Research Article

Clinical Challenges and Treatment Protocols of Molar Incisor Hypo Mineralization: A Review of Literature

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Abstract

Hypomineralization of enamel is described as a defective quality of enamel characterized by reduced inorganic content and increased porosity, leading to structural defects of the physical properties and an increased risk of carious lesions. These lesions include Molar Incisor Hypomineralization (MIH) and Hypomineralized Second Primary Molars (HSPM).

Many clinical challenges are encountered by the treating dental practitioners, for instances, MIH-affected teeth may manifest with hypersensitivity to cold air, warm/hot beverages and food, in addition to tooth brushing, causing suboptimal oral hygiene which favours bacterial biofilm accumulation and subsequently increases vulnerability to carious lesions attack. In addition, difficulty to obtain profound local analgesia is another clinical challenge faced by the treating dentist, affected patients as well as their parents. Occasional eruption complications of affected-molars linked to enamel roughness were reported as well.

MIH-affected patients require more extensive dental treatments and, possibly, as a result, are commonly more apprehensive from the dental setting as related to their MIH-negative counterparts. Consequently, dental clinicians might encounter behaviour management complications in the form of fear and anxiety attributed to pain experienced during dental treatment. Furthermore, MIH-affected children require much more dental intervention as compared to unaffected ones.

Keywords: Molar incisor hypomineralization; Hypomineralized second primary molar; Hypersensitivity; Remineralization

Introduction

Hypomineralization of enamel is described as a defective quality of enamel characterized by reduced inorganic content and increased porosity, leading to structural defects of the physical properties and an increased risk of carious lesions [1,2].

Molar Incisor Hypomineralization (MIH) is a qualitative defect of enamel that has been recognized in many countries worldwide, with a remarkable disparity in its prevalence [3].

MIH condition can affect children's overall wellbeing, and quality of life and its treatment may have a considerable economic burden upon patients, their caregivers in addition to society as a whole. MIH-affected teeth frequently develop advanced cavities necessitating significant restorative treatments and retreatments [4]. A study by Jalnik and colleagues has reported that, by the age of 9-years, MIH-affected children had experienced dental intervention on their First Permanent Molar (FPM) almost ten times more often than MIH-negative controls. In addition, each MIH-affected tooth had been treated averagely two times [5]. It was also shown that a significant percentage of treatment requirements for MIH-affected individuals was the need to treat MIH-affected FPMs [6].

The extent of MIH along with Hypomineralized Second Primary Molar (HSPM) fluctuates not only between affected individuals but also within the same individual. Enamel opacities are regarded as the mildest manifestation of MIH and HSPM, whereas atypical extractions are considered the most severe form [1].

The purpose of the current review was to describe and emphasize the clinical difficulties associated with hypomineralized teeth as well as to list the most recent approved treatment approaches.

Literature Review

Clinical challenges

MIH-affected teeth may manifest with hypersensitivity to cold air, warm/hot beverages and food, in addition to tooth brushing, causing suboptimal oral hygiene which favours bacterial biofilm accumulation and subsequently increases vulnerability to carious lesions attack [6-9]. MIH-related pain and hypersensitivity might be caused by post-eruptive enamel breakdown, fast carious lesion progression, and/or pain during restorative treatment [1,5].

MIH-affected teeth are reported to undergo fast tooth surface disintegration and eventually Post Eruptive Enamel Breakdown (PEB). When PEB takes place in MIH-affected teeth, the highly porous sub-surface enamel in addition to the underlying dentin is exposed, causing teeth to be sensitive to otherwise normal stimuli, and in case teeth are left without dental intervention,

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a possible pulpal involvement and subsequent tooth loss may result [5, 8].

MIH-affected patients require more extensive dental treatments and, possibly, as a result, are commonly more apprehensive from the dental setting as related to their MIH-negative counterparts [5]. Consequently, dental clinicians might encounter behaviour management complications in the form of fear and anxiety attributed to pain experienced during dental treatment. Furthermore, MIH-affected children require much more dental intervention as compared to unaffected ones [8,10]. Thus, it is essential to detect MIH as soon as possible in order to lessen the weakness of the MIH-affected molars by tackling their restorative and preventive requirements [11].

Difficulty to obtain profound local analgesia is another clinical challenge faced by the treating dentist, affected patients as well as their parents. This is likely attributed to the chronically inflamed dental pulp due to invasion of bacteria into the dentin laying below the highly porous and/or broken enamel [12].

When incisors are involved with MIH defects, affected individuals may experience either mild or serious aesthetic concerns based on the severity of the lesion and the overall patients' perception of their appearance [4,7].

Occasional eruption complications of affected-molars linked to enamel roughness were reported as well [4].

Treatment strategies

Dentine hypersensitivity, PEB and their impact on the quality of life, the reduced restorative and treatment prognosis, dental fear, difficulty to obtain profound local anaesthesia, in addition to the increased cost and time required for re-treatment; all these factors combined, make MIH a perplexing condition not only for patients but also for Parents and clinicians [13]. In-depth knowledge of the nature of these demarcated qualitative developmental lesions is therefore of paramount importance scientifically and clinically so as to set appropriate prevention and/or management protocol for the condition [13].

Many treatment strategies are suggested, starting from early preventive measures applied to avoid PEB and cavities, passing through the treatment of hypersensitivity and toothache, restoration of defective teeth and ending up by extraction with or without subsequent orthodontic intervention [8,14].

A systematic treatment protocol for MIH has been suggested by William et al., in 2006 [15], it includes several proposed steps for the proper management of MIH passing from risk identification, early detection, remineralization and desensitization of MIH-related defects (a superior term applied in this context may possibly be mineralization; as the defected teeth did not undergo complete mineralization during their development, however, a possible demineralization process from caries attack might have occurred), prevention of carious lesions and PEB, restorative treatment or extractions, and ending up by a maintenance phase.

Moreover, Mathu-Muju and Wright created an MIH-severity scale which classifies MIH as mild, moderate, or severe at the level of individual tooth and based on the severity of the defect and presence/absence of tooth sensitivity (Table 1) [16]. They suggested a treatment protocol based on this severity scale in addition to the time period required for treatment (short and long term) (Table 2) [16]. This treatment protocol, although, presents a superior approach of treating MIH that can be applied for the long term, the suggested MIH severity is complex and might not aid the dental clinician [8].

Table 1: Severity score of teeth affected by MIH.

	Mild	Moderate	Severe
Crown appearance	Demarcated opacities in non-stress-bearing area of molar	Intact atypical restoration present	Post-eruptive enamel breakdown present
Enamel loss	Isolated opacities	Occlusal/incisal third of teeth without initial post-eruptive enamel breakdown	Post-eruptive enamel breakdown on erupting tooth that can be rapid
Caries	No caries associated with affected enamel	Post-eruptive enamel breakdown/ caries limited to one or two surfaces without cuspal involvement	Often develop widespread caries associated with affected enamel
Sensitivity	Normal dental sensitivity	Usually normal dental sensitivity	Usually history of dental sensitivity
Esthetics	Usually not an issue	Parents often express concern	Parents typically concerned

Table 2: Treatment protocol proposed by Mathu-Muju and Wright 16 for the management of MIH.

	Mild	Moderate	Severe
Molars	Desensitizing toothpaste	Fluoride varnish	Glass ionomer coverage
	Fluoride	Sealants	Interim resins
	Sealants	Resin restorations	Stainless steel crowns Extraction
Incisors	No Treatment	Bleach/Seal	Bleach/Seal
	Resin perfusion	Resin perfusion	Resin perfusion
		Microabrasion	Microabrasion
		restorations Resin	restorations Resin
			Veneers

The MIH Treatment Need Index (MIH-TNI), was developed by Steffen and colleagues in 2017, it suggested decision making treatment protocol for MIH-affected teeth [17]. The MIH-TNI categorizes MIH-affected teeth based on the occurrence of hypersensitivity and the severity of enamel lesions. In addition, a therapeutic plan has been introduced for individuals with a low or high caries risk. The TNI's treatment protocols comprise preventive dental procedures as well as a restorative treatment, and exodontia.

At present, there are still no clinical protocols defining the

therapeutic decisions related to HSPM, creating a challenging treatment decision for both general dental practitioners as well as and paediatric dentists. This may probably result in a "less than optimal" treatment approach, or, sometimes, an over-treatment of HSPM-affected teeth 18. The majority of scientific evidence available on hypomineralization treatment strategies is performed and evaluated for permanent teeth, and these outcomes have been generalized to primary teeth [14,18].

Discussion

Prevention and mineralization

It is of vital importance to begin advising the affected children and their parents about the proper dietary and preventive measures to be undertaken [8]. It has been recommended in a systematic review performed by Willmott et al., that parents of affected children should be instructed to use a fluoridated toothpaste for their children containing a minimum fluoride concentration of 1,000 ppm F [7,19]. Supplementary topical fluoride applications may also be beneficial; such as topical fluoride varnishes, e.g. DuraphatR 22,600 ppm F (Colgate Oral Care) and GelkamR 1,000 ppm F (Colgate Oral Care) [8]. Restrepo et al., and Ozgul et al., indicated a decrease in MIH-related hypersensitive teeth following the use of fluoride varnish [20,21]. Similar outcomes were reported by other investigators who studied the effect of fluoride varnish on patients suffering from tooth hypersensitivity not related to MIH; results suggested positive outcomes in this respect. Therefore, fluoride varnish applications may be used as a treatment modality to alleviate MIH-related tooth sensitivity [22-24].

Another possible effective topical product is Casein Phosphopeptide-Amorphous Calcium Phosphate (CPP-ACP) [7,15]. CPP-ACP has been reported to produce and stabilize a calcium-phosphate highly-saturated micro-environment resulting in their deposition at the enamel surface. CPP-ACP has been assimilated into sugar-free chewing gum and enhances remineralization of demineralized sub-surface defects [25]. Based on several reports, it has been highly recommended that at-home application of CPP-ACP topical creams may aid sealing and desensitizing MIH-affected teeth in addition to providing them with bio-available calcium and phosphate [7, 21, 26]. However, clinical data are still required to test the efficacy of CPP-ACP [21,26].

The daily application of 0.4% stannous fluoride gels have, as well, been suggested to be efficacious in minimizing sensitivity in affected teeth [27], this outcome has still to be established by clinical trials in hypomineralized teeth [8].

Lately, an innovative method using arginine has been proposed (ProArgin™) [28]. The ProArgin™ desensitizing paste consists of hydrated silica, calcium carbonate, glycerin, 8% arginine, water, bicarbonate, cellulose gum, and sodium saccharin. It has been shown to be efficacious in alleviating dentine hypersensitivity of MIH-affected teeth if applied at home or at the dental office [29]. It is suggested that its effect in relieving dentin hypersensitivity is immediate and continues for a period of 8 weeks [30]. This method was first launched as "SensiStat" in the late 1990s; subsequently, in 2009, it has been recognized as Colgate Sensitive Pro-Relief Desensitizing Paste [31]. Several scholars have reported an effective outcome of Pro Argin in soothing tooth sensitivity when applied at the dental office [28,29]. Similar outcomes were indicated by Yang et al., who conducted a meta-analysis on the application of arginine paste applied as a desensitizing agent and cited its use for an 8-week period resulted in reduced dental hypersensitivity [32].

Fissure sealants application

Professional application of Fissure Sealants (FS) may likewise be beneficial for FPM with mild lesions (with neither sensitivity nor PEB), predominantly if they are checked on a regular basis and changed when dislodged [16,27,15]. Mathu and Wright 16 recommended that if fissures of affected teeth were clinically discolored (opaque or yellow-brown), then application of 5% sodium hypochlorite for 60 seconds might be helpful in removing intrinsic enamel proteins. In the study by Kotsanos et al., FS in hypomineralized FPMs were found to require more frequent retreatment sessions as compared to the non-affected control group [10]. Though, longitudinal clinical research in MIH-affected children showing occlusal opacities in FPMs, cited that FS seemed to have increased retention in case the 5th generation adhesive was applied before FS (70% full retention), as related to the application of the conventional procedure (25.5% full retention) [33]. Similar favorable outcomes were suggested by Fragelli et al., For incompletely erupted hypomineralized FPMs, Glass Ionomer Cement (GIC) can be applied as FS, as it provides provisional prevention against dental caries, tooth sensitivity, and PEB. However, and since GIC materials are not retentive for the long term, they should be substituted once the affected-tooth has completely erupted in the oral cavity with the more durable resin-based FS [34,35].

Microabrasion, bleaching and sealants for Incisor teeth

Aesthetics is a usual source of distress for MIH-affected children with the involvement of permanent incisors. It was cited that opacities, which were yellow or brownish-yellow in color are involving the full width of enamel, whereas the lighter defects (creamy-yellow or whitish-creamy) express less porosity and inconstant depth of involvement [36]. Yellow or brownish-yellow defects were found to have a better outcome when bleaching with carbamide peroxide was applied, while lighter defects responded to microabrasion procedure using 18% hydrochloric acid or 37.5% phosphoric acid and abrasive paste [27,37]. More severe enamel defects might be managed by applying both treatment modalities [38]. Bleaching may, however, result in unwanted reactions for young children, including hypersensitivity, irritation to the mucosa, and alterations in enamel surface, while microabrasion may cause loss of enamel structure [39,40]. A clinical procedure recognized as an etch-bleach-seal technique has been proposed by Wright in 2002 and showed acceptable treatment outcomes. It includes three clinical steps starting with a 60 seconds etching using 37% phosphoric acid, followed by bleaching for 5-10 minutes using 5% sodium hypochlorite, and finally re-etching and use of FS over the conditioned surface in order to seal the porosities [41]. The application of the clear FS

may be sufficient to modify the reflective index of the enamel defect and hence reach a satisfactory appearance.

These treatment methods are effective in the late mixed dentition period when children often begin to be aware of their aesthetics and appearance [42]. It is suggested that these non-invasive treatment modalities should be considered as the first line of treatment in such cases before applying more invasive methods such as resin restorations, veneers, or crowns as the later may result in many clinical issues attributed to the wider pulp chamber and unstable gingival margin in immature incisor teeth [42].

Local anaesthesia

MIH/HSPM defects can generate substantial distress to the child owing to the hypersensitivity from taking cold food or even breathing cold air soon after the emergence of the affected teeth [5]. This can raise the parents concern, and can present treatment challenges for dental clinicians [5].

Difficulty anaesthetizing MIH-affected molars is well documented in many scientific papers [2,43].

Hypersensitivity of affected teeth to hot and cold stimuli is attributed to the fact that hypomineralized enamel provides inadequate protection to the pulp which becomes exposed to environmental thermal stimuli [43]. This continuous stimulation of the pulp results in an inflammatory reaction within the pulp as well as pH alterations at periapical tissue area resulting in hypersensitivity of pulp nerve tissue and, consequently, react to lower-level stimuli which normally do not initiate a response [43]. This over-reaction of the pulp is reflected clinically as an extra sensitive tooth which poses a challenge to anaesthetize profoundly regardless of the local anesthetic dose [43]. Profound local analgesia is essential to optimize behavior management problems as well as to perform good quality restoration of MIH-affected teeth [44].

In order to deal with this anaesthetic problem, many solutions have been proposed in the literature; some scholars proposed the application of inhalation sedation prior to treatment so as to raise the pain threshold during dental therapy [15,16,27]. Additionally, anaesthetic adjuncts such as intraligamental, intraosseous and palatal anaesthesia were suggested as well and proved to be efficacious [43]. Among the various forms of Local Anaesthetics (LA) available, the 2% lidocaine HCL and 4% articaine HCL may be the most commonly used LA agents. Studies comparing the efficiency of these LA agents indicated similar effectiveness when used in inferior alveolar nerve block , whereas articaine showed superior efficiency when used in infiltration anaesthesia [45]. Furthermore, the application of buccal infiltration using articaine as an adjunct to inferior alveolar nerve block was reported to improve the local anaesthetic effect [45]. The application rubber dam isolation during dental treatment can preclude sensitivity from other hypomineralized teeth which are not anaesthetized. Moreover, saliva ejector may be a milder option for use in patients suffering from tooth hypersensitivity as compared to high-volume suction.

Additionally, many preoperative management methods have also been recommended, such as the application of desensitizing toothpaste or topical fluoride varnish prior to the dental visit [27,43]. Sedative provisional restorations such as Glass Ionomer Cements (GICs) can be applied in the event of intense pain which makes completion of restorative therapy challenging [43]. GICs are known to have sedative effect on hypersensitive teeth and hence restorative intervention could be completed one to two weeks later [46]. This two-step method can offer shorter and more relaxed dental visits for children [43].

In extreme cases where all suggested therapeutic techniques have not succeeded, treatment under general anaesthesia could be the last option, though, in these circumstances a more radical treatment should be targeted [44].

Restoration of Hypomineralized molars

Having resolved the problems in attaining profound local anaesthesia and dealing with affected children's fear and anxiety, restoration of hypomineralized FPMs can have added problems in demarcating the borders of the cavity and in choosing the appropriate filling material [8]. With respect to properly demarcate the cavity margins, two practical methods have been suggested; elimination of all affected enamel till reaching unaffected borders or elimination of only the affected enamel till resistance to cutting instrument is encountered [15,16,27,47]. The former method necessitates the removal of substantial tooth structure; however, it is considered effective if an adhesive material is to be used. The latter method is more conservative, yet can result in the continuous breakdown of hypomineralized enamel [8].

Several choices of restorative materials are available to the dental clinician dealing with MIH-affected individuals; GIC, Resin Modified Glass Ionomer Cements (RMGIC), Polyacid Modified Composite Resins (PMCR), Composite Resins (CR), and amalgam restorations [8].

Amalgam is a restorative material that adheres to cavities by means of mechanical retention and its application in these unusually designed cavities is not recommended; the lack of ability to keep the remaining enamel surface intact often leads to additional chipping-off of enamel [15,27]. The few available scientific data on amalgam restorations used in hypomineralized molars come in accordance with this conclusion, as they cited increased failure rates as related to CR [10,48].

With respect to the other restorative materials and alternatives, there is an insufficient scientific indication to recommend their application [16,27]. The use of GIC, RMGIC and PMCR is not suggested in the load-bearing surfaces of FPMs, and they can only be applied as interim restorations before placing a final one [7,9,15]. The use of GIC has been recommended in large cavities with substantial dentine involvement as dentine replacement layer preceding the outer CR layer [16].

On the other hand, Fragelli et al., assessed the prognosis of GI restorations in MIH-affected teeth; they indicated acceptable results at 12 months [49]. Applying the Atraumatic Restorative Treatment (ART) guidelines in addition to a glass hybrid restorative system, Grossi et al., indicated a greater prognosis at 12 months [50]. In spite of these reported favorable outcomes, there is still an essential need for MIH-patients to be controlled

since there is deficient data with respect to the efficacy of the ART procedure in MIH-affected permanent teeth [51].

Composite restoration seems to be the only restorative material applicable to multiple surface restorations in MIH-affected FPMs [8]. According to a study by Lygidakis and colleagues assessing the prognosis of CR restorations applied on multiple surfaces including cusps of defective molars, CR showed acceptable durability and longevity after four years [47]. Mejare et al., 48 evaluated different types of restorations on 76 MIH-affected children for a period of 5.2 ± 3.29 years. They reported that GIC had the least prognosis, whereas CR showed a superior one, while, amalgam and compomers showed an average prognosis.

Adhesion to hypomineralized enamel

The application of different adhesive resin systems has some restrictions in MIH-affected teeth due to the presence of enamel. A study by William et al., reported that bonding to MIH-affected enamel is likely; however, the interface between the defective enamel and adhesive material expressed porosity with cracks, reduced bond strength, in addition to an increased risk of cohesive failure as related to unaffected enamel [51]. This finding comes in line with conclusions cited earlier by, who evaluated the etching patterns in different types of Amelogenesis Imperfecta (AI); they suggested that hypomineralized variants of AI may undergo similar etching patterns as those of sound enamel in spite of the of microscopic alterations in mineralization and morphology of enamel crystals [52]. Several ultrastructural and biochemical types of research on MIH-affected enamel, and dentine reported that the full-thickness enamel adjacent to the clinically involved MIH-defects is involved to a lesser degree, whereas the underlying dentine did not express essential alterations in structure [53]. These conclusions may clarify the satisfactory outcomes for adhesive CR restorations when used in MIH-affected molars, given that all clinically defective enamel is removed [42].

The type of adhesive applied should be considered, as well. William et al., indicated that Self-Etching Adhesives (SEA) have greater bond strength to hypomineralized enamel as related to all-etch Single-Bottle Alcohol-Containing Adhesives (SBA). However, it was cited that an acetone-containing adhesive system that was applied prior to the use of CR and FS showed acceptable outcomes for a long duration with respect to bond strength [33,47].

In the same context, Mathu-Maju and Wright 16 proposed pre-treatment of the enamel with 5% sodium hypochlorite so as to eliminate intrinsic proteins enclosing the hydroxyapatite and hence promote better etching and resin infiltration.

Restoring hypomineralized permanent molars with full coronal coverage

Preformed Metal Crowns (PMCs) have been used earlier to attain complete coverage of FPMs with structural defects and are currently suggested as a treatment modality for MIH-affected molars [15,27]. PMCs have been reported to inhibit additional tooth surface breakdown, reduce tooth sensitivity, create optimal occlusion and interproximal contacts, cost-effective and are not time-consuming while preparing and inserting [35].

Many studies indicated good prognosis with PMCs with a follow-up period ranging from 2-5 years [10,54]. Yet, a considerable of tooth structure needs to be removed while preparing PMCs. Hall technique , which does not require tooth reduction has been proposed as an alternative technique for PMCs insertion; however, there further longitudinal studies on its efficacy are needed [42].

Cast restoration

This treatment modality comprises adhesive metal copings, full-coverage metal or tooth–coloured crowns for posterior teeth in addition to porcelain veneers or crowns for anterior teeth [42].

Full coverage crowns are not recommended in general for young patients owing to the large pulp chamber, reduced crown length, and challenges in attaining an acceptable mould for subgingival crown borders [55].

Adhesive metal copings, often consisting of nickel-chrome alloy, are more conservative and reported to have good prognosis on two-year follow-up study by Zagdwon and colleagues [54].

Porcelain veneers for defective anterior teeth may result in satisfactory aesthetic outcomes, however, are not recommended for immature newly erupted teeth due to the ongoing process of emergence resulting in exposure of crown margins. Therefore, this approach is not recommended for treatment of teeth in initial post-eruptive phase since CR or PMCs could achieve comparable outcomes [42].

On the other hand, cast restorations have been suggested to have superior durability in fully erupted teeth, yet longitudinal researches are still required to conclude this recommendation [42].

In the recent years, Intraoral Scanners (IOS) are becoming essential dental tools used for optical impressions and can provide data on the accurate dimension and outline of dental arches [56]. IOS allow fast impression taking without the need for impression materials or trays; this is predominantly beneficial for children and patients suffering from gag reflex [57]. Furthermore, IOS were indicated to be as precise as their conventional techniques for single teeth as well as short span bridges [57]. Hence, IOS were found to enable easy, quick, and accurate impressions in children [57]. Recently, a study performed by Esti Davidovich and colleagues suggested that digital treatment approach should be considered as a superior option for MIH therapy since it guarantees accurate restorations in children owing to great precision of the scanning. However, Children's attitude, choice of caregivers, and the extent of the defect stay the principal elements to be accounted for [58].

Extraction and orthodontic management

It is recommended that the extraction of any FPM should only be performed following careful orthodontic assessment to account for possible complications. If patient occlusion was deemed favorable from an orthodontic perspective, the best dental age for extracting un-restorable FPM would be between 8.5-9 years of age so as to permit mesial drifting of adjacent second permanent molars into the FPM position creating a satisfactory occlusal

characteristics [59,60]. Though delayed extraction at the age of 10.5 years could result in similar outcomes [48]. Once a lower FPM is extracted, compensating extraction of the upper counterpart should be performed in order to permit mesial drifting of the second permanent molar; likewise, a balancing extraction of the contralateral molar/premolar should be considered in order to avoid midline, mainly in cases of crowding [59]. This treatment approach should particularly be taken into account in late mixed dentition when the second premolar appears radiographically in the crypt of the second primary molar; besides, the bifurcation of the second permanent molar should be evident. Unduly premature extraction will cause the second premolar to drift distally, precluding the eruption of the second permanent into the position of FPM. Conversely, delayed extraction has carried a little possibility of spontaneous space closure with resultant extra space remaining between the second premolar and second permanent molar, especially in the mandible [42,59].

Conclusion

Molar incisor hypomineralization affects many children and poses a special set of clinical difficulties for oral health practitioners. MIH treatment is challenged by the fact that MIH-affected patients may exhibit significant levels of dental anxiety, which may be worse by failing to acquire appropriate amounts of local analgesia during treatment. Behavior issues make management much more difficult. The characteristics of affected teeth are extremely sensitive to heat and mechanical stimuli, more prone to cavities, prone to posteruptive disintegration, and showing bond failure to adhesive dental materials. Additionally, several MIH-affected children claim that having evident anterior enamel opacities substantially influences them emotionally. Furthermore, MIH-affected children require much more dental intervention as compared to unaffected ones.

Many MIH treatment protocols have been put out, however, there is yet insufficient high-quality scientific data to support the establishment of a set therapeutic strategy for MIH management. Therefore, it is crucial that basic and clinical research continue to guide a short-and long-term evidence-based strategy for MIH-affected children.

Author Contributions

Conceptualization: M.M.M., M.S.A., A.M.A and Abeer A.A.; data curation: S.A.A., D.A.A, and E.N.H; software: M.M.M., S.A.A. and M.SA.; supervision: H.L.A AND A.E.E.; validation: M.M.M., A.M.A., Arwa A.A., D.A.A, and E.N.H; writing – Original Draft Preparation: M.M.M; writing – Review & Editing: M.M.M., Arwa A.A. and Abeer A.A. All authors have read and agreed to the published version of the manuscript.

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