

## Molar-Incisor-Hypomineralization: Prevalence, Severity and Clinical Characteristics in 8-13 Year Old Saudi Children

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### ABSTRACT

**Aim:** The aim of this study was to evaluate the Prevalence, severity and clinical characteristics of MIH in 8-13 year old Saudi Children. **Materials and Methods:** A total number of 596 children (Male=346; Female=250) was participated in the study with age ranges from 8- to 13-year-old was screened for MIH in Department of Pediatric Dentistry, College of Dentistry. Children who fulfilled the required inclusion criteria were examined by experienced clinicians. Dental examinations were carried out by using a standard mouth mirror and dental probe. For the MIH, the teeth were examined on wet and will record on a specially designed patient research datasheet. All the participating children were instructed to brush their teeth before the examination. After thorough brushing, the four permanent first molars and eight permanent incisors were examined on wet for demarcated opacities and atypical restorations under a portable light source. The results were recorded and analyzed for statistical significance using the Chi-square test and t-test with a P value of <0.05 considered significant. **Results:** Prevalence of MIH according to age was, 17% at 8-9 years, 14% at 10-11 years, 30% at 11-12 years and 39% at 12-13 years of age. The majority of children diagnosed with MIH were 10 years old (39 %), while those aged 8 years had the lowest MIH prevalence (14 %). Pearson Chi-Square showed statistically significance between the age and the prevalence of MIH. 633 teeth were affected by MIH, of which 225 (36%) were central incisors, 94(15%) were lateral incisors and 314(49%) were FPM **Conclusions:** MIH is a clinically and epidemiologically important issue in Saudi school kids. The higher rate of serious forms is of medical concern. The results of today's study stress the necessity for educating present and long term dentists and pediatric professionals in MIH, as well for developing public wellness policies for the avoidance and sufficient treatment of MIH.

**Key words:** MIH, FPM, Enamel defect, Prevalence, Children, Saudi Arabia

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### INTRODUCTION

Molar Incisor Hypomineralization (MIH) is the result of a variety of environmental factors affecting the developing enamel, with an underlying genetic predisposition [1].

Occurrence of disturbed ameloblast function in the later mineralization phase of amelogenesis results in defective enamel with a significantly increased protein content [2]. Due to the varied pattern exhibited by affected molars and incisors, the causative disturbances could take place between the end of the second gestational trimester and up to the age of 4 years [3].

Clinically Hypomineralization can be seen as an abnormality in the translucency of enamel. The enamel of MIH molars looks soft and porous and has the appearance of discolored chalk or Old Dutch cheese. Demarcated opacities of a different color, that is, opacities with a clear and distinct border can be seen adjacent to enamel [4]. MIH is related to unexpected rapid caries development in the erupting first permanent molars. During brushing, children experience pain and hypersensitivity even when the enamel is intact [5]. Many risk factors have been related to MIH including problems during gestation, preterm delivery, and cyanosis, diseases of early childhood such as chickenpox, otitis media, urinary tract infections, tonsillitis, high fever, gastrointestinal disorders and frequent use of antibiotics [6]. These conditions probably cause an alteration in the calcium-phosphate balance or insufficient oxygen supply to ameloblast leading to enamel defects [7].

Molar-Incisor-Hypomineralization (MIH) is defined as the developmentally derived dental defect that involves Hypomineralization of 1 to 4 First Permanent Molars (FPM) that is frequently associated with similarly affected permanent incisors. The condition has been referred to as 'hypomineralized permanent first molars', 'idiopathic enamel Hypomineralization', 'non-fluoride Hypomineralization', and 'cheese molars' by different authors [8]. The defect is clinically presented as demarcated enamel opacities of different colour in the affected teeth, occasionally undergoing post-eruptive breakdown due to soft and porous enamel. This may result in atypical cavities or even complete coronal distortion, requiring extensive restorative treatment. Most prevalence studies of MIH have been carried out in European countries, and rates between 3.6% and 19.3% were reported [9]. At the time of this study, there has been no published prevalence study on MIH in southern part of Saudi Arabia. Therefore, the aim of this study was to evaluate the Prevalence,

severity and clinical characteristics of MIH in 8-13 year old Saudi Children.

## MATERIALS AND METHODS

A total number of 596 children (Male=346; Female=250) was participated in the study with age ranges from 8- to 13-year-old was screened for MIH in Department of Pediatric Dentistry, College of Dentistry. Children who fulfilled the required inclusion criteria were examined by experienced clinicians. The examiners were trained and calibrated against each other prior to start of the study. Explanation about objective of the study was given to the participants during examinations. Voluntary informed consent was obtained from the parents before the examination of child. Dental examinations were carried out by using a standard mouth mirror and dental probe. For the MIH, the teeth were examined on wet and will record on a specially designed patient research datasheet. All the participating children were instructed to brush their teeth before the examination. After thorough brushing, the four permanent first molars and eight permanent incisors was examined on wet for demarcated opacities and atypical restorations under a portable light source.

The diagnostic criteria used in this study, however, were basically the same as those adopted in epidemiologic studies and three examiners were calibrated and well familiar with diagnosis of MIH, which would help to reduce the magnitude of error caused by study design [10]. The criteria used for the diagnosis of MIH were those developed by Weerheijm et al, [11] and described at the European meeting held in Athens in 2003. The results will recorded and analyzed for statistical significance using the Chi-square test and t-test with a P-value of <0.05 considered significant. All the standard preventive and safety measures was taken during examination of the child like checking temperature, sterilization, use of proper mouth mask, Gloves, PPE kit, and others, so as to prevent spread of corona virus in this pandemic period.

## RESULTS

A total number of 596 children (Male=346; Female=250) was participated in the study with age ranges from 8- to 13-year-old was screened for MIH in Department of Pediatric Dentistry,

**Table 1: Distribution of MIH (n, %) among children in different age groups (in years).**

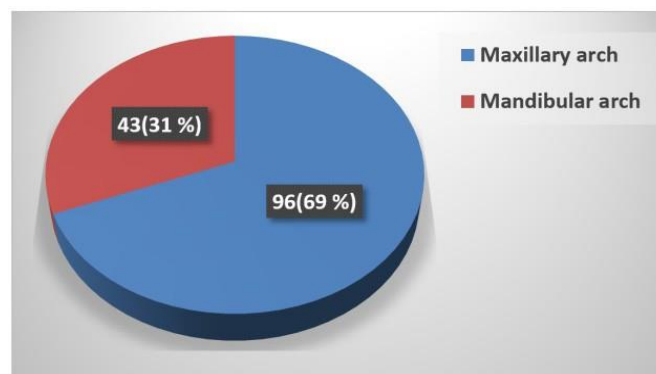
AGE	MIH CASES	No MIH	Total Number
08-09	21 (17%)	73 (83%)	94
10-11	18 (14%)	110 (86%)	128
11-12	38 (30%)	126 (70%)	164
12-13	50 (39%)	160 (61 %)	210
TOTAL	127(21.3%)	469 (79%)	596

\*Statistically Significant at 5% level of Significance

**Table 2: Distribution of permanent teeth affected by MIH.**

	MAXILLARY ARCH	MANDIBULAR ARCH	Total n (%)
Central incisor	162	63	225 (36%)
Lateral Incisor	56	38	94 (15%)
FPM	163	151	314 (49%)
TOTAL	381	252	633 (100%)

\*Statistically Significant at 5% level of Significance

**Figure 1: Distribution of MIH according to dental arch - n (%).**

College of Dentistry. Of the children examined, 127 were affected by MIH, with prevalence rate of 21.3%. [Table 1] shows the prevalence of MIH among the different ages. Prevalence of MIH according to age was, 17% at 8-9 years, 14% at 10-11 years, 30% at 11-12 years and 39% at 12-13 years of age.

The majority of children diagnosed with MIH were 10 years old (39 %), while those aged 8 years had the lowest MIH prevalence (14 %). Pearson Chi-Square showed statistically significance between the age and the prevalence of MIH. 633 teeth were affected by MIH, of which 225 (36%) were central incisors, 94(15%) were lateral incisors and 314(49%) were FPM [Table. 2], showed statistically significance. Prevalence of MIH occurrence is more in maxillary arch 96(69%) as compared to mandibular arch 43 (31%) [Figure 1].

## DISCUSSION

A wide range of prevalence (4 to 25%) was reported for MIH by various investigators in

different countries. However, most of these studies were conducted in European countries [12, 13]. To our knowledge, at the time of this study only two studies were reported in Jeddah and Riyadh, Saudi Arabia [14, 15]. Prevalence of MIH in southern part of Saudi Arabia were not published in literature.

The prevalence of MIH in a group of Saudi children was found to be 21.3%, presently there are very few studies on prevalence of MIH from Saudi Arabia generally. The prevalence of MIH in present study as compared to other Arabian countries, were similar to that reported in Iraq (21.5%), [16] is much higher to that reported in Jeddah, Saudi Arabia(8.6%), Turkey (7.7%), [17] Jordan (17.6%), [18] Libya (9%), [19] and Iran (18.4), [20] but lesser than reported in Riyadh, Saudi Arabia (40.6%).The high variation in the prevalence of MIH could be due to differences in methods, sample sizes, criteria used to diagnose MIH, different age cohorts, or real differences between regions and countries (Jalevik, 2010; Tadikonda et al., 2015) [21, 22]. Another drawback of this study was that the severity of

the Hypomineralization was not recorded in the clinical notes. In the present study, only boys were included as boys and girls have separate schools in Saudi Arabia. More local studies are required to evaluate gender predilection regarding MIH through combined studies in girls and boys schools.

In our study, FPM (49%) was affected as compared to permanent central incisors (36%) and permanent lateral incisors (15%). Maxillary molars were affected more compared to mandibular molars (Martinez Gomez et al., 2012; Parikh et al., 2012; Preusser et al., 2007). [23, 24] On the other hand, there are also studies indicating the opposite (Jälevik et al., 2001) or even no difference between the jaws (Chawla et al., 2008a). Togoo RA (2011) conducted a study to determine prevalence of FPM caries among 7-10 years old school going boys in Abha, Saudi Arabia. Concluded that point prevalence of dental caries in FPM was recorded to be 66.4%. Teeth affected by MIH exhibits enamel defected and rapid progression of caries; therefore, in many cases, affected teeth require restorative treatment right after eruption. If the defect is deep and widespread, it can lead to severe loss of tooth material and early loss of permanent teeth because of caries progression [25-29]. The age-dependent severity of MIH had been reported in previous studies as well, suggesting that over a period of time MIH, a pre-existing congenital defect of enamel, results in post enamel breakdown of FPM due to heavy masticatory forces (Leppaniemi et al. 2001; Jasulaityte et al., 2007) [30, 31] Petrou et al (2015) [32] found that almost one-fifth of the teeth diagnosed with MIH exhibited severe defects. Trauma to primary teeth has been attributed to cause MIH in the corresponding permanent incisors (Balmer et al., 2015) [33]. In addition, in adolescents with active social lives and a developing interest in appearance and slight defects can have a serious impact on self-esteem?

In line with the precipitating increase across duration and/or severity, more teeth are affected, with the mineralization effect recognized as clearer. In this regard, the suggestion is made by Chawla et al., that the clinical diagnosis of MH or MIH should only be performed when all FPMs and permanent incisors have demonstrated eruption; until this time, MIH diagnosis can be

made but only on a provisional basis, with a clear diagnosis only possible when all permanent incisors have erupted and can therefore be positioned on the MIH spectrum. In terms of managing MIH across children, the potential steps forward have been examined in the study of Silva et al. (2017) [34]. Hypo-mineralized teeth management may be seen to span from the placement of fluoride-releasing glass-ionomer cement, with the aim of providing some degree of interim protection, through to the more intense and aggressive restorative process of on lay and crown placement. However, there is also the potential to complete in-home applications of CPP-ACP products in an attempt to achieve remineralization, which could result in the lesser need of extensive treatment and fewer sensitivity complaints. The present study shows that MIH is an existing problem in southern part of Saudi Arabia. However, findings are not representative of the Saudi community as a whole. Despite these limitations, the findings of the study contributes to better understanding of MIH as it provides data on MIH from a country where there have very few studies in the literature.

## CONCLUSION

MIH is a clinically and epidemiologically important issue in Saudi school kids. The higher rate of serious forms is of medical concern. The results of today's study stress the necessity for educating present and long term dentists and pediatric professionals in MIH, as well for developing public wellness policies for the avoidance and sufficient treatment of MIH.

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