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RESEARCH ARTICLE

KNOWLEDGE AND PERCEPTION OF MOLAR INCISOR HYPOMINERALIZATION AMONG DENTAL PRACTITIONERS IN SANA'A CITY-YEMEN

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Abstract

Background: Molar incisor hypomineralization (MIH) has been recognized as a global dental disorder and concern about this pathology is growing among clinicians around the world.
Objectives: This study aimed to investigate the knowledge and perception of Yemeni dental practitioners in the city of Sana'a in relation to diagnosis, etiological factors and management of MIH.
Materials and Methods: A questionnaire modified from similar previous studies was distributed to 311 Yemeni dentists providing oral health care in Sana'a city. The survey consists of two parts, the first is the demographic-occupational variables that was collected for the participants and the second part included questions related to perception of the diagnosis, possible etiological factors, severity of the condition and management, and the participants 'willingness for advance training in relation to MIH.
Results: The overall response rate is (90%). The majority of respondents came across MIH in their practices (GDPs=83.2%, SDPs=90%).Yellow/brown demarcation is feasible as a common clinical symptom. The composite resin was the most used restorative material. The genetic factor was the most specific etiological factor. Most GDPs were significantly uncertain in the diagnosis of MIH compared to SDPs (p=0.003). Most of the respondents (72.5%) had a low level of knowledge regarding MIH. Participants support the need to assess MIH occurrence and conduct clinical training.
Conclusion: Molar incisor hypomineralization (MIH) is a common dental problem faced by dental practitioners in Sana'a City who have required clinical training regarding diagnosis, etiological factors and MIH management.
Keywords: Dental practitioners, knowledge, molar incisor hypomineralization , MIH, perception, Yemen.

INTRODUCTION

Dental research in Yemen has been increasing in recent years despite the poor economic and humanitarian conditions, as the United Nations considered the situation in Yemen the worst humanitarian crisis in the world due to the Saudi-Emirati aggression on Yemen. The most recent research conducted which discussed the prevalence of malocclusion, the causes of permanent tooth extraction in general dental practices, the spread of the canal behind the teeth, the prevalence and causes of dental injuries and finally MIH study[1-5]; this, in turn, will lead to improvement in the provision of dental services in Yemen. The expression molar – incisor hypomineralization (MIH) is described as a specific developmental defect in the enamel, affecting one or more of the first permanent molars, with or without the involvement of the incisor teeth, as an individual with permanent incisors is not designated as having MIH unless associated with a well-defined lesion in at least one of the permanent molars[6,7]. The condition was identified as non-fluoride enamel opacities, internal enamel hypoplasia, non-endemic molting of enamel, opaque spots, and idiopathic

enamel hypomineralization[8,9]. Clinically, the involved teeth show well-defined, white, cream colored, yellow or brown opacities on the enamel, with variant in its extent and severity[10]. The ultra -structural features of the surface of the teeth with MIH was evaluated by Bozal *et al.*,[11] found a loss of prismatic pattern, a porous ultra-structure with cracks, lowered of calcium and phosphate content in the affected surfaces, and change in ionic composition. Enamel alteration may interfere with reconstructive dental procedures[12]. A typical feature of the hypomineralized molar and incisor is the asymmetrical appearance. That is, the enamel of one molar can be severely affected while the enamel on the other side is clinically unaffected or has only minor superficial defect[13]. The etiology is not clear[14]. However; this condition has been associated with a variety of potential etiological factors, such as prematurity, long breastfeeding and infection[15,16,17]. MIH is also associated to respiratory infection such as otitis, bronchitis, pneumonia and asthma[10,18]. In a recent systematic review, a possible relationship between MIH lesions and systemic and environmental factors that may play a role during enamel maturation has been suggested[12]. The unaesthetic appearance of anterior teeth, pain, sensitivity and difficulties to achieve local anesthesia and provide suitable restoration are the main complication of MIH[14]. In addition, the altered and porous enamel structure makes bonding risky, which lead to defective filling and frequent re-treatment[19]. Early detection, intervention and appropriate treatment can prevent severe complications and improve masticatory and aesthetic function[12]. Previously, the prognosis of teeth with MIH was complicated by the presence of a carious lesion, whereas MIH is currently becoming more evident with reduced caries experience in many populations and increased awareness of clinicians[20]. Early diagnosis of this condition and immediate management is essential for successful long-term outcomes in affected children[21]. Many epidemiological studies from several countries declared that MIH is a common clinical problem[22]. Globally, MIH has a high incidence especially among children<10 years old[23]. Mineral deficiencies in the molar incisors can affect the general health and quality of life of children, and their treatment may have a significant financial impact on patients, their parents and society[24]. Clinicians' perception of MIH can facilitate the detection and appropriate treatment of this pathological condition[25]. It is recognized that MIH is of an increasing concern to clinicians worldwide[26]. Information regarding whether Yemeni dental practitioners encounter molar incisor hypomineralization in their fields of work and whether they experience the condition as a clinical problem is lacking. Up to the researcher knowledge there is no single scientific study or data available in Yemen, so this study was carried out to investigate the knowledge and perception of Yemeni dental practitioners in Sana'a city regarding the diagnosis, etiological factors and management of MIH.

SUBJECTS AND METHODS

Study design: This study was a descriptive cross-sectional study. The investigated population were dentists who are providing oral health care in Sana'a city to assess their knowledge and awareness regarding MIH.

Inclusion criteria: Yemeni dental practitioners who are providing oral health care in the government hospitals and centers in Sana'a city.

Exclusion criteria: Dental practitioners who are providing oral health care in the in Sana'a city but they are not Yemeni citizens. Practicing dentists who are working in Sana'a University, faculty of dentistry and were involved in pilot study.

Sample size determination: The present study sample size was (311) which was calculated using OpenEpi® software after knowing the number of dentists (1622) who have approbation from Yemeni Dental Association to practice dentistry in Sana'a city until February, 2017, considering a significant an alpha 0.05 at confidence interval level 95%, power 80% and anticipated proportion= 50%.

Sampling method: Simple random sampling technique was used utilizing software and a computer.

Data collection: A questionnaire survey modified from previous similar studies[27,28]. It was used as an instrument for data collection and the participants were assured that all information is confidential and protected.

Pilot study: The questionnaire was tasted by a pilot study performed amongst 20 of practicing dentists working in Sana'a University, Faculty of Dentistry and they were not included in the study. The feedback from these dentists was used to improve the wording and structures of the questionnaire[29].

Questionnaire: Participation in this study was voluntary and anonymous. Brief information about the MIH condition and aim of the study were included in the cover page with some clinical photographs which were used by ANZ and Iraqi survey[30,27] and others were taken at the Faculty of Dentistry, Sana'a University. The survey was involved five sections, the first section collected the background, demographic and practice information including questions on (age, gender, years of practice and type of qualification). The second section included questions regarding perception and recognition of MIH in Sana'a city. The third and fourth sections investigated the participant's knowledge of possible etiological factors and period of occurrence. The last part of questionnaire collected information about management of MIH and participant's willing to receive education and clinical training regarding MIH[27,28].

Ethical consideration: Ethical approval was obtained from the Ethical Committee of the medical research at Sana'a University. Approval was obtained from all participants before recruiting them to the study and after explaining for them the aim of the study.

Statistical analysis: Data of completed questionnaire obtained, and were manipulated using Statistical Package for the Social Science version 21.0 software (SPSS version 21.0). Descriptive analysis based on the

distribution of selected biographical, educational and work experience variable using Pearson's chi-square test (x^2) were taken. The results considered significant an alpha 0.05 at confidence interval level 95%.

Table 1: Demographic and professional characteristics of the Yemeni dentists who participated in the study.

Characteristic		N	%
Gender	Male	56	20.0
	Female	224	80.0
Age (years)	≤ 30	202	72.1
	31-40	73	26.1
	41-50	5	1.8
Years of experience	≤5	196	70.0
	6-10	38	13.6
	11-20	38	13.6
	21-30	8	2.9
Qualification	BDS	250	89.3
	MSC	23	8.2
	PhD	7	2.5
Total		280	100.0

RESULTS

Of a total of 311 questionnaires distributed, 289 responses were received, and 9 respondents were excluded because they were kept blank or with incomplete answers. The completed questionnaires were 280, general dental practitioners (GDP = 250) and specialist dental practitioners (SDPs=30). The overall response rate was 90%. The majority of the respondents are female (80%) and the ages (72.1%) of the participants were equal or less than 30 years old, while (1.8%) dentists were between (41-50) years old.Approximately, thirty-four of dentists (70%) had less than or equal of 5 years of experience while only (2.9%) of participants had more than 20 years of experience. In addition, the dentists' qualifications were bachelor (89.3%) and (10.7%) were dental specialists MSC/PhD. Perception of the MIH status among general dental practitioners (GDPs) and dental specialists (SDPs) are shown in Table 2. The vast majority of GDPs (83.2%) and SDPs (90%) encountered MIH in their practices. Most of the participants agreed that MIH is a public dental health problem (GDPs = 83.3%, SDPs=74.0%). Almost two third of the GDPs (67.2%) reported that the condition in Sana'a city was moderate while half of the SDPs (50.0%) declared that the condition was mild with a significant difference between the two results (p<0.001, p<0.00, respectively). In response to the question on clinical presentation of MIH half of GDPs and SDPs indicated that yellow, brown demarcated was the most frequent noticed (55.5%, 46.7%, respectively), while post eruptive enamel breakdown defect was the least reported (16.4%, 6.7%, respectively). Significantly almost half of SDPs had noticed white demarcation in their practices (46%) (p=0.05). The majority of SDPs participants (70.0%) significantly observed MIH lesion at a low frequency in the second primary molar (p=0.01). Approximately half of general practitioners (52.4%) were significantly unconfident in diagnosing MIH compared to dental specialists (23.3%) (p=0.003). The vast majority of SDPs and over half of GDPs agreed that it would be worthwhile to assess the prevalence of MIH in our country and there was a significant difference between them (90.0%, 61.2%, respectively) (p=0.003) (Table 2).

Table 2: Perception and recognition of MIH of the Yemeni dentists who participated in the study.

Perception and recognition of MIH	GDPs yes		SDPs yes		*p* value	
	N	%	N	%		
Do you encounter hypomineralization teeth in your practice?	208	83.2	27	90.0		
Do you think MIH is a dental public health problem?	185	74.0	25	83.3		
How sever is this condition do you think in Sana'a city?						
Mild	52	20.8	15	50.0%	*0.001	
Moderate	168	67.2	7	23.3%	*0.00	
Sever	30	12.0	8	26.7%		
What do you most frequently notice in your practice?						
White demarcated	70	28.0	14	46.7%	0.05	
Yellow, brown demarcated	139	55.6	14	46.7%	0.01	
Post eruptive enamel breakdown	41	16.4	2	6.7%		
How do you think the frequency of this defect in the second primary molar compare to first permanent molar (FPM)?						
More frequently	91	36.4	4	13.3%		
Less frequently	112	44.8	21	70.0%	0.01	
Same as FPM	47	18.8	5	16.7%		
How confident do you feel when diagnose MIH?						
Un confident	131	52.4	7	23.3%	0.003	
Confident	119	47.6	23	76.7%		
Do you think it would be worthwhile to assess the prevalence of MIH in our country	153	61.2	27	90.0%	*0.001	

Table 3: Knowledge of possible etiological factors for MIH of the Yemeni dentists who participated in the study.

Knowledge	GDPs		SDPs		*p* value
	Yes		Yes		
	N	%	N	%	
From your broad systemic background, which factor(s) do you think are involved the etiology of MIH?					
Genetic factors	191	76.4	21	70.0	0.49
Environment contamination	129	51.6	13	43.3	0.44
Chronic medical conditions affecting mother or child	120	48.0	17	56.7	0.44
Acute medical conditions affecting mother or child	56	22.4	13	43.3	0.02
Antibiotic and medication	83	33.2	15	50.0	0.10
Fluoride application	85	34.0	18	60.0	<0.001*

*Statistically significant (p<0.05) Pearson's chi-square

Table 4: Knowledge of possible period for MIH of the Yemeni dentists who participated in the study.

Possible period for MIH	GDPs		SDPs	
	yes		yes	
	N	%	N	%
In your clinical work how often do you notice hypomineralization teeth?				
Daily	15	6.0	3	10.0
Weakly	69	27.6	6	20.0
Monthly	118	47.2	12	40.0
Yearly	48	19.2	9	30.0
What age do you think is ideal to assess MIH				
5-7 years	138	55.2	21	70.0
7-9 years	112	44.8	9	30.0

Table 3 presents the knowledge of possible etiological factors. The most common identified etiological factor was a genetic factor (76.4% of GDPs and 70.0% of SDPs). Followed by environmental contamination and chronic medical condition affecting mother and child (51.6%, 43.3% and 48.0,56.7%, respectively). Fluoride exposure and acute medical condition were significantly considered by almost half of dental specialists as relevant factors (60.0%, 50.0% respectively) (p<0.00, p=0.02, respectively). Period of occurrence is showed in Table 4; around half of respondents (GDPs=47.2%, SDPs=40.0%) had noticed hypomineralized teeth on a monthly basis, while nearly third of GDPs (27.6%) had noticed such teeth on a weekly basis and (30.0%) of SDPs on a yearly basis during their practices. Participants in the current study were unable to identify the correct age to assess MIH. The response about management of MIH, education and clinical training demand amongst the participants are illustrated in Table 5. Resin composite was the most frequently used restorative material for MIH affected teeth treatment amongst participants (GDPs=47.6%, SDPs=70.0%), followed by glass ionomer cement (38.4%, 26.7%, respectively). While performed crown was the least used by clinicians (GDPs=10.0%. SDPs=3.3%). Dental specialists (70%) used resin composite material significantly more than general dental practitioners (p=0.03). On the other hand, amalgam material was used significantly by general dental practitioners compared to dental specialists (p = 0.05). Regarding the reported barriers for performing treatment to the children with MIH, half of the participants considered uncooperative and anxiety child as an important barrier for provide proper treatment (GDPs=50.4%, SDPs=53.3%). No significant difference was observed between the two groups in the term of barrier to perform MIH management. Almost two third of GDPs and SDPs stated they were received information about MIH (57.6%, 66.7%, respectively). However, all of the general practitioners willing to receive clinical training regarding tooth hypomineralization and also it has been strongly agreed by (90.0%) of dental specialists with a significant difference between them (p<0.00). Table 6 showed the level of knowledge and awareness of the dentists regarding MIH. About of (72.5%) of the participants in the current study had a low level of knowledge and (25.0%) had moderate level of knowledge while only (2.5%) of respondents had a high level of knowledge. The analysis in the present study showed that specialists dental practitioners likely have better knowledge and awareness level than general dental practitioners and the difference was statistically significant (X^2=6.51; p=0.038) (Table 7, Figure 2). Furthermore, female in the current study likely have a good knowledge and awareness than male with a significant difference (X^2=4.07; p=0.04) (Table 8, Figure 1). No significant difference was found between age and years of practices variables and level of knowledge (p =0.43, 0.28, respectively).

DISCUSSION

This is the first study to be conducted to explore knowledge, perception and clinical experiences about MIH among general dental practitioners (GDPs) and specialist dental practitioners (SDPs) providing oral health care in Sana'a City.

Table 5: Management of MIH and willing to receive education and clinical treating regarding MIH for Yemeni dentists who participated in the study.

	GDPs		SDPs		*p* value
	Yes		Yes		
	N	%	N	%	
What type of materials do you often use in treating MIH tooth?					
Amalgam	28	11.2	0	0.0	0.05
Composite	119	47.6	21	70.0	0.03
GIC	96	38.4	8	26.7	0.23
Preformed crown	25	10.0	1	3.3	0.33
Would any of the following represent a barrier to you for performing MIH management?					
Needs for several appointments	64	25.6	5	16.7	0.37
Uncooperative and anxiety child	126	50.4	16	53.3	0.84
Insufficient training to treat children with MIH	60	24.0	9	30.0	0.5
Are you receiving any information on MIH	144	57.6	20	66.7	0.43
Would you like clinical training regarding tooth hypomineralization?	250	100	27	90.0	<0.001*
In which area would you like the training?					
Diagnosis	12	4.8	0	0.0	0.61
Etiology	22	8.8	1	3.7	0.71
Treatment	19	7.6	5	18.5	0.61
All	197	78.8	21	77.8	0.53

The majority of participants encountered the presence of MIH in their clinical practices and this finding coincides with the results from previous studies[18,25,31]. Yellow/brown opacities were noted by participants as being the most common enamel defect and those found agreed with previous reports in the region[18,27,28]. It is likely that this type of enamel lesion is the least easily misdiagnosed with alternative lesions such as fluorosis and white spot lesions[31,27]. A post eruptive breakdown lesion was less observed by the participants in this study, this was consistent with the previous findings[31,32]. This may be due to MIH that are usually seen as a typical caries lesion later in life, and the participants in this study may have been mistaken for Diagnosed as dental caries rather than enamel collapse after secondary eruption of enamel hypomineralization[33].

Table 6: Level of knowledge and awareness of the dentists towards MHI for Yemeni dentists who participated in the study.

Level of knowledge and awareness	N	%
(Low)	203	72.5
(Moderate)	70	25.0
(High)	7	2.5
Total	280	100.0

In this study, most respondents observed a lower-frequency MIH lesion in the second primary molar compared to the first permanent molar (FPM). As discussed in the literature review, this condition is described as "HSPM". A patient with HSPM needs frequent follow-up as this condition can be considered as an indicator of MIH[31,34]. However, lack of HSPM does not exclude the possibility of further development of MIH. Several general practitioners in this survey were significantly less confident in the diagnosis of MIH compared to dental specialists (p=0.003). This result clarifies their request for further clinical training. Participants in previous surveys reported a similar request for clinical training regarding MIH[31,28]. The vast majority of dental specialists (90%) and general practitioners (61.2%) recommended that investigating the prevalence of MIH in our country would be helpful.

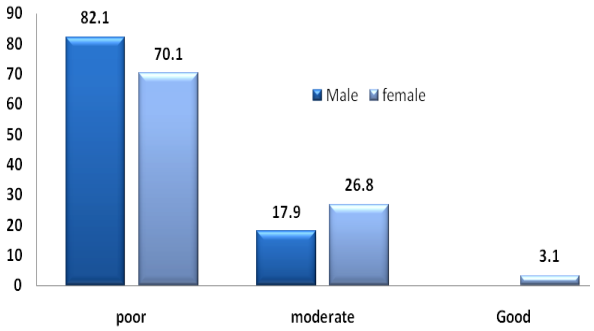

Figure 1: Distribution of the gender of the dentists and their level of knowledge and awareness regarding MIH in Sana'a city.

This finding reflects the fact that MIH will emerge as an issue of concern to the dental community[20,30]. The response of the participants in the current study regarding the etiological factors of MIH reflected the suspected multifactorial nature of MIH. Most of them were identified by genetic factors as the most common factor which is consistent with similar studies conducted internationally[25,18,30]. Acute medical condition during pregnancy and during early childhood has been reported as a presumptive etiological factor of MIH (p=0.02)[25,30]. Fluoride was also significantly implicated by more than half of the dental specialists in

this study (p<0.001), which may indicate that there is still confusion in the dental community regarding the distinction between fluorosis and other developmental defects. This result reflects the results of the Iraqi studies and the studies of ANZ[27,30]. In the current study, less than half of general practitioners and a third of dental specialists identified the appropriate age for assessing MIH (7-9 years) correctly. This finding was unexpected and indicates that more work is needed to restore this lack of understanding of the condition and prevent further misdiagnosis. Statistical analysis in this study showed that the most preferred dental material that the respondents used was composite resin, which is in line with the reports of the other studies[18,25,31]. The second preferred material that the participants used was GIC, and this was in agreement with the results of Crombie *et al.*,[30] and Gambetta-Tessini *et al.*,[20]. These results may be controversial and thus the use of GIC in teeth with MIH is considered an interium therapy by many to reduce sensitivity and prevent PEB in an effort to stabilize the teeth so that they can be restored at a later date. Medium and long-term treatment options for MIH-affected teeth should include direct resins compound restoration, cast restoration, and extraction and placement of PMCs[30].

However, the crown performed was the least reported material that the participants in this study used (GDP = 10.0%, SDPs=3.3%). This finding is in agreement with Crombie *et al.*,[30], but does not agree with the results of Alanzi *et al.*,[31].

Table 7: Association between level of participants' knowledge and their qualification for Yemeni dentists who participated in the study.

Independent Variable			Level				X^2	*p*-value
			Low	Moderate	High	Total		
Qualification	GDPs	N	186	57	7	250	6.51	0.038*
		%	74.4%	22.8%	2.8%	100.0%		
	SDPs	N	17	13	0	30		
		%	56.7%	43.3%	0.0%	100.0%		

*significant

Table 8: Association between level of participants' knowledge and their sex for Yemeni dentists who participated in the study.

Independent variable			Level			Total	X^2	*p*-value
			Low	Moderate	High			
Gender	Male	N	46	10	0	56	4.07	0.04*
		%	82.1%	17.9%	0.0%	100.0%		
	Female	N	157	60	7	224		
		%	70.1%	26.8%	3.1%	100.0%		

Participants in the current study reported that "uncooperative and anxious child" was a common barrier to MIH management, reflecting insufficient training of dentists in child management. This finding was consistent with the findings of Alanzi *et al.*,[31] and disagreed with that of Hussain *et al.*,[18] who found "inadequate training" as a common barrier among dentists in Malaysia. Half of the respondents in this study reported that they had received information regarding MIH, but more than nearly two-thirds (72.5%) had a low level of knowledge regarding MIH and only (25.0%) had a moderate level of knowledge.

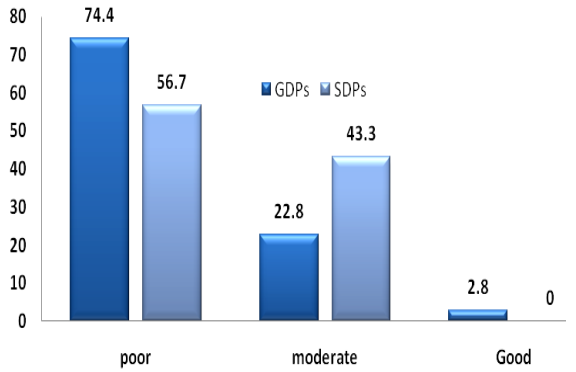

Figure 2: Distribution of the dentist's qualification and their level of knowledge and awareness regarding MIH in Sana'a city.

Thus MIH diagnostic criteria were introduced only in 2001[7]. In addition, the information available regarding MIH is also very scarce because dental education programs in our country are concentrated in some practical areas of dentistry such as orthodontics and implantology which causes restriction of access to knowledge in MIH after graduation. A significant difference in the level of knowledge between GDPs and SDPs was reported in this study (p=0.03), and the results of the study showed that (43.3%) SDPs have a moderate level of knowledge compared to only GDPs (22.8%). This can be explained by the results presented in Table 5 where (66.3%) of service delivery points reported receiving some information related to MIH. Another result in this study found a significant difference in the level of knowledge between male and female dentists with good level of knowledge among females compared to males (p=0.04). The report showed that (26.8%) of females had a moderate level of knowledge and (3.1%)

had a high level of knowledge while (17.9%) only males had a moderate level of knowledge. This may be due to female dentists' interest in engaging with children more than males and more active in self-training programs. Thus, the level of knowledge increases with more information on MIH and child management and this was noted in this study.

CONCLUSIONS

MIH is a widespread oral health condition commonly faced by GDPs and SDPs in Sana'a city. Yellow/ brown opacity was identified by the respondents as the most clinical symptom of MIH and most of the GDP being uncertain in the diagnosis of MIH compared to SDPs. The uncooperative and anxious child was the most frequently reported barrier to MIH administration and the resin compound was the most common restorative substance used to treat teeth with MIH. The majority of respondents in the current study had a low level of knowledge and most requested clinical training regarding MIH.

AUTHOR'S CONTRIBUTION

This research work is part of a Master's thesis. **Al-deen AAS:** works, writing original draft. **Al-deen HMS:** hypothesis of the work. **Abbas AKM:** writing original draft, editing, review. **Al-Akwa AAY:** methodology, formal analysis. **Al-Shamahy HA:** supervision, review. **AL-Haddad KA:** formal analysis, conceptualization. **Al-Sharani HM:** data curation, investigation. **Al-labani MA:** methodology, formal analysis, conceptualization. All authors revised the article and approved the final version.

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CONFLICT OF INTEREST

None to declare.

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