



**Molar Incisor Hypomineralization:
A Survey of awareness and
management strategies among dental
practitioners in Benghazi. Libya**

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Department of paediatric dentistry

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DEDICATION

I would like to dedicate this thesis to my father's soul, my helping mother, my supporting husband, all my family who have been always at my side, friends, and my colleagues.

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I wish to express my gratitude to my supervisor

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LIST OF ABBREVIATIONS

Abbreviation	Full Term
CPP-ACP	Casein Phospho-Peptide and Amorphous Calcium Phosphate.
DDF	Developmental Defect of Enamel.
EAPD	European Academy of Paediatric Dentistry.
GIC	Glass Ionomer Cement.
LBW	Low Birth Weight.
MIH	Molar Incisor Hypomineralization.
PB	Prelen Birth.
PI	Principal Investigator.
PFMs	Permanent First Molars.
SSCs	Stain Less Steel Crowns.

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ABSTRACT

Aims and objectives

The aim of this study was to investigate awareness of MIH and its management among dental practitioners.

Materials and Methods

Across sectional study design was adopted to run a questionnaire-based survey of dentists in Benghazi, between January and April 2021. The participants were drawn from all dentists practicing in city of Benghazi in both private and public dental clinics as well as dental interns at the faculty of Dentistry, University of Benghazi and Libyan Medical University. The questionnaire used in the present was handed to participants in their practices. The questionnaire covered knowledge about and awareness of MIH as well as treatment concerns and restorative materials options. The data was analyzed using SPSS 25 software. All statistical tests were conducted at value of 0.05.

Results

A total of 389 responses out of 500 questionnaires distributed, were received giving a response rate of 79.9%. The majority were females (85%,332) and dentists (73.8%,287). The most commonly reported dental practices were public settings (28.8%,112). Although the majority of

respondents indicated familiarity with hypomineralized teeth, they encounter these lesions very often in their practice. Most of respondents are not aware of the prevalence of MIH in Libya, but consider MIH a clinical problem, mainly caused by genetic factors and affect esthetics and diagnosis. A performed crowns and Glass ionomer Cements were the most commonly used materials.

Conclusions

The current study shows that MIH is a condition commonly encountered the Libyan dental practice. Continuing education courses on MIH condition are required to ensure high -quality care for children with MIH affected teeth.

Chapter 1

Chapter 1

INTRODUCTION

The term molar incisor hypomineralization (MIH) has been defined recently to describe the phenomenon of demarcated, qualitative defects of enamel of systemic origin, affecting one or more permanent molars with or without involvement of the incisor teeth (1). As such, it encompasses a wide range of conditions with which the dental clinician is likely to be familiar, including: "idiopathic enamel hypomineralization in the first permanent molars", "hypomineralized first permanent molars", "non-fluoride hypomineralization in permanent first molars", "cheese molars", "non-fluoride enamel opacities", "idiopathic enamel opacities" and "opaque spots". Clinically, MIH may present as discrete, opaque lesions, ranging from white to yellow-brown, distinct from the more diffuse linear opacities usually associated with fluorosis, and may be associated with post-eruptive enamel loss making it difficult to distinguish from enamel hypoplasia. The distribution of the condition is often asymmetric, commonly with marked variation in severity within an individual. Several challenges are presented by MIH to both the affected individual and treating clinician, with a significant increase in treatment need being reported for those with MIH (2-4).

These teeth are often sensitive, impacting on oral hygiene practice and vulnerable to caries so that intervention may be required soon after eruption. Increased treatment need is not only due to increased caries susceptibility but also ongoing deterioration in the affected teeth and marginal breakdown impacting on the durability of restorations. In some cases, extraction is the most

viable long-term option which may have major orthodontic implications ,as well as representing a significant and stressful procedure for a young patient. When considered in conjunction with difficulties in oral access for the clinician, limited cooperation, difficulty in achieving adequate local analgesia and the need for multiple re-treatment, it is hardly surprising these patients also experience higher level of dental anxiety and/or phobia(2); if the anterior teeth are affected then there may be significant aesthetic issues and clinical challenges. (2-4). MIH may have significant impact on the quality of life of patients (2), causing pain, plaque retention, dental caries and eventually tooth loss (5).

Estimates of the prevalence of MIH vary widely in the literature, with data ranging from 3 to 42 percent in general population studies (6) (7). Although this could reflect real disparities in MIH prevalence between different countries, many commentators put this down to variations in indices, diagnostic criteria, age groups and examination protocols used to measure MIH, and hence, under or over estimation of MIH prevalence in various locations (8, 9). Therefore, this variation may reflect prior lack of both a consistent classification index and a standardized methodology of assessment for MIH⁽¹⁵⁾. Since most studies assess developmental defect using the Developmental defect of Enamel (DDE) Index, rather than MIH specifically, prevalence figures are generally based on data for demarcated opacities as this is the DDE category most representative of the lesions of MIH. There is a higher incidence of developmental defect (up to 81 percent) in children with co-existing medical conditions, however the majority

of studies do not distinguish between demarcated and diffuse lesions so it is unknown what percentage would be considered affected by MIH ⁽¹⁶⁻¹⁹⁾. The etiology of MIH is still unclear and whilst several factors (such as birth complication, medications, acute medical conditions or environmental contaminants) have been implicated, available evidence is equivocal (2, 10).

A 2003 European survey of pediatric dentists investigating the existence and prevalence of MIH in Europe reported that, although MIH prevalence was low, data was available and that the majority of clinicians perceived MIH to be a clinical problem worthy of further investigation (11). In Libya, oral health research has become very active in recent years with the establishment of postgraduate program at the faculty of Dentistry, University of Benghazi. Many research conferences and scientific days were held in the country. However, as far as the authors concerned, no research has investigated the issue of MIH until a recent research published in 2020 reported that 15% of 8-10 years of Libyan children had MIH(12). This draws attention to the size of MIH problem and hence additional research to investigate how the Libyan dentists perceive and approach the management of MIH is required. Such research provides a database for planning education and training activities in order to provide better dental care for MIH patients. Reviewing literature as will be described in the next chapter indicates no previous studies were conducted about MIH awareness and management among Libyan dentists, and that very few studies were conducted in Arab league countries such as Iraq (13).

The Libyan health care system is a hybrid comprising both private and public sectors. Dentists mainly graduated from public health schools although recently private dental schools have emerged and provide the community with dental professional. The dental education system in Libya mandate one postgraduation years of training known as internship, during which the graduates do practice different disciplines of dentistry. Pediatric dental care is supposedly provided by general dental practitioners and specialists. However, this kind of care is most often provided by pediatric dentists. Therefore, the present study aims to explore the perception and management of MIH among different oral health professionals with different professional experience and career levels.

Chapter 2

Chapter 2

Literature Review

2.1 Overview

Hypomineralization of tooth enamel was firstly reported on in the late 1970s, where several researchers described frequent congenital hypomineralization of the permanent first molars (PFMs) and incisors of the permanent dentition (14, 15). Later in 2000 at the European Academy of Paediatric Dentistry (EAPD) Congress in Bergen, this condition was named as Molar-Incisor Hypomineralization (MIH) (8). MIH is defined as a qualitative developmental defect of enamel in children and adolescents, affecting at least one PFM with or without involvement of the incisors (16, 17). MIH is clinically characterized by more or less well-defined opacities that vary in size and can be discoloured from white to yellow-brownish (16, 18). The hypomineralized enamel is friable and has inferior mechanical properties as well as reduced modulus of elasticity when compared to sound enamel (16, 19, 20). Molecularly, MIH-affected enamel presents a high number of proteins, like serum albumin, type I collagen among others, and it is suggested that the presence of these proteins inhibits the growth of hydroxyapatite crystals and enzymatic activity during enamel maturation, which results in a reduction of the mineral content of enamel in MIH cases (21, 22). As a consequence, hypomineralized enamel leads to post-eruptive breakdown and hypersensitivity, and it is prone to development of carious lesions and pain (16, 23, 24). However, the full understanding of the aetiology of MIH is still not obtained (24, 25). From an epidemiologic standpoint,

MIH is the most frequent enamel defect. However, the prevalence varies significantly in studies available in the literature. A study based on Danish children showed that the prevalence of demarcated opacities, eventually complicated by loss of tooth substance in any PFM was 37.3% (95% confidence interval (95% CI) $33.6 \pm 41.0\%$) and 6.3% (95% CI $4.7 \pm 8.5\%$), respectively(26). On the other hand, a study on Brazilian children displayed a prevalence of 40.2%, where the number of affected incisors increased with increasing number of affected molars (27). Latest studies presented a prevalence of 3 to 22% in Europe(21, 26), and 2 to 40% worldwide(27, 28). Due to pain, fragile enamel and increased treatment need at an early point of time in life, MIH represents a clinical challenge.

2.2 Aetiology of MIH

Evidence from systematic reviews and meta-analyses that addressed the aetiology of MIH demonstrated multiple aetiological factors associated with MIH which can be divided according to pre-, peri- and postnatal periods (29, 30). Regarding the prenatal period, the most outstanding factor was the existence of systemic conditions. Several studies showed that medical problems were more predominant in mothers of children with MIH compared to mothers whose children did not have MIH (31). Urinary infection during the last trimester of pregnancy was associated with higher risk of MIH, however, inconsistent association was found in relation to specific diseases in many studies (31). While

some studies reported no association, other study maternal illness was associated with 40% higher odds of having MIH. Therefore, it has been suggest that the role of maternal systemic conditions during pregnancy is inconclusive (32). Furthermore, maternal smoking and alcohol intake during pregnancy had no significant association with MIH, but maternal stress was positively associated with MIH (32). In the perinatal period (covering caesarean delivery, prolonged delivery, premature birth and twinning), studies were also contradictory with mixed reports of positive and negative associations (31). Hypoxia is common during birth as result of prematurity respiratory stress or traumatic and prolonged birth. Hypoxia association with MIH is explained by the effect of oxygen insufficiency on the activity of ameloblasts (33). Another condition linked to MIH was hypocalcaemia, which causes low calcium levels and hence possible impairment of the ameloblasts' calcium metabolism (32). Hypocalcaemia can occur in any of the periods (pre-, peri- or postnatal) and is also associated with multiple conditions, like maternal diabetes, vitamin D deficiency during the prenatal and/or perinatal period and prematurity (33). Concerning the association between MIH and preterm birth (PB) and low birth weight (LBW), respectively, the results were once again inconsistent. MIH was significantly associated with PB in both the primary and permanent dentitions (29). Considering LBW, two meta-analyses were contradictory, with one showing no association, and another reporting that LBW neonates were about three times more likely to have MIH (30). Lastly, the association of MIH with preterm (PT), LBW, caesarean delivery

and birth complications was reported to be low (33). In the postnatal period, long duration of breastfeeding, childhood illnesses and early childhood medication were in one or another way linked to MIH. Long duration of breastfeeding had no association with MIH (32, 33), as well as one review found contradictory information about the levels of pollutants in human milk (31). Concerning reports on early childhood illness, several disorders were taken into consideration and found to have a positive association with MIH, for example fever, diseases (asthma, pneumonia), otitis, adenoiditis, urinary tract infection, chickenpox (31, 33). MIH was significantly more common among children for whom amoxicillin was the only antibiotic medicament they had received, but not among children who were exposed to mixed use of antibiotics, including amoxicillin (31, 33). Nevertheless, it was also reported that no association between amoxicillin and MIH was found, and even antibiotics exposure was not associated with MIH (33). On the other hand, other types of antibiotics, like erythromycin and macrolides, were found to be more commonly used in children with MIH (31). Concerning anti-neoplastic treatment and anti-epileptic drugs, these were also reported as being associated with an increased risk of developing numerous teeth with diffuse opacities and even enamel hypoplasia (34). In relation to asthma medication as corticosteroids and bronchodilators, an association with enamel defects has been reported. Yet, other authors found no association with anti-asthma medication, although there could be an association with a subset of cases involving post-eruptive breakdown (33).

2.3 Clinical problems in MIH

Clinically MIH represents a unique challenge to the dental practitioner because of its nature, age of the patient and also treatment options. MIH can be present as different lesions ranging from demarcated opacities, to structural loss that results in atypical restorations or tooth loss. Teeth affected by MIH are hypersensitive to various thermal and mechanical stimuli, resulting in sub-optimal tooth brushing, plaque accumulation and therefore these teeth become at high risk of rapid caries development with resultant post-eruptive breakdown (PEB) due to enamel collapse under masticatory forces (3, 4). MIH requires extensive treatment, that varies from prevention to restorations and extractions, often under general anaesthesia. Therefore, a multidisciplinary collaboration of clinicians is often required, particularly to manage orthodontic consequences following the extraction of first permanent molars (35). Behavioural management of anxiety and fear among MIH patient is another aspect to consider when treating such cases because it can considerably affect a child's overall well-being. Consequently, the clinical management of MIH can be challenging for both clinicians and patients and negatively affect children's quality of life (36). Generally, MIH causes concern to children and their parents, as well as dentists because it affects aesthetics, enamel loss, increased risk of development of caries lesions, hypersensitivity and possibility of tooth loss, especially in severe cases (16, 25).

A recent paper published in the British Dental Journal (2) summarized the most commonly reported clinical problems for patients with MIH as following:

- Post-eruptive enamel breakdown leading to dentine exposure and this makes the tooth at risk of pulp involvement
- Tooth sensitivity, which might lead to poor oral hygiene and therefore, caries susceptibility increases
- Local anaesthesia problems which are possibly related to chronic pulp inflammation
- Behavioural management problems due to dental fear and anxiety which is related to the pain experienced by the patients during multiple treatment appointments
- Aesthetic problems in anterior teeth
- Tooth loss
- Occasional eruption difficulties of molars due to enamel roughness
- Negative impact on the child's school performance due to the absence from school
- Financial concern for families.

2.4 Clinical management of MIH

Clinical management of MIH is dependent on the disease stage (mild, moderate and/or severe) , and the treatment need can be comprehensive (37). For mild case, fissure sealants are considering in the handling of minor defects where

there is insignificant sensitivity and enamel breakdown (25). A new generation adhesives with a two-step etch-and-rinse provides higher retention and hence minimize the need for re-treatment, often seen in some types of fissure sealants(19). Some studies reported on the use of glass ionomer cements as fissure sealants as well as temporary restorations in provisional situations, in order to decrease sensitivity and minimize further breakdown of enamel (21).

Remineralization of the affected enamel and reduction of the sensitivity using fluoride varnishes can be used and supplemented the use of sealing or restorations (25, 38). Some researchers investigated the use of casein phosphopeptides and amorphous calcium phosphate (CPP-ACP) pastes and it has shown no significant differences with or without added fluoride in MIH cases (38, 39) .

Furthermore, amalgam restorations were also explored and had relatively low success rates (22). Adhesion procedures are challenging in MIH lesions (40). Although the use of several adhesives were studied, such as Clearfil TM SE Bond, Opti Bond TM FL, 3 MTM Single Bond, Adper TM, Scotch bond TM Multi-Purpose and Scotch bond TM Universal), there were no consensus regarding the best adhesive materials to be used and/or protocols on how to apply it in MIH teeth (19). Restorative approaches with, e.g., use of resin composite fillings were assessed in several clinical trials, where the effects of deproteinization and various types of adhesives also were evaluated (23, 41). The results were contradictory, with some studies showing that application of NaOCl after etching significantly increased bond strength to MIH-affected enamel, and

other studies reporting that NaOCl pre-treatment on the affected enamel did not enhance enamel bonding, but caused less pre-test failures (NaOCl 23.6 MPa vs. MIH-affected enamel 21.3 MPa, and sound enamel 31.2 MPa) (19).

In severe MIH cases, Stainless steel crowns (SSCs) were considered reliable to prevent further enamel loss, to control the hypersensitivity, to establish correctly interproximal and proper occlusal contacts with a low cost and little working time required (42). However, extraction can be a clinical option after taking into considerations the child's age, pulp involvement, and take orthodontic considerations into account(42).

Aesthetic challenges often associated with anterior teeth affected by MIH, manifesting as white or yellow-brown defects. Different approaches have been mentioned (43), namely etch-bleach-seal technique, bleaching with 10% to 38% carbamide peroxide in permanent teeth only, enamel reduction followed by the use of opaque resins and direct composite veneering, micro-abrasion using an abrasive paste and 18% hydrochloric, or polishing with pumice and etching with 37.5% phosphoric acid (42). Very recently, resin infiltration has been discussed as a possibility for restoration of decalcified enamel, since it masks the enamel whitish discolorations. However, there is no agreement because of an erratic or poor penetration (44).

2.5 MIH prevalence

To describe the prevalence, it is important to verify appropriate case definitions of MIH. Studies using the EAPD case definition presented higher prevalence values compared to other studies, where other types of definitions were used. The MIH prevalence varies significantly. Nevertheless, it was considered that the proportion of cases in need of care was estimated to 27.4%, or nearly 5 million new MIH cases every year that need dental treatment, and 240 million existing cases, among which some cases were not treated, particularly in poorer countries (20). MIH is considered a relatively common condition(2, 10). However, wide variations in MIH prevalence have been reported in different countries, ranging from as low as 2.8% in Hong Kong (6) to 40.2 % in Brazil (7). Although this could reflect real disparities in MIH prevalence between different countries, many commentators put this down to variations in indices, diagnostic criteria, age groups and examination protocols used to measure MIH, and hence, under or over estimation of MIH prevalence in various locations (8, 9). In an attempt to standardize MIH assessment, the European Academy of Paediatric Dentistry (EAPD) established MIH assessment criteria which have been supported by a training manual for use in clinical practice and epidemiological surveys (45). However, despite the popularity of EAPD assessment criteria for MIH assessment in developed and western

European countries, there is still a paucity of data on MIH in some regions such as Africa and the Middle East (11).

2.6 Awareness of MIH among Dentists

Searching literature revealed no studies were conducted regarding MIH awareness, diagnosis and treatment in the Libyan dental practice. However, several studies were conducted in several countries which are summaries in the next paragraphs.

European study (46), explored awareness of MIH prevalence and clinical impacts among forty four paediatric dentists in 30 European countries. MIH was stated to occur in almost all countries. Nearly all the responders were familiar with the clinical appearance of MIH, considered it as a clinical problem. In the view of limited data on the prevalence of MIH, the respondents highlight the need of prevalence studies to gain more knowledge about the extent of MIH and associated clinical problems.

Crombie and colleagues used a questionnaire based on the European study to investigate clinical experience of MIH, knowledge of prevalence, aetiology and contemporary management strategies for MIH among Australian members of the Australian and New Zealand Society of Paediatric Dentistry (3). Most respondents were familiar with MIH and encountered it in their practice. The majority estimated that MIH occurred in between 5 to 25 per cent of their clinical practice and almost all respondents considered MIH to be a clinical problem.

However, small proportion were aware of available data on the prevalence of MIH which is considered worthy of further investigation. No consensus existed regarding the aetiology of MIH or its clinical management. However, glass ionomer cements were popular

A questionnaire study, based on the same tool used in previous European and Australian/New Zealand studies, assessed the perception of Iraqi academic clinicians about MIH prevalence, severity and aetiological factors(13). The majority of the respondents observed the increasing rates of MIH in their clinical activities in recent years. A variation in the perceptions of MIH causes, prevalence, and severity was reported.

A Malaysian study of 131 dentists and dental nurses assessed and compared their knowledge regarding the occurrence of MIH within dental practice, its diagnosis, aetiological factors and clinical management (47). The authors concluded that MIH is identified and encountered by most respondents. Inconsistencies exist concerning MIH frequency of occurrence within their practice, its diagnosis, aetiological factors and management. Glass ionomer cements were the most popular material used in treating MIH. There was a clear need to have clinical training in the diagnosis and therapeutic modalities of MIH.

In Saudi Arabia, researchers investigated the perception of general dental practitioners (GDPs), specialist dentists and dental students regarding the prevalence, severity and aetiological factors of MIH. The majority of GDPs and specialists had encountered MIH in their practice, and that MIH could come

second to dental caries as a public health concern. A range of possible aetiological factors were identified with genetics the most common. The majority of respondents highlighted the need for further training on MIH management (48).

In Kuwait (49), A self-administered questionnaire regarding the prevalence, diagnosis, severity, training demands and clinical management of MIH , was distributed to the attendees of Kuwait Dental Association Scientific Conference. Most of the respondents noticed MIH in their practice, with a prevalence ranging between 10 and 20%. Resin composite and preformed crowns were the dental material often used in treating MIH teeth. Many GDPs felt unconfident when diagnosing MIH and supported the need to investigate MIH prevalence and to receive a clinical training.

A survey-based study included 251 U.S. pediatric dentists in the Midwest region was conducted to determine their knowledge, perceptions, and clinical management strategies of MIH. Nearly all participants were familiar with MIH. The majority reported the MIH prevalence to be less than 10 percent in their clinical practice Most respondents were confident when diagnosing teeth with MIH. The most cited clinical challenge in managing MIH teeth was "long-term success of restorations". Responses differed significantly for different demographics and educational characteristics of the respondents. The authors concluded that “MIH is generally well acknowledged by U.S. Midwest pediatric

dentists, with differences related to their perceptions of the condition's prevalence as well as clinical and restorative management challenges”(50).

A cross-sectional survey of 255 randomly selected GDPs in Hong Kong assessed their knowledge, experience, and perceptions regarding MIH. Majority of the respondents had encountered MIH in their practices (77.6%). Significantly more Pediatric Dentists had encountered MIH compared to GDPs and confident in diagnosing and treating MIH than GDP. The authors recommended continuing education programs to assure that MIH is accurately diagnosed and well managed (51).

A recent questionnaire-based study of Irish dentists assessed how they perceive and manage MIH (37). The mailed questionnaire was completed by 230 dentists. Most of the dentists reported that they observe MIH on a weekly basis. The majority of respondents felt confident in diagnosing and managing MIH. The most commonly cited barrier to care was the child's behaviour, followed by difficulty in achieving local anaesthesia. Composite resin was the most commonly selected material used to restore teeth affected by MIH. The authors concluded that there is a wide disparity of responses, and further highlights the need for the development of strong treatment guidelines and continuing dental education to assist dentists in treatment planning for MIH.

Chapter 3

Aims and Objectives

3.1 Aim

The aim of this study was to investigate awareness of MIH and its management among Libyan dental practitioners in order to inform health education institutions and policy makers.

3.2 Objective

1. To assess awareness of the Libyan dental practitioners of MIH.
2. To describe clinical experience of Libyan dental practitioners associated with MIH.
3. To describe current treatment strategies of MIH Among Libyan Dental Practitioners.

Chapter 4

Chapter 4. **Materials and Methods**

4.1 Study Design

A cross sectional study design was adopted to run a questionnaire-based survey of Dentists and dental trainees in Benghazi, between January and April 2021.

4.1.1 Sampling

A sample size of 385 participants was identified as sufficient to allow an estimate of the proportion of dental practitioners aware of the MIH and its management in their everyday practice, with 95% confidence limits of at most ± 0.05 (52). This estimated sample size is also sufficient for computing regression models including up to three independent variables (53). Given that no previous investigations, to author's best knowledge, have addressed the issue of MIH awareness in Libyan dental practices, the calculation of sample size was based on the assumption that 50% of dentists and interns would be aware of MIH. However, obtaining this number from practicing dentists would be impossible because of the limited number of dentists actually practicing dentistry in the Libyan dental practice. Furthermore, there is a potential non-response rate particularly in private dental practices where dental practitioners are usually busy. Therefore, a convenience sampling technique was employed to recruit study participants.

However, sampling was conducted in a way that allows the recruitment of a sample representative of different generations and types of practices in the

Libyan dental practice. The sample was drawn from all dentists practicing in the city of Benghazi in both private and public dental clinics as well as dental interns at the faculty of Dentistry, University of Benghazi and Libyan International Medical University (LIMU). These were recruited in a two-stage sampling process. In the first stage, a number of dentists were recruited. In the second stage, dental interns were recruited during their participation in oral health day campaign organised by the University of Benghazi. LIMU interns were recruited by directly contacting them at their University facilities.

4.1.2 Questionnaire

A self-administered questionnaire was specifically designed for this study. It was informed by available literature on MIH awareness and knowledge (54-56). The question format and questionnaire layout were refined over extensive discussion with the supervisor. A close-ended structured as yes/no, questions were used. A free text response section was included at the beginning of the questionnaire to collect sociodemographic information.

The questionnaire was pre-tested for clarity and content validity among a purposeful sample of 20 dentists and demonstrators at the departments of paediatric dentistry and restorative dentistry, at the University of Benghazi. These dentists were chosen for their expertise. They were asked to complete the questionnaire and provide feedback regarding each question. They were particularly asked to indicate their understanding of each question, and to give suggestions regarding ways to improve wording and the categories given in

close-ended answers. Their feedback given on copies of draft questionnaires was also supplemented by cognitive interviewing (57, 58). Two participants were interviewed while completing the questionnaire, in a think-loud exercise to gain further understanding as how dentists would interpret each question responses (59). Most of the feedback received was related to question wording and options of treatment of MIH. The participants in the questionnaire piloting process were not included in the final sample.

The final questionnaire (Appendix A), covered six topics:

Section A: demographic background, education and current employment

Section B: awareness of MIH

Section C: knowledge of MIH aetiology

Section D: challenges of treatment of MIH

Section E. Choices of restorative materials

4.1.3 Administration of the questionnaire

The questionnaire was handed to the participants by the Principal Investigator (PI). The aim of the study was explained and the fact that participation is voluntary was emphasised. The PI provided her phone number to clarify any questions. Systematic reviews of literature have recommended many ways to maximise the response rate of questionnaire surveys (60). These include notifying people in advance, using short questionnaires with a pleasant appearance and using incentives as well as several reminders with enclosed copies of the questionnaire. The questionnaire was dispatched as a coloured

printing and was personally addressed to the participants by the PI. Participants were given up to 3 weeks to reply. Another wave of questionnaires to non-responders was issued 3 weeks after the first round.

4.1.4 Data management

Collected questionnaires were checked for completeness where participants' answers were examined for inconsistencies across questions and contingency questions (61). For example, questionnaire with all answers as 'yes' or all answers as 'no' were excluded. Questionnaires with completely missing information on the use of the awareness of MIH were excluded. The questionnaires were then uploaded on excel sheet and numbered codes were given to each answer. For example: code 1 was give to the answer 'yes' and code 2 was given to the answer 'no'

4.1.5 Statistical analysis:

Data were analysed using statistical software SPSS Version 22.0. (Armonk, NY: IBM Corp.). Descriptive statistics were used to describe the demographics and professional characteristics of the participants, the characteristics of their dental practices and their current carrier position according to years of experience (Novice: newly graduated, early carrier: 2-5 years of experience, and Experienced: more than 5 years of experience). Counts and percentages were used to summarise responses to closed ended questions and categorised answers of choices and experiences questions.

The responses to clinical problems experienced by participants were summed up to create score of clinical problems. Bivariate analysis using T test and one-way ANOVA were used to compare the score according to the professional characteristics of the participants. Chi-squared test was used to compare the dichotomic responses (Yes VS No) by demographic, professional characteristics and dental practice characteristics of the respondents. For all statistical tests, statistical significance level was set at $p \leq 0.05$.

Chapter 5

Results

5.1 Response rate

Of the 500 questionnaires handed to dental practitioners, 421 valid responses were received. Of these 32 (7.6%) incomplete questionnaires were received, which were excluded from the analysis. The overall response rate was therefore 79.9 % (389/500), (Figure 5-1).

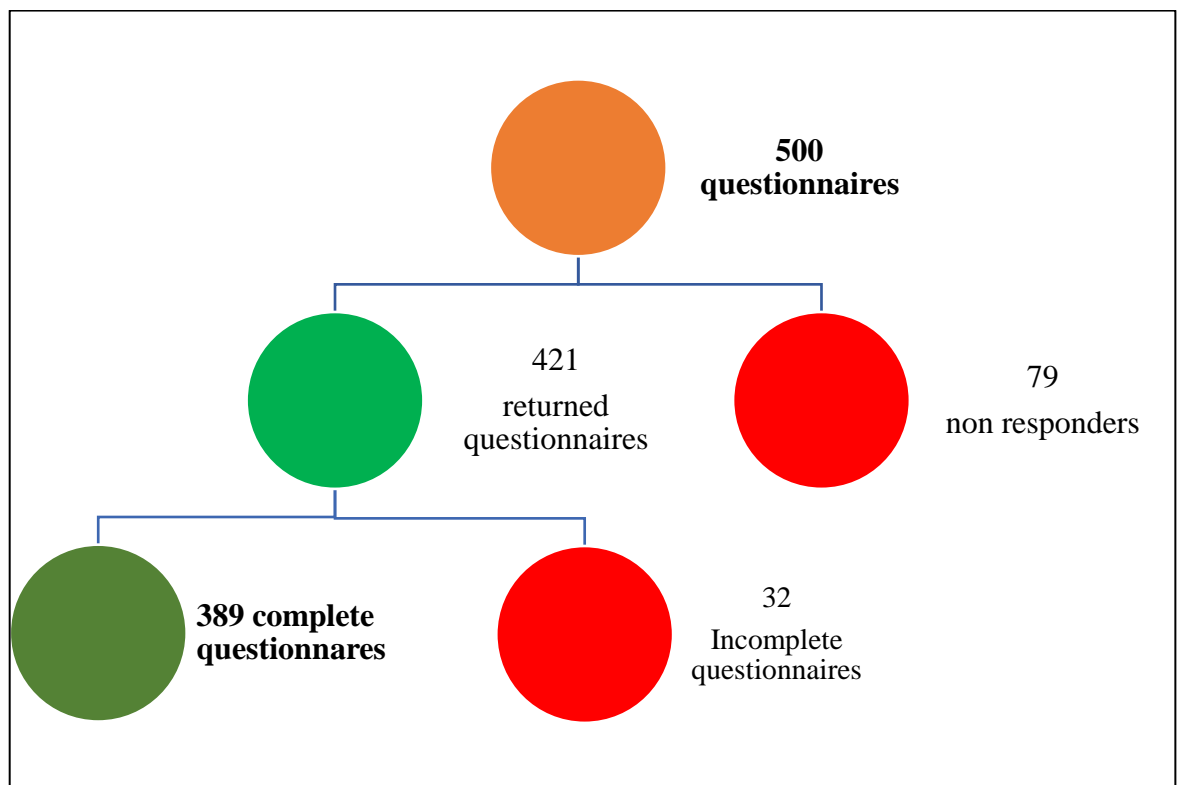


Figure:5-1: Flow chart of questionnaire distribution phases and response rates

5.2 Sample description

Demographic, professional and practice characteristics of respondents are summarised in Table 5-1. Nearly eight percent (30) have postgraduate dental qualifications. The majority were females (85%, 332) and dentists (73.8%, 287). The most commonly reported dental practices were public settings (28.8%, 112). Respondents had a mean 6.05 (SD 6.24) years of experience and comparable levels of experience.

Table 5-1: Characteristics of the study sample (n=389)

Variables	Categories	Statistics	
		Count	(%)
Gender	Male	57	(85)
	Female	332	(14)
Practice	Private	93	(23)
	Public	112	(28)
	Mixed	82	(21)
	New graduates	102	(26)
Education	BDS	359	(92)
	Postgraduate	30	(7.)
Experience	Novice	142	(36)
	Early carrier	108	(27)
	Experienced	139	(35)
Year of experiences		Mean 6.05	(SD) (6.23)

5.3 Awareness of MIH

Figure 5-2 depicts the participants responses to questions related to familiarity with MIH as a clinical condition and its prevalence in Libyan dental practice. The majority of participants (78.4%) indicated that they are familiar with this type of teeth (shown in coloured photograph) but lesser proportions (67%) encounter these cases in their practice. Less than quarter of the participants were aware of the prevalence of MIH in Libya and more than half of the participants support investigating the prevalence of MIH in the Libyan population. While nearly half of the participants believe MIH cases are on increase, the condition is estimated to range between 5 and 70%, and affected 30% of patients on average.

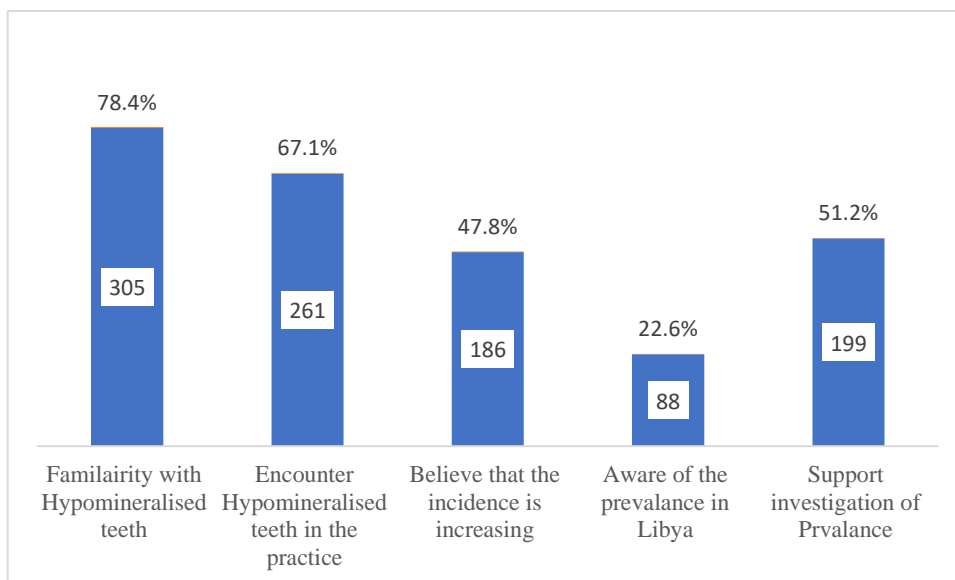


Figure:5-2: Responses to questions on awareness of MIH

Comparisons of awareness of MIH and its prevalence in the Libyan dental practice are presented in tables 5-2 and 5-3, according to demographic and professional characteristics. Generally, there were no statistically significant differences the awareness of MIH and its incidence by participants gender. The only exception was that more males believe that MIH is on increase ($p=0.002$). Conversely, statistically significant differences were observed in all comparison conducted according to the type of practice ($p\leq 0.0001$). Newly graduated dental practitioners demonstrated lower levels awareness than dentists working in dental practice. Likewise, statistically significant differences were observed in all comparison conducted according to the level of experience ($p\leq 0.0001$). novice dentists exhibited less awareness of MIH than more experienced colleagues. On the other hand, comparisons made by level of education revealed non statistically significant differences ($p\geq 0.05$).

Table 5-2: Comparisons of participants' awareness of MIH by demographic and professional characteristics (n=389)

Variables	Categories	Familiarity with MIH		Encounter MIH in their practice	
		N (%)	P value	N (%)	P value
Gender	Male	49 (86)	0.133	41 (71.9)	0.400
	Female	256 (77.1)		220 (66.3)	
Practice	Private	79 (84.9)	0.000***	79 (84.9)	0.000***
	Public	96 (85.7)		84 (75)	
	Mixed	72 (87.8)		60 (73.2)	
	Trainees	58 (56.9)		38 (37.3)	
Education	BDS	281(78.3)	0.825	241 (67.1)	0.959
	Postgraduate	24 (80)		20 (66.7)	
Experience	Novice	90 (63.4)	0.000***	70 (49.3)	0.000***
	Early carrier	94 (87)		82 (75.9)	
	Experienced	121 (87.1)		109 (78.4)	

N =Count , (%= Percentage), Chi Square test was used, *P<0.05, **P<0.01, ***P<0.001

Table 5-3: Comparisons of participants' awareness of MIH incidence by demographic and professional characteristics (n=389)

Variables	Categories	MIH incidence is increasing		Aware of incidence in Libya		Investigation of prevalence is needed	
		N (%)	P value	N (%)	P value	N (%)	P value
Gender	Male	38 (66.7)	0.002**	14 (24.6)	0.705	31 (54.4)	0.598
	Female	148 (44.6)		74 (22.3)		168 (50.6)	
Practice	Private	40 (43)	0.000***	14 (15.1)	0.011	49 (52.7)	0.002**
	Public	78(69.6)		26 (23.2)		66 (58.9)	
	Mixed	40 (48.8)		34 (17.1)		48 (58.5)	
	Trainees	28(27.5)		38 (33.3)		36 (35.3)	
Education	BDS	168(47.8)	0.164	82 (22.8)	0.721	187 (52.1)	0.203
	Postgraduate	18(60)		6 (20)		12 (40)	
Experience	Novice	40 (28.2)	0.000***	40 (28.2)	0.134	60 (42.3)	0.022*
	Early carrier	64 (59.3)		22 (20.4)		58 (53.7)	
	Experienced	82 (59.0)		26 (18.7)		81 (58.3)	

N =Count , (%= Percentage), Chi Square test was used, *P<0.05, **P<0.01, ***P<0.001

5.4 Aetiology of MIH

The most perceived cause of MIH was the genetic causes (60.2%), followed by environmental contamination and fluorides (47.6% & 42.9%, respectively). On the other hand, acute infections (20.1%) were the least incriminated for causing MIH, followed by antibiotics use (28%).

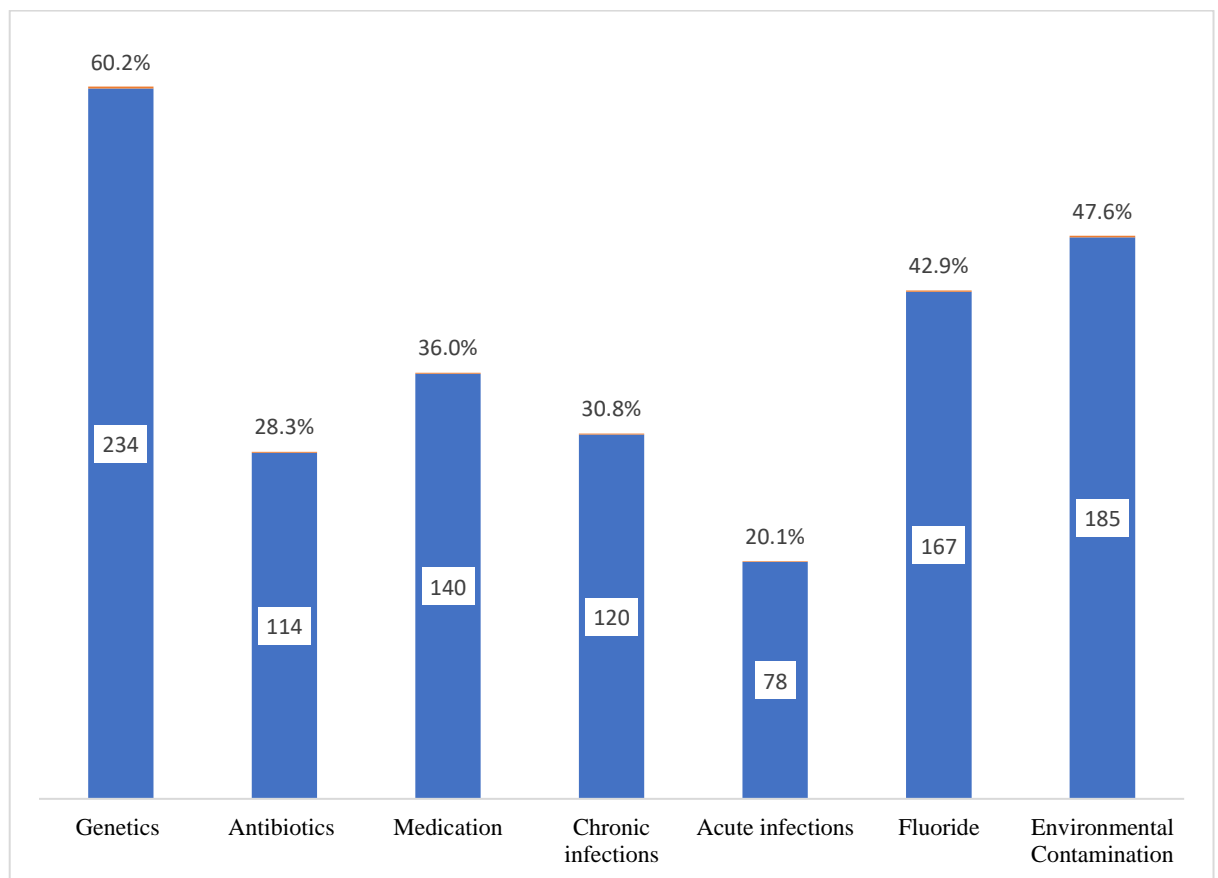


Figure:5-3: Perceived causes of MIH according to participants' responses

5.5 Clinical problems of MIH

Most of the participants (92.3%) consider MIH a clinical problem (Figure 5-4). The most challenging aspect was ‘Aesthetics’ (59.4%) followed by ‘Diagnosis’ (44.2%). On the other side, ‘Achieving adequate local anaesthesia’ and ‘Achieving patient comfort’ were the least challenging clinical aspects of MIH (18% & 28.8%, respectively). The restorative challenges were reported by above the third of respondents.

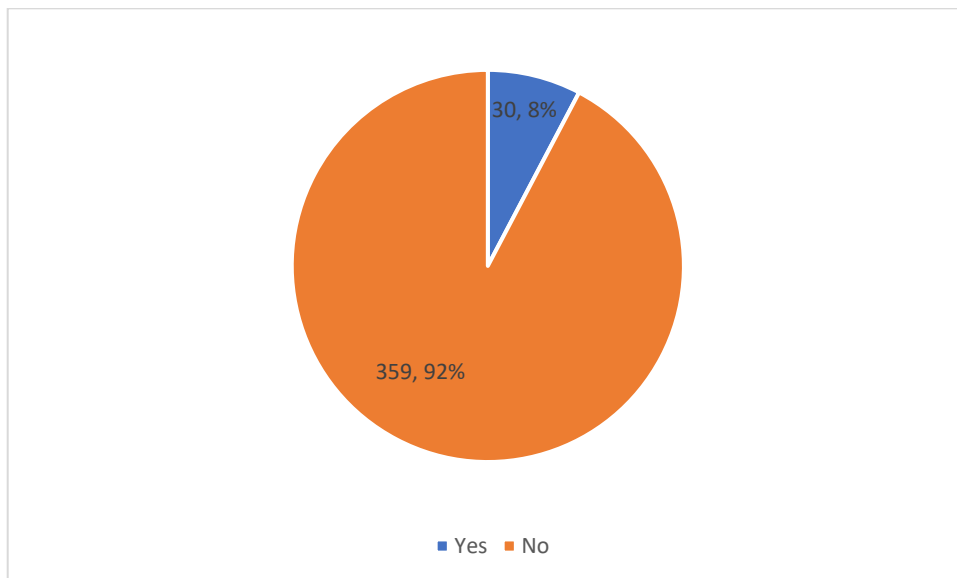


Figure:5-4: Proportions of participants who consider MIH as a clinical problem

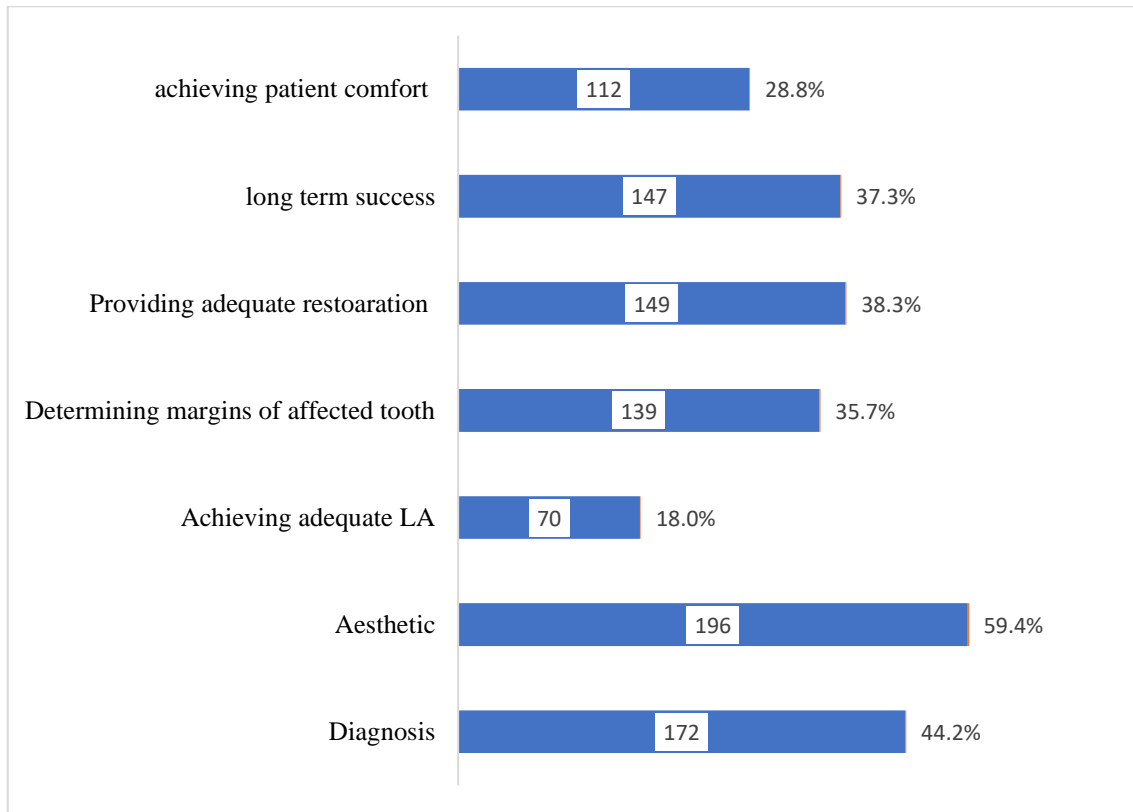


Figure:5-5: Proportions of clinical problems associated with MIH

Table 5-4 shows the summary statistics for the overall score of clinical problems recognised by the respondents and comparisons of this score by the professional characteristics of the participants. Overall, the median score was relatively low (2.00) with wide range extending to the maximum score (7.00). No statistically significant differences were observed when mean scores were compared across study subgroups. However, it is well noticed that dentists working in private sector experienced more problems than their peers in the public sector or the newly graduated dentists.

Table 5-4: Comparisons of clinical problems of MIH by professional characteristics

Variables	Categories	Clinical problems score	
Overall statistics	Mean (SD)	2.53 (1.68)	
	Median (Range)	2.00 (0-7)	
	Minimum- Maximum	0-7	
Variables	Categories	Mean (SD)	P value
Practice	Private	2.87 (1.73)	0.088
	Public	2.32(1.65)	
	Mixed	2.46 (1.66)	
	Trainees	2.51 (1.65)	
Education	BDS	2.53(1.65)	0.801
	Postgraduate	2.53 (1.96)	
Experience	Novice	2.49 (1.61)	0.491
	Early carrier	2.53 (1.41)	
	Experienced	2.55 (1.92)	

T test and one-way ANOVA test were used to compare means of scores, *P<0.05, **P<0.01, ***P<0.001

5.6 Choices of restorative materials

Figure 5-6 depicts different reasons behind choosing restorative materials used in the treatment of MIH. The most common influencing factors were 'Adhesion' and 'Aesthetics' (58.4% & 54%, respectively). Patients related reason (patients' preferences and sensitivity) were less common. The least common influencing factor was 'Research findings' reported by less than quarter of the respondents (21.6%). Personal experience appeared to be insignificant factor and reported by just above the quarter of participants. The most commonly selected restorative options were 'Preformed crowns' (41.6%) and 'High fluoride glass ionomer cement' (43.2%), whereas the least prevalent option was 'Flowable composite', 'Amalgam' and 'Compomer' (14.4%, 21.2% & 22.6%, respectively). 'Composites' and 'Glass ionomer cement' were not popular options and chosen by less than quarter of the participants.

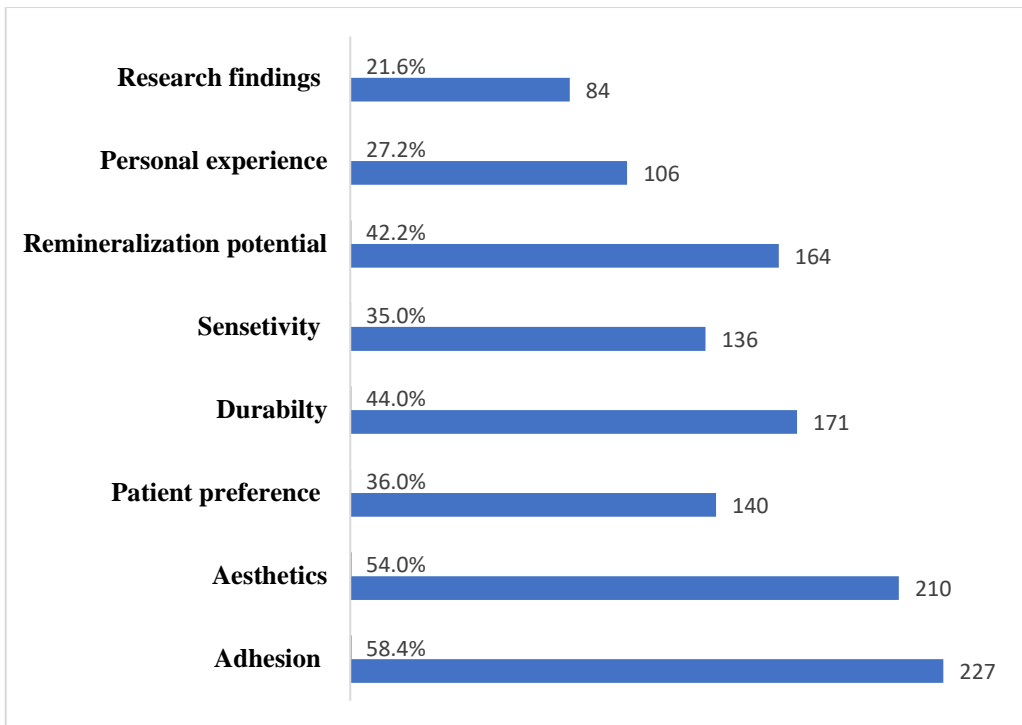


Figure:3-6: factors influencing the choice of restorative materials used for treating MIH

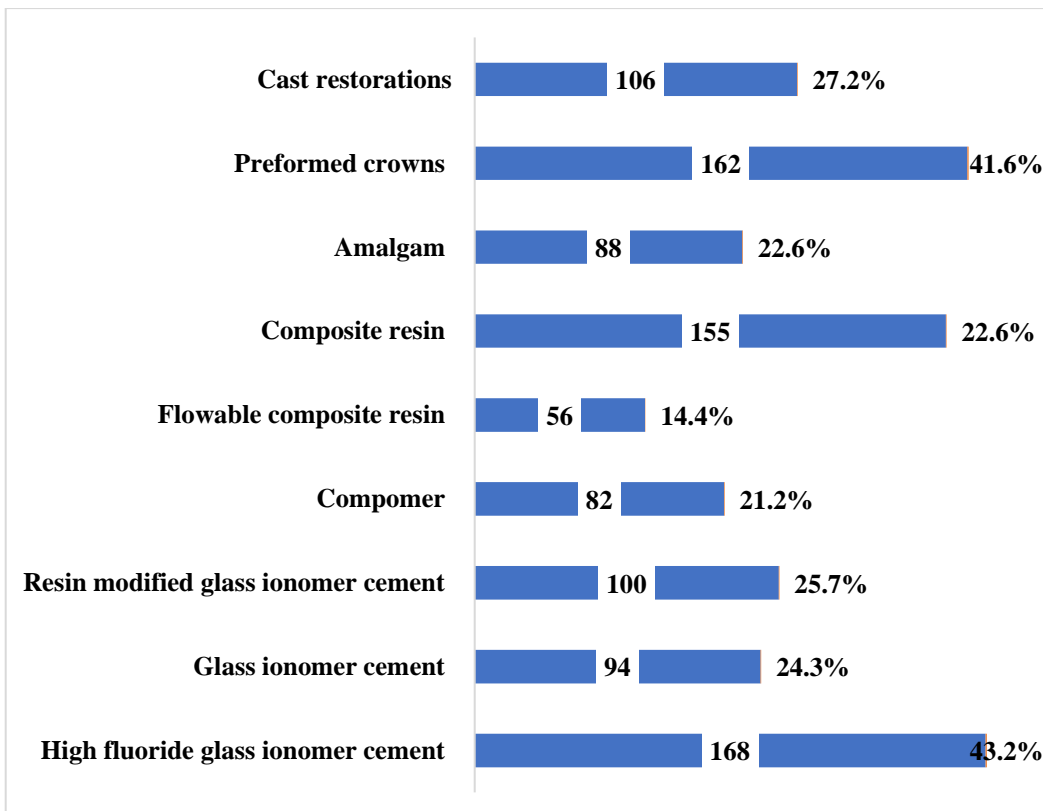


Figure:3-7: The choice of restorative materials used for treating MIH

Chapter 6

Discussion

This is the first known study to examine Libyan dentists' and trainees' perception and management of MIH. Cross-sectional study design using a self-administered paper-based survey was used to investigate the awareness of MIH and its management practices among Libyan dental practitioners. Cross-sectional surveys are a study approach that estimate the self-reported prevalence of a variable or group of variables in a given population (62). Using questionnaires is a quick and cheap research method that allows systematic and reliable data, if conducted properly (63). It offers both descriptive and analytical analysis of the outcome variables and related covariates (64). In health care research, questionnaire surveys are commonly used to investigate the attitudes and practices health professionals and how they perceive and deliver health services (65). Questionnaires can be completed in a variety of ways: in an interview; self-completed wherein respondents complete the questionnaire by themselves on internet, or by post (64).

The vast majority of respondents (78.4%) were familiar with teeth typical of MIH and noted its increasing occurrence in the Libyan dental practice. This finding is consistent with previous studies conducted in Europe (46), Iraq (13), Saudi Arabia (48) and Australia/New Zealand (3). On the other hand, most of the respondents demonstrated low awareness of MIH prevalence in Libya. This agrees with the previous study in New Zealand but contradicts the findings of the European study which exclusively included paediatric dentistry specialists. Therefore, this finding is not a surprising given that the participants were

recruited from general dental practice and hence many of them encounter paediatric patients infrequently. However, more than half of the respondents showed support of investigating the prevalence of MIH. Recently published study filled this gap and investigated the prevalence of MIH among Libyan school children, and found that 15% of children had some forms of MIH. The respondents in the present study overestimated the prevalence of MIH and suggested that on average MIH affected 30% of patients on average, with a wide range between 5% and 70%. This later is wider than that reported among dental practitioners in Australia/ New Zealand (3) and U.S pediatric dentists who reported the prevalence of MIH to be less than 10% in their practices (50). However, this wide range could be attributed to the variations in study sample. In other words, the present study comprised of specialist and GDPs with different experience and working in different sectors. So, those who regularly see child patients could encounter MIH more than those who usually see adults or newly graduated GDPs.

The precise aetiological mechanism(s) of enamel hypomineralization and its asymmetric presentation is poorly understood. However, the aetiology of MIH is believed to be multifactorial, with susceptibility varying between individuals despite being exposed to the same intrinsic or extrinsic challenges (3). A systematic review of literature which included 28 papers that covered medical problems in prenatal, perinatal and postnatal period, medication of the child during the first years of life, and exposure to fluoride or environmental toxicants

(dioxins and PCBs) in the early childhood and concluded that : “Based on the assessment of the articles it was still not possible to specifically name those factors causing MIH although correlations between several potential factors and MIH were presented”. Among the factors suggested and found to cause enamel defects in animal experiments were: high fever, hypoxia, hypocalcaemia, exposure to antibiotics (amoxicillin, a macrolide), and dioxins (66).

In agreement with the previous studies conducted in Australia/New Zealand and Saudi Arabia the majority of participants in the present study (60.2%) perceived MIH as genetic induced problem, and considerable proportions of them attributed MIH to environmental contamination and fluorides. Several studies have explored the potential genetic aetiology of MIH an suggested a strong link. For example, a study of 167 pairs of twins (8-15 years old) concluded that he greater concordance in the diagnosis of MIH among monozygotic twins indicates a genetic influence, although environmental factors, such as family income and haemorrhage during pregnancy, are also associated with the occurrence of MIH (67). Another study conducted among Brazilian children suggested that more severe cases with incisors affected by MIH could be associated with polymorphism in VDR gene (68).

Knowledge on factors associated with the aetiology of MIH can contribute to the identification of children who are more prone to this condition as well as the establishment of preventive measures and specific treatment. Several population-based studies have addressed prenatal, perinatal and postnatal factors

associated with the occurrence of MIH in children (10, 66). In Libya, a very recent study by Arheiam and colleagues found that , higher mean number of MIH-affected teeth was observed in children who were males, had caries in permanent teeth, those with history of complicated delivery, with early childhood health problems and those whose mothers had medication during pregnancy (12).

It is worth noting that a considerable number of respondents implicated fluoride, which suggests a confusion between hypo-mineralization and fluorosis as well as other developmental enamel defects. This highlights the need to put more emphasis on appropriate diagnosis of these conditions and their aetiology in dental curriculum. So that clinicians become competent in conducting accurate risk assessment and apply appropriate intervention.

Most of the participants (92.3%) consider MIH a clinical problem that brings several challenges, especially in terms of ‘Aesthetics’ and ‘Diagnosis’. These findings confirm the previously reported literature on clinical difficulties experienced by dental practitioners while dealing with MIH cases (3, 46) but contradicts the finding of other studies such as that conducted among Irish dentists consider children behaviours and achieving local anaesthesia were the most common influencing factors (37). The findings of the present study can be seen as a reflection of the insufficient training and shortage of information about MIH in dental curriculum and the lack of continuous education programs that shed the light on MIH in the Libyan dental practice. Although no information was collected about the teaching of MIH in Libya, in other countries, such as

Malaysia and Chile there is evidence that small number of dental practitioners reported that they have received information regarding MIH (47, 53). In addition, the majority of dental students in participated in a study on MIH in Saudi Arabia had not heard of MIH and most were in favour of including MIH-associated cases in the undergraduate curriculum of paediatric dentistry (48). Therefore, it is important that health and education authorities in Libya review the current dental curriculum and spread scientific evidence to provide dental practitioner with an updated information on the clinical management of MIH. This may help preventing and reducing the treatment and financial burden associated with MIH in the future

Interestingly, the findings of this study indicate that dentists working in private sector experienced more problems than their peers in the public sector or the newly graduated dentists. This can be attributed to the fact that most of dental services in Libya are provided in the private sector and that dental services in the public sector are limited to emergency case such extraction. In line with this, previous study among Irish dentists showed that dentists working in the private sector were less confident in diagnosing and treating MIH (37). Another possible explanation could be that the private sector recruit mainly experience dentists would not have been graduated long time ago and did not have any formal training or experience of MIH diagnosis during their undergraduate training given that the term MIH was only formally defined in the literature in 2001 and it has been an emerging phenomenon (2). Therefore, it is plausible that the type

of sector and treatment provided in it influence the dentists' skill in management of MIH. Previous studies among Libyan dentists suggested that practice-related variations and barriers can hinder the provision of appropriate preventive dental care (69).

Although some recent studies suggested that composite resins were the most commonly used restorative materials in managing MIH (37, 49), the findings of the present study corroborate a great deal the findings of previous studies conducted in Australis/New Zealand (3) and Hong Kong (51). The most commonly used restorative materials were 'Preformed crowns' and 'High fluoride glass ionomer cement', and the most common factors choosing influencing the choice of restorative materials used in the treatment of MIH were 'Adhesion' and 'Aesthetics'. These finding appear logical given that MIH affects incisors which is in the aesthetics zone of any individual. In addition, previous research found that the bond strength is lower in hypomineralized enamel (70). Therefore, it is not surprising that the use of preformed crowns is most common option. This is consistent with the findings of the previous study conducted in Kuwait were preformed crown was the most common restorative option for sever MIH(49). However, a contradictory finding was observed among Chilean dentists where the use of preformed crowns in the management of MIH was very limited, which was attributed to omitting this topic from undergraduate education in Chile (53). Anecdotal evidence suggests that preformed crowns are taught as part of the undergraduate curriculum at the

University of Benghazi. Previous studies indicated that Paediatric dentists were more likely to use preformed crowns and treat children compared to general dentists (71). It is worth noting that the findings of the present study reflect the knowledge of Libyan dental practitioner and not their actual practices. Further research is therefore required to assess how Libyan dentists' manage MIH cases in reality.

The reliance of research findings was the lowest contributing factor to dentists' decision on choosing the restorative materials for MIH treatment, reported by less than quarter of the respondents (21.6%). This finding can be seen as a reflection of the insufficient continuous education and the limited application of evidence-based guidelines and recommendations in the Libyan dental culture. While this phenomenon requires further exploration and assessment, higher number of practitioners appeared to count on their personal experience (above the quarter of participants) rather than research findings, as an influence on material choice.

The present study while demonstrated acceptable levels of awareness towards MIH diagnosis and management in the Libyan dental practices, it highlights the need of continuing education programs to disseminate MIH knowledge and enhance clinical skills of dental professionals in both diagnosing and treating children with MIH. Inclusion of up-to-date information about MIH in the clinical guidelines or implementation of accurate continuing development programs may help practitioners to increase their understanding when diagnosing

and treating MIH-affected children. Early diagnosis and management of MIH can reduce the burdens of treatment and allows for more conservative interventions.

A self-completed questionnaire was used to meet study aims. This method was selected because it enabled the collection of data from a large and remote population (72). Self-completion of questionnaires also eliminates interviewer bias which can be a problem when face-to-face methods are undertaken (72, 73). However, an inherent downside of self-completed questionnaires is that the investigator has limited control over responders and how they complete the questionnaire, and this potentially results in incomplete answers or the questionnaire being completed by the wrong person (65).

A relatively low response rate is a common concern in questionnaire studies on topics involving personal issues or investigating people's views on systems (72). Low response rates are common in studies involving health care providers (74). For example, recent surveys among UK GPs showed response rates ranging from 30% to 40% (75, 76). However, in the present study response was relatively high (). Many strategies have been considered as potential ways in which the response rate of questionnaire surveys may be increased. The following options are outlined in a comprehensive systematic review on interventions to increase response rates to questionnaires (77). The odds of response to questionnaires was found to be statistically significantly increase to or exceed the double when using a monetary incentive and when the

questionnaire topic was interesting to the respondents. A substantial increase in the Odds of the questionnaire response was also reported with: pre-notification, follow-up contact, shorter questionnaires, providing a second copy of the questionnaire at follow-up, mentioning an obligation to respond (and university sponsorship). Also, using non-monetary incentives, personalized questionnaires, colored printing, stamped return envelopes, an assurance of confidentiality were all found to increase the response rate. Conversely, including questions of a sensitive nature, beginning the questionnaire with the most general questions or offering the participants the opportunity to opt out of the study reduced the odds of response. This may explain the high response rate in the present study. For example, the questionnaire did not include any judgmental questions and challenging to the knowledge of the participants. The questionnaire was short and MIH is an interesting topic. In addition, high response rate has been reported in previous studies conducted among Libyan dentists. For example, Arheiam and colleagues (2015) reported response rate of 88% (78). To minimize social desirability bias and non-response bias, the PI emphasised that no judgments were to be made by the recipients of the questionnaires about what represented 'best practice'(79), and no personal information that indemnify the identity of the participants were requested.

The majority of the participants in the present study were either newly graduated or early carrier dentists who may have insufficient clinical experience. Precious studies have shown conflicting results when the experience of

participants was varied. For example, the study conducted in Kuwait with the majority of dentists (66%) practicing less than 5 years(49), the respondents were less confident in diagnosing and treating MIH. Contrary results were observed among Irish dentists, when a large proportion of the respondents in survey (46%) had been practicing dentistry for more than 20 years (37).

Basic research is required into the aetiology, structure and clinical characteristics of MIH teeth to determine whether current caries-model management strategies are appropriate for MIH. The authors suggest that further investigation into the interactions, physical properties and clinical performance of restorative materials when placed in MIH affected teeth is undertaken so that evidence-based treatment guidelines can be developed. It would be worthy to investigate the teaching of MIH- associated cases in dental curriculum and how this would improve the diagnosis and treatment.

Chapter 7

Chapter 7 Conclusion and Recommendations

7.1 Conclusions

The current study shows that MIH is a condition commonly encountered in the Libyan dental practice. Genetic causes were the most frequently reported aetiological factor of MIH. Preformed crowns and Glass ionomer cements were the most commonly used materials and the aesthetic as well as diagnosis were the most challenging aspects of treatment. However, variation in views was recorded about the proper treatment of MIH and factors influencing treatment and diagnosis. Continuing education courses on MIH condition are required to ensure high-quality care for children with MIH affected teeth.

7.2 Recommendations

- Clinical guidelines on the management of MIH should be made available for all practicing dentists in Libya.
- Continuing education program should be implemented and reinforced to make the GDPs more aware of how to use and apply the clinical guidelines and to standardize the diagnosis and management of MIH.
- The undergraduate teaching should emphasize the importance of MIH as a public health problem so that GDPs can be equipped to properly diagnose the condition, and treat simple cases.

Chapter 8.

Chapter 9.

Chapter 10.

Chapter 11.

Chapter 12.

Chapter 13.

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APPENDICES



**Molar Incisor Hypomineralization:
A Survey of awareness and management strategies
among dental practitioner in Benghazi.**

نقص التمعدن الرحوي القاطعي: استبيان لممارسي طب الأسنان على
الوعي و استراتيجيات العلاج في بنغازي, ليبيا.

By

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Research Proposal

Submitted in Partial Fulfilment of the Master's Degree in
Paediatric dentistry

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INTRODUCTION

The term molar incisor hypomineralization (MIH) has been defined recently to describe the phenomenon of demarcated, qualitative defects of enamel of systemic origin, affecting one or more permanent molars with or without involvement of the incisor teeth ⁽¹⁾. As such, it encompasses a wide range of conditions ⁽²⁾ with which the dental clinician is likely to be familiar, including: "idiopathic enamel hypomineralization in the first permanent molars", "hypomineralized first permanent molars", "non-fluoride hypomineralization in permanent first molars", "cheese molars", "non-fluoride enamel opacities", "idiopathic enamel opacities" and "opaque spots". Clinically, MIH may present as discrete, opaque lesions, ranging from white to yellow-brown, distinct from the more diffuse linear opacities usually associated with fluorosis, and may be associated with post-eruptive enamel loss making it difficult to distinguish from enamel hypoplasia. The distribution of the condition is often asymmetric, commonly with marked variation in severity within an individual ^(1,3). Several challenges are presented by MIH to both the affected individual and treating clinician, with a significant increase in treatment need being reported for those with MIH ^(4,8).

These teeth are often sensitive, impacting on oral hygiene practice and vulnerable to caries so that intervention may be required soon after eruption. Increased treatment need is not only due to increased caries susceptibility but also ongoing deterioration in the affected teeth and marginal breakdown impacting on the durability of restorations. In some cases, extraction is the most viable long-term option which may have major orthodontic implications, as well as representing a significant and stressful procedure for a young patient ⁽⁸⁾. When considered in conjunction with difficulties in oral access for the clinician, limited cooperation, difficulty in achieving adequate local analgesia

and the need for multiple re-treatment, it is hardly surprising these patients also experience higher level of dental anxiety and/or phobia ⁽⁴⁾. If the anterior teeth are affected then there may be significant aesthetic issues and clinical challenges.

Estimates of the prevalence of MIH vary widely in the literature, with data ranging from 3 to 50 percent in general population studies ⁽⁹⁻¹⁴⁾. This variation may reflect prior lack of both a consistent classification index and a standardized methodology of assessment for MIH ⁽¹⁵⁾. Since most studies assess developmental defect using the Developmental defect of Enamel (DDE) Index, rather than MIH specifically, prevalence figures are generally based on data for demarcated opacities as this is the DDE category most representative of the lesions of MIH. There is a higher incidence of developmental defect (up to 81 percent) in children with co-existing medical conditions, however the majority of studies do not distinguish between demarcated and diffuse lesions so it is unknown what percentage would be considered affected by MIH ⁽¹⁶⁻¹⁹⁾. The etiology of MIH is still unclear and whilst several factors (such as birth complication, medications, acute medical conditions or environmental contaminants) have been implicated, available evidence is equivocal ⁽²⁰⁻²⁹⁾.

A 2003 European survey of pediatric dentists investigating the existence and prevalence of MIH in Europe reported that, although MIH prevalence was low, data was available and that the majority of clinicians perceived MIH to be a clinical problem worthy of further investigation ⁽³⁰⁾. In Libya, a recent research reported that 15% of 8-10 years of Libyan children had MIH. However, little is known about MIH awareness and management among Libyan dentists. Therefore, the aim of this study will be to address this issue by investigating awareness of MIH and its management among Libyan dental practitioners in order to inform health education institutions and policy makers.

Objective

1. To assess awareness of the Libyan dental practitioners of MIH.
2. To describe clinical experience of Libyan dental practitioners associated with MIH.
3. To describe current treatment strategies of MIH Among Libyan Dental Practitioners .

Methods

Study design:

This study will be a cross sectional of Libyan dental practitioners in the city of Benghazi.

Study population and sampling:

All Libyan dental practitioners working in the city of Benghazi will be included. All public and private dental clinics in the city will be identified and all practicing dentists will be invited to take part in the study.

Data collection:

A self- administered questionnaire developed from previous studies will be used to collect data from dentists. The questionnaire will be in English language and tested for clarity and understanding among postgraduate students at the faculty of Dentistry, University of Benghazi. The questionnaire will cover following aspects: (demographic characteristics, awareness of MIH and treatment options and experiences)

Ethical consideration:

Ethical approval will be obtained from the ethics committee of faculty of dentistry of Benghazi university. Participation in the study will be voluntary and all information will be treated as confidential.

Data analysis:

Data will be processed and analyzed using SPSS Version 24 (SPSS Inc, Chicago, IL, USA). Descriptive statistics will be presented. Significance level for all statistical level will be set at 0.05.

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Serial no.

A questionnaire for dentist and paediatric specialist

1. Could you kindly give the next information:

Age Gender Occupation

Do you work in (private clinic_ public clinic _both _ University _Others)

Year of graduation for (BDS): years of experience

Educational level

BDS_ MASTER _ PHD_ OTHERS (mention please)

2. Could you kindly answer all the following questions

	Question	Yes	No
1	Are you familiar with these types of teeth?		
2	Do you encounter these teeth in your practice?		
3	What percentage of patients do you observe these teeth?		
4	In your practice do you feel the incidence has increased in the last 10 years or less?		
5	Are you aware of prevalence data for your country?		
6	Do you think it would be worthwhile investigating the prevalence?		
7	Which factors do you think are involved in the aetiology of MIH?		
	Genetic		
	Antibiotics		
	medications		
	Chronic medical conditions		
	Acute medical conditions		
	Fluoride		
	Environmental contaminants		
8	Do you think MIH is a clinical problem? If yes??		
9	Do you experience problem with		
	Diagnosis		
	Aesthetics		
	Achieving adequate LA		
	Determining the margins of affected tooth		
	Providing adequate restorations		
	Long-term success of restorations		
	Achieving patient comfort (for function, OH)		
10	Which factors influence your choice of restorative material?		
	Adhesion		
	Aesthetics		
	Patient/parent preference		
	Durability		
	Remineralisation potential		
	Sensitivity		

	Personal experience		
	Research findings		
11	What are the material you used for the treatment of MIH?		
	High fluoride glass ionomer cement		
	Glass ionomer cement		
	Resin modified glass ionomer cement		
	Compomer		
	Flowable composite resin		
	Composite resin		
	Amalgam		
	Preformed crowns		
	Cast restorations		



نقص التمعدن الرحوي القاطعي: استبيان لممارسي طب الاسنان على الوعي واستراتيجيات العلاج في بنغازي_ ليبيا

اعداد:

هالة محمد الترهوني

تحت اشراف:

د. ارحيم العوامي

الملخص

الغرض من الدراسة : هو معرفة اطلاع أطباء الاسنان ووعيهم لظاهرة نقص تمعدن القواطع والضروس للأطفال في مدينة بنغازي.

المواد والطريقة : قمت بإجراء مسح مقطعي وأجريت 385 استبيان لأطباء الاسنان في العيادات الخاصة و العامة وأطباء الامتياز في كلية طب وجراحة الفم و الاسنان في جامعة بنغازي والجامعة الليبية الدولية من يناير الي ابريل 2021.

النتيجة: أظهرت الدراسة ان العديد من أطباء الاسنان في مدينة بنغازي يفتقدون لمعرفتهم لظاهرة نقص تمعدن القواطع والضروس وفي اغلب الأحيان وجد ان سبب نقص تمعدن القواطع والضروس يرجع لاسباب وراثية. ومن اهم طرق علاجه صنع تيجان تغطي وتحمي الاسنان ووضع مادة القلاس ايونومر سيمينت. يجب عمل دورات تثقيفية مستمرة لنشر الوعي حول ظاهرة نقص التمعدن لاطباء الاسنان للتأكد من العلاج الأمثل للأطفال اللذين يعانون من هذه الظاهرة.



نقص التمعدن الرحوي القاطعي :
استبيان لممارسي طب الاسنان على الوعي
واستراتيجيات العلاج في بنغازي_ ليبيا

اعداد:

هالة محمد الترهوني

تحت اشراف:

د. ارحيم العوامي

قدمت هذه الرسالة استكمالاً لمتطلبات الحصول على درجة الماجستير في طب

أسنان الأطفال

جامعة بنغازي

كلية طب وجراحة الفم والاسنان

سبتمبر 2021