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Review Article

Molar Incisor Hypomineralization- A Systematic Review

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Abstract

Literature search reveals that molar-incisor hypomineralisation (MIH) is a routinely encountered dental abnormality noticed around the globe in the recent past. This dental abnormality is often associated with complications that would invariably affect the quality of life of the individual in addition to posing a great treatment challenge to the operator. It is a common finding that the affected teeth are usually more prone to caries and enamel breakdown in the post-eruptive phase. Hence, it is considered that this condition could be accountable for a substantial amount of childhood caries since this condition has high prevalence. Recognition of the individuals at threat and early diagnosis can lead to the initiation of more effective and conservative treatment. This paper is intended to focus on the various aspects pertaining to molar-incisor hypomineralisation.

Keywords: Molar, incisor, Hypomineralization, Pediatric Dentistry.

INTRODUCTION

It is a well-known fact that molar incisor hypomineralization (MIH) is a condition characterized by a deficiency in the quality of enamel. Hypomineralized permanent first molars (PFMs), idiopathic enamel hypomineralization, nonfluoride hypomineralization, and dysmineralized PFMs are the other routine terminologies used for this condition [1]. This condition is typically characterized by the involvement of one to four permanent first molars, often related with affected incisors [2-4]. Few previous studies have reported a prevalence rate ranging from 3.6% to 25% while few studies have advocated a prevalence rate between 2.4% and 40.2% [5, 6].

It is hypothesized that during the late stage of amelogenesis at the time of mineralization or maturation, if the ameloblasts are affected, it can result in a blemish leading to enamel translucency. Hence, it is known as enamel hypomineralization. A typical array of enamel hypomineralization involving the molars and incisors is familiarly known as MIH [1, 7]. Clinically they epitomize white to yellow to brown enamel opacities intermittently enduring breakdown as a result of the soft and porous nature of the existing enamel [3, 4, 8]. Previous studies have shown that there exists a reduction in the thickness of enamel following the eruption of the tooth. This subsequently uncovers the dentin resulting in dentinal hypersensitivity [1, 2]. It is hypothesized that as a result of this the tooth turns out to be susceptible to rapidly progressing caries [2, 3, 4, 9]. Considering the fact that pediatrics fail to maintain effective oral hygiene teeth undergo cavities, loss of enamel, inclination to caries, dentin hypersensitivity, tooth loss and poor esthetics necessitating intervention [10,11].

The various aetiological elements triggering deviations in organic/inorganic composition of teeth affected by molar incisor hypomineralization are still unfamiliar [12, 13]. Previous studies have suggested that molar incisor hypomineralization could be a result of a multifactorial aetiology. It is believed that there could be a genetic susceptibility linked to one or more systemic invectives affecting the tooth during its susceptible stages of tooth formation [14].

It is a well-known fact that the first year of life is considered to be the maximum crucial time frame for the development of enamel defects in the first permanent molars and incisors when early maturation occurs since the ameloblasts are considered to be very susceptible to different environmental strives throughout this time period [15]. Longer period of time taken for the enamel maturation in the first molars lead to hypomineralisation [16].

METHODS

Selection criteria

Literature in which children with prevalence of MIH was documented or could be analyzed are considered for this review. The information pertaining to the inclusion and exclusion criteria are shown in Table 1. Those literatures which are published in English language only are included.

Search strategy

A comprehensive search was conducted in databases (PubMed, Scopus, and CINAHL) up to March 1, 2020. The search strategy used keywords related to MIH and terms related to study design. The detailed keywords used for the search strategy for all databases are shown in Table 2. Additional articles were hand searched in the citation list of the published articles and reviews. The studies from these three databases were imported to Covidence website for the removal of duplicate titles. The rest of the literature was screened for their titles and abstracts to identify those studies for inclusion in the systematic review that harmonized the inclusion and exclusion criteria. Then, the articles were subjected to full-text screening by two reviewers (PKC and YS) where certain articles were excluded with reasons.

Data extraction

A specifically designed data extraction form was employed to obtain information from each study. Information included were geographic distribution, criteria used for the assessment of MIH, age, and gender distribution of the sample along with prevalence estimates as per gender.

Clinical features

In majority of the clinical scenarios it was observed that the enamel at the cervical potion is similar to that of ideal enamel without any signs of imperfections in the structure. Moving from the cervical region to the occlusal region, the imperfections are limited to the internal enamel whereas the external enamel remains unaffected. However, it is observed that at the occlusal area, the hypomineralisation becomes more evident involving the complete thickness of the enamel. It is noteworthy that these imperfections generally do not invade the cuspal tips but when margins are involved it results in the reduction of the coronal height [17, 18].

Previous studies have shown that hypomaturation defects like amelogenesis imperfecta or fluorosis can be differentiated from molar incisor hypomineralization by the presence of high residual amelogenin protein [19, 20]. The organic content of the enamel in the affected teeth can be used as a predictor for determining the severity of molar incisor hypomineralization [17]. Previous studies have shown that the brown enamel is considered to have the maximum organic protein content making it the utmost severe form of molar incisor hypomineralization. On the other side, the protein content of white and yellow enamel is considered to be relatively greater than normal enamel [17]. Due to the existence of augmented quantities of organic substance in the enamel of these teeth, there prevails a clinical situation where the formation of an inadequate etch profile resulting in the adhesions between resin based restorative materials and the defective enamel being compromised [21].

Management

Literature reveals that the recognition of the individuals at threat for molar incisor hypomineralization and prompt diagnosis would result in delivering a more effective treatment [22, 23]. It is essential to initiate enhanced prevention immediately after the eruption of molar incisor hypomineralization teeth in order to prevent enamel breakdown and caries.[24] It is very essential to encourage such individuals to use fluoridated toothpaste in order to decrease the risk of caries and dentinal hypersensitivity. Few studies have emphasized the importance of enhancing the mineralisation of molar incisor hypomineralization teeth following eruption based on in-vivo and in-vitro studies. However, it was noticed that this option may not provide comprehensive solution due to the depth of these lesions [25, 26].

It is advocated that prolonged use of casein phosphopepetide amorphous calcium phosphate (CPP-ACP) is suggested particularly during the initial stages when the enamel surface of a newly erupted tooth is not completely matured [25, 26]. This ingredient enhances the bio-availability of calcium and phosphate within saliva thereby facilitates remineralisation and desensitisation of molar incisor hypomineralization teeth [27]. In the management of these teeth, confusion always prevails pertaining to whether the teeth can be restored or should be extracted. This decision making is often governed by the age of the child, severity of condition, pulp involvement, presence of third molar germ, and the expected long-term prognosis and the expenses involved [28].

Resin infiltration is routinely employed. Even though this technique does not provide bioactive properties, it prevents impending mineral augmentation in the lesion. Previous studies have advocated that resin infiltration would shield the tooth against acid attack in addition to enhancing the micromechanical properties

of enamel thereby reducing the enamel breakdown in the post-eruptive phase [29]. In clinical scenarios where the tooth is grossly damaged a preformed metal crown can be employed with a good success [28]. They would avoid additional enamel breakdown and cope up with the sensitivity issues in addition to not being expensive [28].

For teeth which are unrestorable, extraction of the teeth would be the last resort and it should be deliberated between 8 - 10 years of age. This is supported by the hypothesis that the second permanent molar can get a chance to move into the position of the first permanent molar [30]. Litraturee suggests that the probability of best positioning of the second permanent molar following the removal of first permanent molar at this particular time interval for the maxillary second permanent molar is 94% and for the mandibular second permanent molar is 66% [31].

When the incisors are affected esthetics become a critical factor than function. Considering the fact that this condition is prevalent in the pediatrics, the incisors at that age generally have large and sensitive pulps hence necessitating a conservative approach [24]. Microabrasion, resin infiltration, etch-bleach-seal technique, Composite restorations or veneers and bleaching of teeth are the available treatment options.

Table-1: Eligibility criteria of the studies included

Inclusion criteria	Exclusion criteria
• Cohort or cross-sectional observational studies • Studies set in general population • Studies where prevalence data can be extracted or calculated • Children above 6 years of age	• Conference proceedings, editorials, and letters Sample in a specific subset of the general population (e.g., hospital/clinic outpatients)

Table-2: Keywords included in the search strategy for all three databases

Search term	Search stratergy
• Outcome term • Study type term. • Population term	• "Molar incisor hypomineralization" OR "cheese molars" OR "idiopathic enamel hypomineralisation" OR "nonfluoride hypomineralization" • "Epidemiology" OR "cohort study" OR "cohort analysis" OR "cross-sectional study" OR "cross-sectional analysis" OR "observational analysis" • "Child" OR "children"

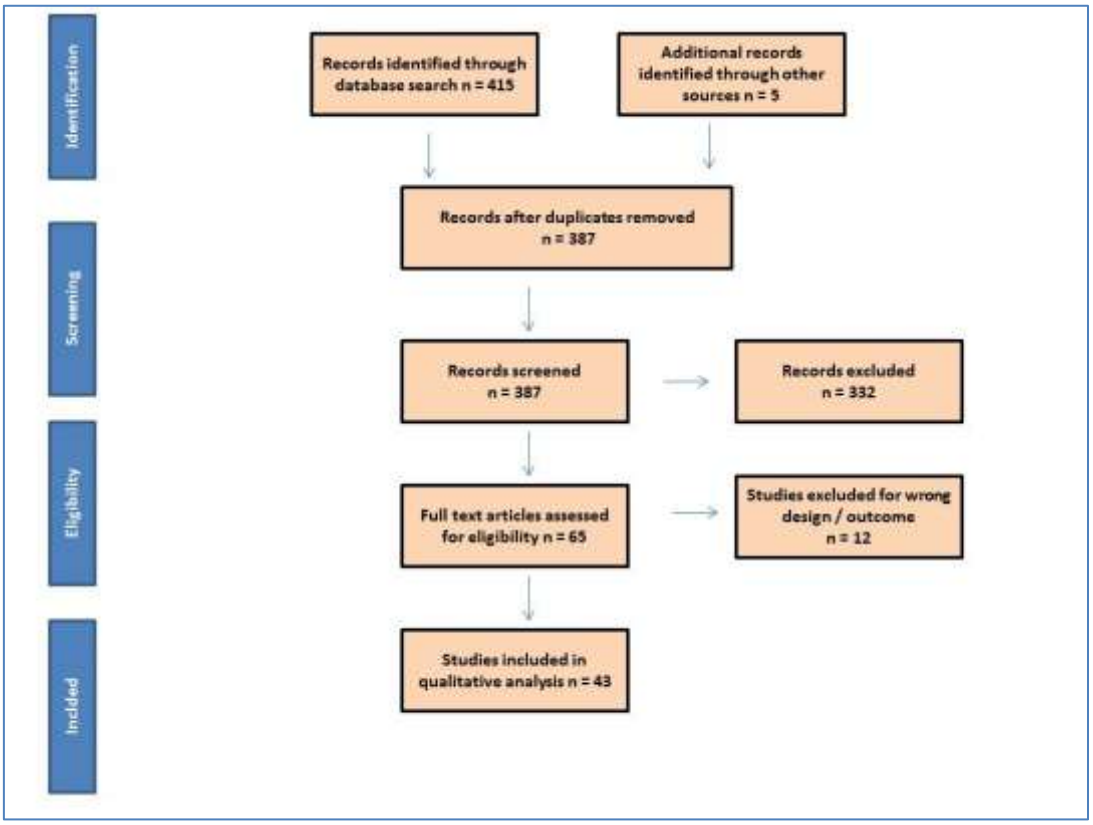

Fig-1: Steps involved in the selection of the literature

CONCLUSION

Pediatric patients having deprived overall general health during their initial childhood in addition to hypomineralised second primary molars are deliberated to be at a greater risk for molar incisor hypomineralization. Hence, it necessitates a repeated scrutiny all through their eruptive stages. Treating this condition should involve long-term prognosis in addition to the current clinical findings. Addressing the esthetic concerns should be done as conservative as possible and factors like the age of thee patient, aesthetic concern and severity of the condition should always be taken into consideration. Remineralisation along with the resin infiltration techniques are till date considered as effective conservative approaches in treating this condition. However, it necessitates additional exploration.

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