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## Assessment of Knowledge, Attitude and Practice of Molar-Incisor Hypomineralisation among a Group of Egyptian Dentists (Observational Cross-Sectional Study)

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## **Assessment of Knowledge, Attitude and Practice of Molar-Incisor Hypomineralisation among a Group of Egyptian Dentists (Observational Cross-Sectional Study)**

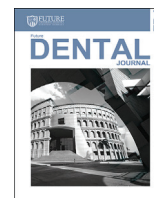
### **Cover Page Footnote**

I would like to express my profound thanks to all Egyptian Dentists participating in this questionnaire study

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# Assessment of Knowledge, Attitude and Practice of Molar-Incisor Hypomineralisation among a Group of Egyptian Dentists (Observational Cross-Sectional Study)

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### ABSTRACT

**Introduction:** Molar Incisor Hypomineralisation (MIH) is one of qualitative DED. MIH is increasing dramatically in the new generations, which is considered to be challenging for the majority of dentists. MIH was found to be prevalent in 14.2% of the world's population, with the high incidence 18% in South America and the least (10.9%) in Africa. This study was carried out to assess the knowledge, attitude, and practice of graduated Egyptian dentists' group regarding MIH condition and compare the outcome information among different dental specialists. **Material and methods:** A google based questionnaire based on previously validated published papers distributed electronically through different social media by direct message or public social media link. Eligibility criteria including Graduated Egyptian licensed dentists excluding students, interns and other medical specialties. Model answer prepared by researchers in 3 rounds based on most recent published papers. **Results:** 416 participants enrolled in this study with response rate reach to 16.7% for direct message and 1.4% for public share link. 79.1% of PDs, 45.8% of GPs and 45.0% of other specialties are familiar with both MIH condition and terminology. A prevalence of 10-20 % was notice by participants during their practice (21.9% PDs, 22.0% GPs and 22.2 other specialties). Most of participants believe that there is a lack of information regarding MIH between Egyptian dentists. The majority of the participant used Full coverage for posterior teeth and composite resin for anterior teeth as treatment choice. 53.1% of PDs are encountered MIH in monthly bases. **Conclusion:** MIH is a clinical problem that Egyptian dentists well recognize and frequently encounter in clinical practice. There is a need to include MIH in academic curriculum to increase the awareness regarding the condition and clinical management.

### 1. INTRODUCTION

Molar Incisor Hypomineralisation (MIH) is one of qualitative DED. MIH is increasing dramatically in the new generations, which is considered to be challenging for the majority of dentists. Information, experience, complication, patient behavior, and isolation are the most effective barriers. MIH terminology was introduced in 2001 to describe systemic origin teeth condition, defined as chronological and general disturbance condition affecting one to four first permanent molars' enamel, with and without permanent maxillary incisors' involvements<sup>1</sup>.

In 2000, four presentations at the European Academy of Pediatric Dentistry Congress described one significant enamel alteration influencing the Permanent First Molar (PFM). The condition was dubbed hypomineralized PFM in these findings<sup>2</sup>, idiopathic enamel hypomineralization in PFM<sup>3</sup>, non-fluoride hypomineralization in PFM<sup>4</sup> and cheese molars<sup>5</sup>.

MIH was found to be prevalent in 14.2% of the world's population, with the high incidence 18% in South America and the least (10.9%) in Africa<sup>6</sup>.

The MIH clinically is an asymmetrical circumstance between collateral teeth ranging from small distinct, isolated, discolored patched (white, yellowish, or brown-colored demarcated opacities) to accomplish post-eruptive enamel structural breakdown (white, yellowish, or brown-colored demarcated opacities). Soft, porous, or chalk-like defects are possible. There is always a distinct line of demarcation between the hypomineralized deficiency and normal enamel<sup>7</sup>.

The deciduous teeth impacted by hypomineralization are the Hypomineralized Second Primary Molars (HSPM), and Hypomineralized Primary Canines (HPC). Children with HSPM/HPC are six times more likely to develop MIH. There is no link between the number of primary teeth that are affected and the severity of hypomineralized primary dentition or the development of MIH<sup>8-10</sup>.

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This study was carried out to assess the knowledge, attitude, and practice of graduated Egyptian dentists' group regarding MIH condition and compare the outcome information among different dental specialists.

## 2. MATERIALS AND METHODS

The Dental Research Ethical Committee of Faculty of Oral and Dental Medicine, Future University in Egypt (FUE.REC (6)5-2019, Meeting 22, 9/5/2019) ethically approved the study. (**Appendix 1**).

### Sample size:

Assuming that 50 % of dentists have good knowledge about MIH, using a margin of error of 6%, the alpha error of 0.05, design effect 1.5. The minimum required sample size was estimated to be 401 dentists. The sample size was calculated using Epi info7 software.

### Eligibility criteria:

Graduated Egyptian licensed dentists excluding students, interns and other medical specialties.

### Data collection and variables:

The principal researcher and supervisors developed a google web-based questionnaire after comprising previously validated published papers <sup>11-17</sup>.

### KAP questionnaire and distributions:

The questionnaire distributed electronically via social media through the following link (<https://forms.gle/vQiB9Pjp4jZsvXQ89>). Participation in the survey was voluntary. The target dentists were selected randomly. Data collection started from June 2019 till July 2020. A gentle requesting message containing descriptive information about the study with direct access web link to the questionnaire was sent by the investigator either by

**Direct messages** like WhatsApp, Instagram messages and Emails.

**Or Public sharing links** like Facebook and webinars.

### Reminder:

A gentle reminder was sent three times with one-week intervals.

### Model answers:

Model answers were conducted by the investigator and supervisors only for selected questions in the knowledge section (six questions with eight possible answers) and all the treatment option questions (four questions). Other questions which based on personal experience or opinion were neglected from the total score. A web-based questionnaire was sent to the investigator and supervisors to approve the model answers through three rounds: first round; each team member selected their approved answers through paper-based researches answers; the second round was to discuss the disputed questions, and the third round was to approve the final answers. Each right answer was scored by 1, and the other answers were scored by 0. Therefore, the maximum score for total knowledge will be 8, and attitude will be 4. The final score was statistically analyzed to obtain the knowledge score for the Egyptian dentists regarding MIH.

### Statistical analysis:

Categorical data were presented as frequencies (n) and percentages (%). Numerical data were presented as mean and standard deviation values. Associations with numerical variables were analyzed using Kruskal Wallis test followed by Dunn's post hoc test with Bonferroni correction. Associations with categorical variables were analyzed using chi square test followed by multiple pairwise comparisons utilizing z-test with Bonferroni correction. The significance level was set at  $p \leq 0.05$  for all tests. Statistical analysis was performed with R statistical analysis software version 4.1.2 for Windows<sup>18</sup>.

Data was collected by Google form. All data were entered and saved electronically in web cloud; data was encrypted using a password under the researcher's google account with direct access for supervisors. All data were maintained in storage for five years after completion of the study. The questionnaire link was available online from June 2019 till July 2020.

## 3. RESULTS

### I. Demographic data:

456 participants took part in the study, 40 (8.8%) of which were non-Egyptians and were excluded from the study. Out of the remainder 416, the majority were 2001-2010 graduates 236 (56.7%), from public universities 328 (78.8%), were general practitioners 168 (40.4%) and mostly working in private clinics 210 (34.4%). The majority of participants that completed the questionnaire, 277 (80.3%), received the link via WhatsApp (Table1).

**Table (1)**

Response rate.

Parameter	messages sent	responses	Response rate
WhatsApp	2830	277	9.8%
Facebook Link	189,100	30	0.02%
How did you receive this questionnaire link?	Webinar	7	1.4%
	E-mail	1	1.0%
	Instagram and messenger	180	30

### II. Associations:

#### 1. Association between knowledge and specialties:

Association between knowledge and specialties were presented in Table (2). For question (1), there was a significant difference between different groups, with significantly lower percentage of PDs choosing "I have not heard about it before" and "I know the condition, but I am not familiar with the terminology" and a significantly higher percentage of PDs choosing "I know the condition and terminology" ( $p < 0.001$ ). For question (2), there was a significant difference between different groups, with significantly lower percentage of PDs choosing "No" and "Not sure" and a significantly higher percentage of PDs choosing "Yes" ( $p < 0.001$ ). For question (4), there was a significant difference between different groups, with significantly lower

\* R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.

percentage of PDs choosing “Fluoride exposure” and a significantly higher percentage of PDs choosing “An acute medical condition affecting mother or child” ( $p=0.002$ ). For question (5), there was a significant difference between different groups, with significantly lower percentage of PDs choosing “Not sure” and a significantly higher percentage of PDs choosing “No” ( $p=0.003$ ). For question (6), there was a significant difference between different groups, with a significantly higher percentage of PDs choosing “Yes” in comparison to GPs ( $p=0.047$ ). For question (8), there was a significant difference between different groups, with a significantly higher percentage of PDs choosing “Yes” in comparison to other specialties ( $p=0.003$ ). For other questions, the difference was not statistically significant ( $p>0.05$ ).

### 2. Association between attitude and specialties:

Association between attitude and specialties were presented in table (3). For question (10), there was a significant difference between different groups, with significantly lower percentage of PDs choosing “GP” and a significantly higher percentage of PDs choosing “Pedodontics” (in comparison to GPs) and “Endodontics” ( $p<0.001$ ). For the first picture there was a significant difference between different groups, with significantly lower percentage of PDs choosing “No treatment” and a significantly higher percentage of PDs choosing “Stainless steel crowns” ( $p<0.001$ ). For the second picture, there was a significant difference between different groups, with significantly lower percentage of PDs choosing “Composite” (in comparison to GPs) and “Glass ionomer” (in comparison to other specialties) and a significantly higher percentage of PDs choosing “Stainless steel crowns” ( $p<0.001$ ). For the fourth picture, there was a significant difference between different groups, with significantly lower percentage of PDs choosing “Composite” and a significantly higher percentage of PDs choosing “Fluoride” ( $p<0.001$ ). For other questions, the difference was not statistically significant ( $p>0.05$ ).

### 3. Association between practice and specialties:

Association between practice and specialties were presented in table (4). For question (13), there was a significant difference between different groups, with significantly lower percentage of PDs choosing “Never” (in comparison to GPs) and “Annually” (in comparison to other specialties) and a significantly higher percentage of PDs choosing “Weekly” (in comparison to other specialties) ( $p<0.001$ ). For question (14), there was a significant difference between different groups, with significantly lower percentage of PDs choosing “No” (in comparison to other specialties) and “Not sure” and a significantly higher percentage of PDs choosing “Yes” ( $p<0.001$ ). For question (15), the difference was not statistically significant ( $p=0.167$ ).

### 4. Association between total score and specialties:

Association between total score and specialties were presented in table (5). There was a significant difference between different groups, with PDs having a significantly higher score than other groups ( $p<0.001$ ).

**Table (5)**

Association between knowledge and specialties.

	Total Score (Mean±SD)			p-value
	Other specialties	Pedodontist	GP	
Knowledge score	3.37±2.06 <sup>B</sup>	4.96±1.92 <sup>A</sup>	3.17±2.26 <sup>B</sup>	<0.001*
Attitude score	2.03±1.34 <sup>B</sup>	2.54±1.09 <sup>A</sup>	2.03±1.42 <sup>B</sup>	<0.001*

Values with different superscript letters within the same horizontal row are significantly different \*; significant ( $p \leq 0.05$ ) ns; non-significant ( $p > 0.05$ )

**Table (2)**

Association between knowledge and specialties.

Question	Answers	Other specialties		Pedodontist		GP		p-value
		n	%	n	%	n	%	
<b>1. Did you know MIH before? (n=416)</b>								
I have not heard about it before.		19 <sup>AB</sup>	17.4%	11 <sup>B</sup>	7.9%	41 <sup>A</sup>	24.4%	<0.001*
I know the condition and terminology		49 <sup>B</sup>	45.0%	110 <sup>A</sup>	79.1%	77 <sup>B</sup>	45.8%	
I know the condition, but I am not familiar with the terminology.		41 <sup>A</sup>	37.6%	18 <sup>B</sup>	12.9%	50 <sup>A</sup>	29.8%	
<b>2. Have you been aware that MIH is a developmental defect that differs from fluorosis and hypoplasia? (n=345)</b>								
Yes		64 <sup>B</sup>	71.1%	120 <sup>A</sup>	93.8%	94 <sup>B</sup>	74.0%	<0.001*
No		12 <sup>A</sup>	13.3%	4 <sup>B</sup>	3.1%	17 <sup>A</sup>	13.4%	
Not sure		14 <sup>A</sup>	15.6%	4 <sup>B</sup>	3.1%	16 <sup>A</sup>	12.6%	
<b>3. How prevalent do you think MIH might be in Egypt? (n=345)</b>								
<5%		11	12.2%	11	8.6%	16	12.6%	0.826ns
5-10%		19	21.1%	31	24.2%	21	16.5%	
10-20%		20	22.2%	28	21.9%	28	22.0%	
>20%		10	11.1%	20	15.6%	21	16.5%	
Not sure		30	33.3%	38	29.7%	41	32.3%	
<b>4. What are the etiological factors of MIH in your point of view? (Multiple answers are allowed) (n=865)</b>								
Genetic factors		55 <sup>A</sup>	26.3%	86 <sup>A</sup>	24.9%	82 <sup>A</sup>	26.5%	0.002*
Exposure to bisphenol A		27 <sup>A</sup>	12.9%	53 <sup>A</sup>	15.3%	49 <sup>A</sup>	15.8%	
Chronic medical conditions affecting mother or child		43 <sup>A</sup>	20.6%	63 <sup>A</sup>	18.2%	59 <sup>A</sup>	19.0%	
An acute medical condition affecting mother or child		27 <sup>B</sup>	12.9%	77 <sup>A</sup>	22.3%	42 <sup>B</sup>	13.5%	
Antibiotic or medication		39 <sup>A</sup>	18.7%	60 <sup>A</sup>	17.3%	49 <sup>A</sup>	15.8%	
Fluoride exposure		18 <sup>A</sup>	8.6%	7 <sup>B</sup>	2.0%	29 <sup>A</sup>	9.4%	
Not sure		13 <sup>A</sup>	14.4%	14 <sup>A</sup>	10.9%	18 <sup>A</sup>	14.2%	
<b>5. All MIH defects are combined with dental caries? (n=345)</b>								
Yes		13 <sup>A</sup>	14.4%	14 <sup>A</sup>	10.9%	18 <sup>A</sup>	14.2%	0.003*
No		57 <sup>B</sup>	63.3%	103 <sup>A</sup>	80.5%	76 <sup>B</sup>	59.8%	
Not sure		20 <sup>A</sup>	22.2%	11 <sup>B</sup>	8.6%	33 <sup>A</sup>	26.0%	
<b>6. If MIH is super-imposed with decay. Do you think the pattern of decay in MIH (according to depth, location and progression level) is different from the normal decay? (n=300)</b>								
Yes		58 <sup>AB</sup>	75.3%	98 <sup>A</sup>	86.0%	75 <sup>B</sup>	68.8%	0.047*
No		7 <sup>A</sup>	9.1%	5 <sup>A</sup>	4.4%	13 <sup>A</sup>	11.9%	
Not sure		12 <sup>A</sup>	15.6%	11 <sup>A</sup>	9.6%	21 <sup>A</sup>	19.3%	
<b>7. Do you think there is a lack of information about MIH between Egyptian dentists? (n=345)</b>								
Yes		81	90.0%	122	95.3%	118	92.9%	0.315ns
No		9	10.0%	6	4.7%	9	7.1%	
<b>8. Do you receive any information about MIH during your practice from an official agency (university, associations, syndicate, and ministry of health etc.)? (n=345)</b>								
Yes		24 <sup>B</sup>	26.7%	64 <sup>A</sup>	50.0%	51 <sup>AB</sup>	40.2%	0.003*
No		66	73.3%	64	50.0%	76	59.8%	

Values with different superscript letters within the same horizontal row are significantly different \*; significant ( $p \leq 0.05$ ) ns; non-significant ( $p > 0.05$ )

**Table (3)**

Association between attitude and specialties.

Question	Answers	Other specialties		Pedodontist		GP		p-value	
		n	%	n	%	n	%		
<b>9. Do you think that the decision taking for treatment of MIH should be multidisciplinary? (n=345)</b>									
Yes		53	58.9%	79	61.7%	71	55.9%	<b>0.750ns</b>	
No		2	2.2%	4	3.1%	2	1.6%		
Sometimes		35	38.9%	45	35.2%	54	42.5%		
<b>10. Which of the following should be a part of MIH treating team in your point of view? (Multiple answers are allowed) (n=902)</b>									
GP		56 <sup>A</sup>	24.2%	45 <sup>B</sup>	12.4%	81 <sup>A</sup>	26.3%	<b>&lt;0.001*</b>	
Pedodontics		73 <sup>AB</sup>	31.6%	115 <sup>A</sup>	31.7%	106 <sup>B</sup>	34.4%		
Orthodontics		22 <sup>A</sup>	9.5%	49 <sup>A</sup>	13.5%	22 <sup>A</sup>	7.1%		
Prosthodontics		37 <sup>A</sup>	16.0%	47 <sup>A</sup>	12.9%	40 <sup>A</sup>	13.0%		
Implantologist		2 <sup>A</sup>	0.9%	3 <sup>A</sup>	0.8%	5 <sup>A</sup>	1.6%		
Oral surgeon		5 <sup>A</sup>	2.2%	16 <sup>A</sup>	4.4%	4 <sup>A</sup>	1.3%		
Endodontics		36 <sup>B</sup>	15.6%	88 <sup>A</sup>	24.2%	50 <sup>B</sup>	16.2%		
<b>11. What are the anticipated challenges in your point of view during the treatment of MIH? (Multiple answers are allowed) (n=1133)</b>									
Sensitivity		34	13.5%	84	17.7%	66	16.3%		<b>0.316ns</b>
Isolation		25	9.9%	52	10.9%	40	9.9%		
Coronal seal		18	7.1%	59	12.4%	37	9.1%		
Patient cooperation and behaviors		39	15.5%	67	14.1%	64	15.8%		
Tooth restorability and remaining walls		64	25.4%	109	22.9%	104	25.6%		
Selection of suitable restorative materials for each condition		72	28.6%	104	21.9%	95	23.4%		
<b>12. According to the following picture what is the best type of restorative treatment? (A) (n=345)</b>									
Amalgam		1 <sup>A</sup>	1.1%	2 <sup>A</sup>	1.6%	2 <sup>A</sup>	1.6%	<b>&lt;0.001*</b>	
Composite		12 <sup>A</sup>	13.3%	11 <sup>A</sup>	8.6%	20 <sup>A</sup>	15.7%		
Glass ionomer		27 <sup>A</sup>	30.0%	21 <sup>A</sup>	16.4%	32 <sup>A</sup>	25.2%		
Sealant		4 <sup>A</sup>	4.4%	6 <sup>A</sup>	4.7%	6 <sup>A</sup>	4.7%		
Fluoride		9 <sup>A</sup>	10.0%	6 <sup>A</sup>	4.7%	13 <sup>A</sup>	10.2%		
Extraction		1 <sup>A</sup>	1.1%	1 <sup>A</sup>	0.8%	0 <sup>A</sup>	0.0%		
Stainless steel crowns		23 <sup>B</sup>	25.6%	80 <sup>A</sup>	62.5%	46 <sup>B</sup>	36.2%		
No treatment		13 <sup>A</sup>	14.4%	1 <sup>B</sup>	0.8%	8 <sup>AB</sup>	6.3%		
<b>12. According to the following picture what is the best type of restorative treatment? (B) (n=345)</b>									
Amalgam		4 <sup>A</sup>	4.4%	3 <sup>A</sup>	2.3%	11 <sup>A</sup>	8.7%	<b>&lt;0.001*</b>	
Composite		20 <sup>AB</sup>	22.2%	19 <sup>B</sup>	14.8%	37 <sup>A</sup>	29.1%		
Glass ionomer		50 <sup>A</sup>	55.6%	43 <sup>B</sup>	33.6%	47 <sup>B</sup>	37.0%		
Sealant		0 <sup>A</sup>	0.0%	1 <sup>A</sup>	0.8%	0 <sup>A</sup>	0.0%		
Fluoride		1 <sup>A</sup>	1.1%	0 <sup>A</sup>	0.0%	1 <sup>A</sup>	0.8%		
Extraction		0	0.0%	0	0.0%	0	0.0%		
Stainless steel crowns		14 <sup>B</sup>	15.6%	62 <sup>A</sup>	48.4%	30 <sup>B</sup>	23.6%		
No treatment		1 <sup>A</sup>	1.1%	0 <sup>A</sup>	0.0%	1 <sup>A</sup>	0.8%		
<b>12. According to the following picture what is the best type of restorative treatment? (C) (n=345)</b>									
Amalgam		0	0.0%	0	0.0%	1	0.8%	<b>0.709ns</b>	
Composite		72	80.0%	108	84.4%	96	75.6%		
Glass ionomer		8	8.9%	4	3.1%	8	6.3%		
Sealant		1	1.1%	0	0.0%	2	1.6%		
Fluoride		5	5.6%	8	6.2%	10	7.9%		
Extraction		0	0.0%	0	0.0%	1	0.8%		
Stainless steel crowns		1	1.1%	3	2.3%	2	1.6%		
No treatment		3	3.3%	5	3.9%	7	5.5%		

Question	Answers	Other specialties		Pedodontist		GP		p-value
		n	%	n	%	n	%	
<b>12. According to the following picture what is the best type of restorative treatment? (D) (n=345)</b>								
Amalgam		0	0.0%	0	0.0%	0	0.0%	<b>0.003*</b>
Composite		44 <sup>A</sup>	48.9%	41 <sup>B</sup>	32.0%	60 <sup>A</sup>	47.2%	
Glass ionomer		5 <sup>A</sup>	5.6%	6 <sup>A</sup>	4.7%	7 <sup>A</sup>	5.5%	
Sealant		3 <sup>A</sup>	3.3%	6 <sup>A</sup>	4.7%	2 <sup>A</sup>	1.6%	
Fluoride		18 <sup>B</sup>	20.0%	60 <sup>A</sup>	46.9%	32 <sup>B</sup>	25.2%	
Extraction		0	0.0%	0	0.0%	0	0.0%	
Stainless steel crowns		0 <sup>A</sup>	0.0%	0 <sup>A</sup>	0.0%	1 <sup>A</sup>	0.8%	
No treatment		20 <sup>A</sup>	22.2%	15 <sup>A</sup>	11.7%	25 <sup>A</sup>	19.7%	

Values with different superscript letters within the same horizontal row are significantly different \*; significant (p ≤ 0.05) ns; non-significant (p > 0.05).

**Table (5):**

Association between practice and specialties.

Question	Answers	Other specialties		Pedodontist		GP		p-value
		n	%	n	%	n	%	
<b>13. How frequently do you encounter MIH in your practice? (n=345)</b>								
Never		10 <sup>AB</sup>	11.1%	4 <sup>B</sup>	3.1%	23 <sup>A</sup>	18.1%	<b>&lt;0.001*</b>
Weekly		3 <sup>B</sup>	3.3%	19 <sup>A</sup>	14.8%	13 <sup>AB</sup>	10.2%	
Monthly		34 <sup>A</sup>	37.8%	68 <sup>A</sup>	53.1%	54 <sup>A</sup>	42.5%	
Annually		43 <sup>A</sup>	47.8%	37 <sup>B</sup>	28.9%	37 <sup>B</sup>	29.1%	
<b>14. Do you feel the incidence of MIH has increased in the recent period of your practice? (n=345)</b>								
Yes		26 <sup>B</sup>	28.9%	90 <sup>A</sup>	70.3%	55 <sup>B</sup>	43.3%	<b>&lt;0.001*</b>
No		14 <sup>A</sup>	15.6%	7 <sup>B</sup>	5.5%	15 <sup>AB</sup>	11.8%	
Not sure		50 <sup>A</sup>	55.6%	31 <sup>B</sup>	24.2%	57 <sup>A</sup>	44.9%	
<b>15. Did you encounter MIH or MIH like defects in other teeth? (Multiple choices allowed) (n=533)</b>								
Never		17	12.2%	38	20.2%	42	20.4%	<b>0.167ns</b>
Premolars		38	27.3%	39	20.7%	39	18.9%	
2 <sup>nd</sup> permanent molars		15	10.8%	19	10.1%	25	12.1%	
Permanent Canine		21	15.1%	18	9.6%	28	13.6%	
Primary Incisors		17	12.2%	19	10.1%	28	13.6%	
Primary Canine		4	2.9%	10	5.3%	10	4.9%	
1 <sup>st</sup> deciduous molar		14	10.1%	12	6.4%	12	5.8%	
2 <sup>nd</sup> deciduous molar		13	9.4%	33	17.6%	22	10.7%	

Values with different superscript letters within the same horizontal row are significantly different \*; significant (p ≤ 0.05) ns; non-significant (p > 0.05)

**4. DISCUSSION**

MIH is one of the most evolving enamel defects characterized by qualitative and demarcated enamel defects of methodical origin. Although the precise etiology of MIH is not clear, multiple factors may cause the defect. Some of the etiological factors of MIH system conditions include upper respiratory tract infection, pneumonia, hypoxia, asthma, high fever and otitis media. In 2018 **Zhao et al.** found that MIH global prevalence is 14.2%. Early detection of the MIH may help decrease the challenges of rapid caries development <sup>18-20</sup>.

The current study data were collected through electronic google based questionnaire. A response rate was between (16.7% to 9.71%) from direct messages (Instagram and Messenger – WhatsApp) respectively and was between (1.4% to 0.02%) from social media links (webinars – Facebook) respectively. The response rate was low compared to similar studies distributed electronically by emails 61.9% **Crombie et al. 2008** and 29% **Gambetta-Tessini et al. 2016**<sup>11,13</sup>. This variation occurs; as in Egypt, there is no official authority to contact the dentists; however, all the contacts and emails were done personally with the main researcher, which may lead to security concerns leading either to ignore the message or block and report the message sender.

The present study demonstrated that when comparing different levels of knowledge between specialties, PDs recognized both the MIH condition and terminology, and were significantly higher than GPs and other specialties (79.1 %, 45.8 % and 45%) respectively. This comparison reflects the remarkable higher knowledge of PDs about the condition as they are regarded as front liners to children affected with MIH among different specialties.

A high percentage of 93.8% of the PD knew that MIH differs from fluorosis and hypoplasia compared to 74.0% of the GPs. This is comparable to what was reported by **Gamboa et al. 2018**, PD 96.3% and GP 72.8% **Silva et al. 2016**, PD 85.4%, GP 59.3% respectively<sup>14,17</sup>.

There was no significant relationship between participants regarding the prevalence of MIH in Egypt, about 22% of the GPs and 21.9% of PDs believe that the prevalence of MIH in Egypt is between 10–20%. These results against **Serna-Muñoz et al. 2020**, who found that 59.4% of GPs showed <10% of their patients had MIH, while 50% of PDs answered that MIH prevalence was between 10-25%<sup>21</sup>. This conflict may return to the difference in the prevalence percentage between countries and difference in diagnosis criteria.

Regarding potential etiological factors, a variety of viewpoints were expressed. The opinions were given for the possibility of genetics as one of MIH etiological factors for PD, GP and other specialties are almost convergent (24.9%), (26.5%) and (26.3) respectively, with no statistical difference between answers. The present finding goes against **Ghanim et al. 2011** in the academic community, who found variation in answers (prosthodontics 61.5%, orthodontics 59.1%, GPs 55.8% and basic science group 45.5%) when comparing opinions in the same factor<sup>12</sup>.

PDs were more likely to choose the answer “an acute medical condition affecting mother or child” as a possible etiological factor of MIH 22.3%. Their answers were statistically different than GPs and other specialties 13.5% and 12.9%, respectively. At the same time, 9.4% of GPs and 8.6% of other specialties answers support the role of fluoride exposure in MIH which is significantly higher than the PDs opinion (2.0%). These results are against **Ghanim et al. 2011** survey result who found that 16.3 % of GPs suggest that the “acute medical condition affecting mother or child” is a possible etiological factor of MIH. While 41.9% of GPs support the fluoride role<sup>12</sup>.

The current research findings proved that PDs 80.5%, GPs 59.8% and other specialties 63.3% believe that MIH is not always combined with dental caries. The current study results showed that PDs, GPs and other specialties groups have enough knowledge and a positive attitude when responding to clients' questions and treatment queries. To a greater extent, their confidence to practice cases with MIH increases day by day with more practice and knowledge in the field<sup>22</sup>.

About 86.0% of PDs, 68.8% of GPs and 75.3% of other specialties support the difference between MIH decay and normal classical caries pattern in depth, location and progression level while 4.4% of PDs, 11.9% of GPs and 9.1% of other specialties are not sure about the difference in decay pattern and 9.6% of PDs, 19.3% of GPs and 15.6% of other specialties do not see any difference in decay pattern between MIH and normal teeth. This data

was against the answers of Australian and Chilean GPs in the same question. 94.4% of Australian GPs and 91.5% of Chilean GPs support the difference between the pattern of MIH decay from normal classical caries<sup>13</sup>.

MIH has become a more apparent clinical condition and a field of interest to dental practitioners worldwide. Almost all the Egyptian dentists participating in this study think that there is a lack of information about MIH between Egyptian dentists (95.3% of PDs, 92.9% of GPs and 90.0% of other specialties). This result support the need to include MIH condition in study curriculum in both undergraduates and postgraduates studies and increase the awareness continuous education lectures and programs regarding MIH. Participants supported the need to receive clinical training regarding MIH. These findings agreed with similar research<sup>14,17,19,23</sup>.

Little is known about MIH condition in Egypt where 50 % of PDs receive MIH information comparing with only 40.2% of GPs and 26.7% of other specialties. This against results of a study by, **Elhennawy et al. 2020** for covering all the academic community of Germany to evaluate knowledge, attitude and believes that final students of graduating year of all German universities showed that majority of participants were familiar with the MIH terminology and diagnosis criteria and that 91.7 % of students were aware about the risk factor of the MIH condition<sup>23</sup>.

In terms of treatment of MIH, the decision taking for MIH treatment should be multidisciplinary between different specialties. More than half of the PDs and GPs (61.7% and 55.9%) respectively, believe that MIH treatment decision making should be multidisciplinary.

Regarding the MIH treatment team, about one third of participants (31.7% of PDs, 34.4% of GPs and 31.6 of other specialties) agreed with the importance of PDs in the MIH treating team compared to other specialists such as orthodontists, oral surgeons and Implantologists. This result may show the management challenge of MIH treatment; these findings agree with **Serna-Muñoz et al. 2020**<sup>21</sup>. These agreements support the reason for the discomfort of the single practitioner to treat the condition without consultation.

Regarding the anticipated challenges during the treatment of MIH 14.1% of PDs, 15.8% of GPs and 15.5% of other specialties believes that “Patient cooperation and behavior” is one of the MIH challenges during treatment. This result against **Ghanim et al. 2011**, who found 48.8% of PDs, 60.9% of GPs and 16.9% of other specialties who suggest that child behavior is one of the barriers of MIH treatments<sup>12</sup>. This conflict may return to the effect of School Health Program continuous education which include most of the PDs and GPs working in Kuwait. This program concerned with treating most of Kuwait children schools.

The treatment choice for PDs, GPs and other specialties for the figure (A) are stainless-steel crowns (62.5%, 36.2%, 25.6%) respectively. While in the anterior teeth figure (C) the most selected treatment choice is composite resin (84.4% of PDs, 75.6% of GPs and 80.0% of other specialties) respectively. This current data agreed with **Ghanim et al. 2011**, study which also the treatment option regarding specific selected condition. In the selected figure for posterior teeth PDs, GPs and other specialties selected stainless-steel crowns as a treatment choice with the following percentage (82.9% ,64.3% and 49.2%) respectively while in anterior the treatment choice was composite resin with the following percentage (26.8%, 42.6% and 26.2%) respectively<sup>12</sup>.

The collecting data showed more than half of PDs, 53.1% and less than half of GPs, 42.5% encounter MIH monthly. At the same time, 47.8% of other specialties encounter MIH annually. This current data finding is inconsistent with **Serna-Muñoz et al. 2020**, who found that 72% of PDs encounter MIH weekly and 59.46% of GPs encounter MIH monthly<sup>21</sup>. These findings agree with **Alanzi et al. 2018**, who found that 48.8% of PDs and 44.4% of GPs notice MIH every month during their practice. These research data variations referred to different diagnosis criteria and different prevalence rate<sup>16</sup>.

Most pediatric dentists, 70.3 %, 43.3 % of GPs and 28.9 % of other specialties believed that the incidence of MIH was increased in the last few years. This finding agrees with **Chilean** GPs 52.4%, agreed with the MIH prevalence increase but inconsistent with **Australian** GPs 84.6% in the same research, this conflict may return to the prevalence variation difference between communities <sup>13</sup>.

MIH or MIH like defects may extend to other teeth where PDs encountering MIH defects in premolars with percentages of 20.7%. On the other hand, 2<sup>nd</sup> Primary molars were the highest affected primary tooth with hypomineralization (MIH like defect) PDs, GPs and other specialties who encountered hypomineralized secondary primary molar with a highly significant rate of 17.6%, 10.7% and 9.4% respectively <sup>13</sup>.

There was a highly statistically significant difference between overall knowledge and attitude with PDs comparing to other groups, which may reflect the effect of specialty study curriculum on the gaining knowledge. Good knowledge and proper practice increased with higher scientific knowledge. These results coordinated with **Gambetta-Tessini et al. 2016 and Tagelsir et al. 2018**, who reported a significant association between knowledge, attitude, and practice with the academic level of education and no significant association with other demographic characteristics <sup>13,24</sup>. These agreements support the need for continuous education, motivation and training about MIH.

## 5. STUDY LIMITATIONS

Sample of small size, which doesn't reflect all dentistry specialists in the Egyptian population, there is no contact data updated for Egyptian dentists registered in the Egyptian dental syndicate, Some of the participants refused to participate in the questionnaire for security reasons, Lack of cooperation of some of Facebook, WhatsApp and webinars group admins and the designed questionnaire did not assess the involvement of MIH within the curriculum of dental students.

## 6. CONCLUSIONS

MIH is a clinical problem that Egyptian dentists well recognize and frequently encounter in clinical practice. There is a need to include MIH in undergraduate, postgraduate academic curriculum and continuous dental education to increase the awareness regarding the condition and clinical management. Most Egyptian dentists feel unconfident in treating and managing MIH clinically and prefer multidisciplinary with different specialties. Egyptian dentists have varying levels of knowledge about the prevalence, etiology, treatment options, and clinical management of MIH.

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