cannot be altered, in contrast to other hard tissues like bone. Enamel has non-remodeling character, changes to it during its formation are permanently imprinted on the tooth surface.¹

The worldwide decline in dental caries has prompted academics and physicians to investigate and identify additional disorders that were previously missed. Non-fluoride- associated developing dental abnormalities have been recognized as an emerging clinical concern over the last few decades. These anomalies, marked by discolored opacities or a total loss of enamel, are most likely to impact the FPMs, with or without adversely affecting the permanent incisors.²

White to yellow-brown enamel opacities in FPMs were observed in Sweden in the late 1970s. MIH was the MIH prevalence ranged from 2.4 in China to 44% in Sydney.^{7,8} Most of the initial MIH prevalence investigations have been conducted in Europe. MIH occurrence in North European countries is in the range of 3.6% to 37.3%. Finland and Denmark have the greatest prevalence rates, with studies in Sweden, Germany, and England finding percentages ranging from 10 to 18%.⁹ Prevalence statistics from low-income nations such as India were few; a few studies estimated a prevalence ranging from 6.31 to 9.46%.⁶

MIH prevalence data for India is limited, especially from endemic Fluorosis areas. Thus thecurrent study attempts to ascertain the occurrence and MIH severity among children in the age group of 7 to 12 years, in Fluorosisaffected Mehsana area, as well as its correlation with cariesand Fluorosis.

Material and Methods

The Institutional Review Board of Narsinhbhai Patel dental college and hospital, Visnagar gave its ethical permission before the current cross-sectional descriptive study was conducted.

Study Population: The study population comprised of 700 (352 boys and 348 girls) 7 to 12 year-old school children belonging a Fluorosis endemic area of Mehsana City in Gujarat district, Gujarat.

Subject selection: The city was separated into three distinct zones: north, middle, and south. Two schools (one public and one private) were selected at random from each zone.

name given to this ailment later on.³ MIH was devised by Weerheijm et al. (2001) to characterize a systemic hypomineralization either or all FPMs, which may be commonly linked with afflicted incisors. ⁴

MIH is described as enamel hypomineralization of unknown aetiology in either or all FPMs, typically in association with impacted incisors, by the EAPD. Similar irregularities have been seen in second primary molars, permanent incisors, and permanent canine points in a recent research.³

The appearance of the enamel of MIH molars is similar to Dutch cheese or crumbly, discolored chalk. It is possible to spot demarcated opacities next to the enamel that have a distinct and well-defined boundary. MIH is linked to brushing hypersensitivity and unexpectedly rapid caries development in developing first permanent molars.⁵



Inclusion criterion: Hypomineralization of at least one FPM and/or incisor to one-third of clinical crown height, Hypomineralization was not generalized or spread, and opacities along the border or on other surfaces persisted. FMP with cavities, opacities not caused by trauma or disease, Restoration, or Posteruptive enamel breakdown (PEB).

Exclusion criterion: Children with Amelogenesis or Dentinogenesis Imperfecta, Hypoplasia, Diffuse opacities, White spot lesion, Tetracycline staining and Non-vitality.

Approval from government and private school authorities was obtained as well as parental consent. The inclusion criterion was used to select children for the research. Children with additional enamel abnormalities were not eligible.

Study setting and data collection: According to EAPD 2015 recommendations, four FPMs and eight permanent incisors were examined orally by a well-trained,

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qualified examiner utilizing the diagnostic instruments.⁹ (Table 1)

The charting style is separated into two sections:

- The clinical visual appearance of enamel deficiencies (Clinical status assessment)
- The surface area of the impacted tooth. (Criteria for lesion extension)

Association between MIH as well as caries in the permanent dentition was evaluated withDMFT index.

Statistical Analysis

SPSS version 20.0 for Windows was used to analyses the data. The rate of occurrence as well as distribution of clinical recordings were investigated using a descriptive analysis. To compare groups, the chi-square test and Pearson correlations were utilized. For any tests, a p-value of 0.05 or less was classified as statistically significant.

Result

In all, 700 children among age bracket of 7 to 12 years The mean value of DMFT in MIH-affected children was 0.7, while in non-MIH children it was 0.34, indicating a significant positive correlation between MIH and dental caries. Concerning the association between the MIH and Fluorosis, 14% Fluorosis affected children were part of the study. A total of 57 individuals were found to have MIH-affected teeth, with a prevalence level of 8.14%. The mean age of the children was 1:0.96 years with 50.28 % boys and 49.71 % girls. Statistically significant gender variances were not observed in MIH prevalence. Among them 8.2 % were male and 8 % were female (Table 1) and it was more frequently found in children who were below the age of 10 years but was found to be not statistically significant. (Table 2). The prevalence of MIH did not significantly increase with the age.

Among the 8.14% of children with MIH, 3.4% had Moderate MIH, which was greater but not statistically significant.

There is a significant relation is observed in MIH affected children between Caries present in FPM and Caries absent in FPM, Caries is present in first permanent molar (63.2%) and not present in (36.8%) in MIH affected population which is statistically significant .(p - value = 0.00, Table 3)

experienced MIH and 23 % Fluorosis affected children were not affected with MIH. The result shows that prevalence of Molar incisor hypomineralisation is not associated presence Fluorosis.(Graph 1)

	Clinical Status Criteria		
0	No visible enamel defect		
	Enamel defect, non-MIH/HSPM		
	11 = diffuse opacities		
1	12= hypoplasia		
	13 = amelogenesis imperfect		
	14= hypomineralisation defect (not MIH/HSPM)		
	Demarcated opacities		
2	21 = White or creamy demarcated opacities		
	22 = Yellow or brown demarcated opacities		
3	Post-eruptive enamel breakdown (PEB)		
4	Atypical restoration		
5	Atypical caries		

Table 1: MIH Criteria (Ghanim A et al, 2015)

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6	Missing due to MIH/HSPM			
7	Cannot be scored*			
Lesion extension criteria (only after diagnosing MIH/HSPM, i.e. scores 2 to 6)				
Ι	Less than one third of the tooth surface affected.			
II	At least one third but less than two thirds of the surface affected.			
III	At least two thirds of the tooth surface affected.			

Table 2: Intergroup Gender wise comparison for prevalence of MIH

Gender	MIH – non affected Children	MIH – affected children	Total	p value
Male	323(91.8%)	29 (8.2%)	352	
Female	320(92%)	28 (8%)	248	0.926 NS
Total	643(91.9%)	57(8.1%)	700	

Table 3: Intergroup Age-wise comparison for prevalence of MIH

Age group	MIH -non affected Children	MIH – affected children	Total	p value
≤ 10 years	425 (91.6%)	39 (8.4%)	464	
> 10 years	218(92.4%)	18 (7.6%)	236	0.772
Total	643 (91.9%)	57 (8.1%)	700	NS

Table 4: Intergroup comparison of MIH and Caries

MIH	Caries present FPM	Caries absent FPM	Total	p value	
Non affected children	151 (23.5%)	492 (76.5%)	643		
Affected children	36 (63.2%)	21 (36.8%)	57	0.000 S	
Total	187 (26.7%)	513 (73.3%)	700		



Figure 1: Intergroup comparison of MIH and Fluorosis

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Figure 2: Judgment criteria for MIH Diagnosis				
Weerheijm et al. (2001) ¹⁰ Diagnostic Criteria for MIH are based on Judgment				
Demarcated opacities in enamel of molars and incisors				
Post-eruptive breakdown of molars and incisors				
Atypical restorations in molar				
Molar extraction due to MIH				

Discussion

MIH is a widespread condition that affects single teeth or groups of identical teeth all over the world. (Figure 2)¹⁰. Early detection of MIH is critical because afflicted teeth typically exhibit post-eruptive enamel breakdown, resulting in fast caries development and discomfort.¹¹ Despite the significance of early detection, MIH prevalence statistics from endemic Fluorosis areas in India are few. Therefore, this research was undertaken to determine the rate of occurrence of MIH in the endemic fluoride-affected area in the district of Mehsana.

The current study assessed the prevalence, severity, and relationship between dental caries and fluorosis in children aged 7 to 12 years. This age group was chosen

because, within this age group, at least one of the first molars would have erupted, reducing the likelihood of an enamel defect being concealed by a large carious lesion later in life. Due to the difficulties in predicting, the unerupted teeth were regarded to have no defect, which may have resulted in an underestimating of the occurrence in the present population.

In the present study, EAPD 2014 guidelines were used and found the prevalence of Mehsana district was 8.14% which is lower than study conducted in Gandhinagar, Gujarat.¹² The wide variations in MIH prevalence rates may reflect genuine disparities across areas and nations, as well as changes in sample sizes, indices, diagnostic criteria, and recording techniques utilized, as well as age ranges/special groups www.jchr.org

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The severity of defects was classified into mild, moderate and severe defects and the great majority of the affected teeth revealed moderate defect which is not significant and severity of MIH was not significantly increased with increasing age both are contradictory to other studies. ^{12, 17}

Dental caries in FPM was higher among MIH affected children (63.2%) as compared to MIH non affected children (23.5%) which is parallel with study by Farias L et al (2021) and similar range were result found by Leppaniemi et al (2001) Caries in FPM 40% (In MIH) while 32% (In Non MIH).²¹

There is no significant relationship between Fluorosis and the effect of MIH among this population analogous to Duarte MB et al (2022) and other studies $^{22-23}$

Conclusion

MIH prevalence was found to be 8.14% in the age group of 7 year to 12-year-old childrenof Mehsana district with no bias among genders. MIH is substantially connected with an elevated incidence of caries, emphasizing the importance of early detection, prevention, and treatment of future dental caries. There is no statistically significant link between MIH and fluorosis.

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In this study it was observed that there was no gender disparity with regard to MIH, which is consistent with previous authors' findings.^{12,17-19} In terms of age distribution, children under the age of 10 years had a greater MIH prevalence (12.1%) than children over the age of 10 years, according to a research done in Udaipur.¹⁷

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