



Prevalence of Molar Incisor Hypomineralization (MIH) in Primary School Children in Colombo District, Sri Lanka

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ABSTRACT

Molar Incisor Hypomineralization (MIH) is a condition associated with hypomineralization of the enamel affecting 1-4 permanent first molars and incisors, and doubtful in origin. Clinically, MIH presents as demarcated opacities at the time of the eruption, leading to post-eruptive breakdown and high caries incidence. The global prevalence of MIH ranges from 2.4 to 40.2%. The present study aimed to determine the prevalence of MIH among primary school children in the Colombo district and describe the pattern of disease involvement. All the students in Grade 3, aged 8 years, in randomly selected 20 schools in the Colombo district were examined by a single dentist. MIH was identified and recorded according to the European Academy of Paediatric Dentistry (EAPD) judgment criteria published in 2003. The sample consisted of 1161 children; 638 (54.9%) were girls and 523 (45.1%) were boys. MIH was diagnosed in 118 (10.2%, 95% CI 9.3 – 11.1); 61 (51.7%) girls, and 57 (48.3%) boys. Sex is not an associated factor for MIH ($p > 0.05$, chi-square test). The number of first permanent molars affected with MIH was higher than permanent incisors. The first incisors are more frequently affected compared to the second permanent incisors. The observed prevalence of MIH was comparable with the reported regional prevalence rates and MIH is a relatively common condition. Early diagnosis and management of MIH are important in preventing complications. In-depth studies with more representative samples are important.

KEYWORDS: *Molar Incisor Hypomineralization, Hypomineralization, First permanent molars, Prevalence of Molar incisor hypomineralization*

1 INTRODUCTION

Molar Incisor Hypomineralization (MIH) is a qualitative structural defect of the enamel (Silva et al. 2019). It affects one to four first permanent molars and seldom involves permanent incisors (Garg et al. 2012; Weerheijm et al. 2003). The latest data indicates that MIH is a frequent and serious dental ailment in children who are under the age of 10 years (Zhao et al. 2018).

The condition affects the person's appearance with whitish-yellow or yellowish-brown discoloration from the eruption. Affected molars can later undergo post-eruptive enamel breakdown due to occlusal loading. Structural defects of enamel associated with MIH are leading to rapid development and progression of caries. Hypersensitivity associated with the condition discourages teeth brushing and creates difficulties in management (Alaluusua 2010). In certain cases, the progression of the carious lesions without the child's or parent's knowledge would lead to extensive loss of tooth substance. Early detection is of utmost importance to prevent these deleterious complications. Having an idea about the incidence of MIH is thus important to plan early detection and implementing secondary prevention at the community level.

Possible contributory causes of MIH are prenatal, perinatal, and postnatal illnesses, maternal illness, smoking and alcohol use during pregnancy, low birth weight, complications during delivery, Post-Traumatic Stress Disorder, antibiotic consumption, and toxins from breastfeeding, asthma, pneumonia, respiratory infections, otitis media, tonsillitis and chickenpox (Caufield et al. 2012; da Costa-Silva et al. 2010; Silva et al. 2016). In addition, socioeconomic status is also claimed as an associative factor for MIH (Wuollet et al. 2018). More recent evidence has suggested that a combination of multiple factors may affect ameloblasts, resulting in abnormal enamel

formation and leading to MIH (Hernandez et al. 2016).

The universal prevalence of MIH ranges from 2.4% to 40.2%. The prevalence in Southeast Asian countries varied from 7.3% to 20.2% (Allazzam, Alaki and El Meligy, 2014; Padavala et al. 2018; Rai et al. 2019; Singh et al. 2020). This study aimed to determine the MIH prevalence among primary school children residing in the Colombo district and describe the pattern of disease involvement.

2 RESEARCH METHODOLOGY / MATERIALS AND METHODS

A cross-sectional study was performed among all the Grade 3 (age 8 years) students in randomly selected 20 government schools in the Colombo district, from January 2016 to December 2016. The main objective was to identify the prevalence of MIH. The specific objectives were to identify the sex distribution and identify the affected frequency in indexed teeth. There were 367 schools with primary sections and 28,166 students were studying in Grade 3 in the Colombo district, in 2016 (Ministry of Education, 2017).

The students were examined by a single dentist in the classroom following informed written consent obtained from parents. The index teeth (4 permanent molars and 8 permanent incisors) were examined under moist conditions and adequate artificial light (Dental/ENT Surgical headlight) using dental mirrors and probes. The diagnosis of MIH was made according to the 2003-EAPD judgment criteria, affecting at least one of the permanent molars with or without affecting the incisors. Demarcated opacities >1 mm in diameter, enamel disintegration, atypical restorations, tooth sensitivity, and extracted permanent first molars with suspicious MIH in the rest of the dentition were reported. In addition, affected second primary molars were recorded.

A database was created in Microsoft Excel and analysis was performed with IBM SPSS Statistics for Windows, Version 23.0. Variables were described as medians, quartiles, and percentages with confidence intervals at a 95% significance level were calculated.

3 RESULTS & DISCUSSION

There were 1161 children in the sample. It included 638 (54.9%) girls and 523 (45.1%) boys. MIH was diagnosed in 118 (10.2%, 95% CI 9.3 – 11.1); 61 (51.7%) girls, and 57 (48.3%) boys. The prevalence of MIH in girls was 9.6% (95% CI 8.4 – 10.8 %) and in boys was 10.9% (95% CI 9.5 -12.3 %). MIH was not associated with sex (p=0.45, Chi-square test) (Table 1).

Table 1: Prevalence of MIH by sex and its association with the sex

	Female		Male		Total		OR (95% CI) p (Chi-square test)
	n	%	n	%	n	%	
Having MIH	61	51.7 9.6	57	48.3 10.9	118	10.2	0.86 (0.59 - 1.26) p=0.45
Not Affected	577	55.3 90.4	466	44.7 89.1	1043	89.8	
Total	638	100.0	523	100.0	1161	100.0	

The mean number of affected teeth in a child was 3.32. The median numbers of molars and incisors affected were 2.12 and 3.32 in a child. There was no correlation between the affected number of molars and incisors (Pearson’s correlation coefficient = 0.155).

incisor, LL2 – left lower lateral incisor, LL6 – left lower first permanent molar, RL1- right lower central incisor, RL2 – right lower lateral incisor, RL6 – right lower first permanent molar)

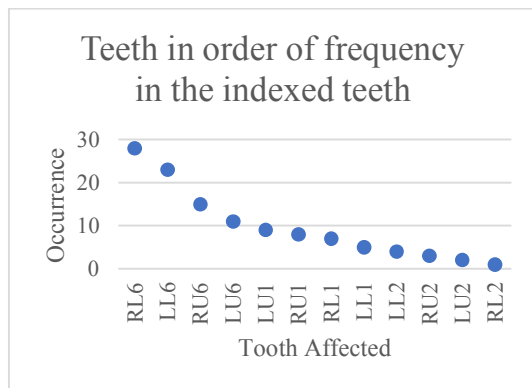


Figure 1: Teeth in order of affected frequency in indexed teeth (LU1- left upper central incisor, LU2 – left upper lateral incisor, LU6– left upper first permanent molar, RU1-right upper central incisor, RU2 – right upper lateral incisor, RU6 – right upper first permanent molar, LL1- left lower central

The observed prevalence of MIH in the current study, 10.2%, was comparable with the Asian value reported by a recent meta-analysis (10.7%)(Lopes et al. 2021). Though we have selected a sample with a narrow age range, findings are comparable with general value because all permanent first molars and most incisors have erupted at the age of eight years. Moreover, at this age, the permanent first molar teeth are in relatively good condition and have no excessive post-eruptive breakdown (Hassanali and Odhiambo 1981). A study conducted in India among 9 to 12-year-old school children reported the highest prevalence among children at the age of ten years (Rai et al. 2019). However, the prevalence in Asian countries was less compared to the overall global prevalence and prevalence in other regions (Lopes et al. 2021). The study has

indicated that the most affected teeth are first permanent molars. The second most affected teeth are the first permanent incisors and then the second permanent incisors.

The present study as well as the previous ones conducted in different contexts reported that the prevalence of MIH was not significantly different across sexes (Biondi et al. 2012; Saitoh et al. 2018).

Similarly, all studies have confirmed that molars were more affected than incisors (Padavala et al. 2018). The first permanent molars and incisors begin to develop in the 4th gestational month. The hard tissue formation in those begins soon after the birth or the very latter part of the intrauterine life. Respectively, by the end of the 5th and 3rd years of life enamel formation is completed in the upper first incisors and the first molars. Thus the permanent incisors and first molars are at extreme risk for defects affected by systemic and environmental factors to the completion of the first year of life (Sadashivamurthy and Deshmukh 2012).

Caries and post-eruptive enamel breakdown are common in affected teeth (Weerheijm et al. 2003). This predisposition to subsequent Dental complications would affect patients' quality of life and create treatment challenges for dentists (Weerheijm 2004). Early diagnosis and identification of risks in subsequent diseases can lead to more effective and conservative management of MIH patients (William et al. 2006; Negre-Barber et al. 2016).

4 CONCLUSION & RECOMMENDATION

The observed prevalence of MIH was comparable with the reported regional prevalence rates. Early identification of the condition and early intervention can prevent the progression of early lesions into advanced lesions. Therefore, identifying the prevalence and drawing a national protocol for early diagnosis and management is important.

Further studies with more representative samples to determine the prevalence in Sri Lanka more accurately and to determine the associations with MIH are important.

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