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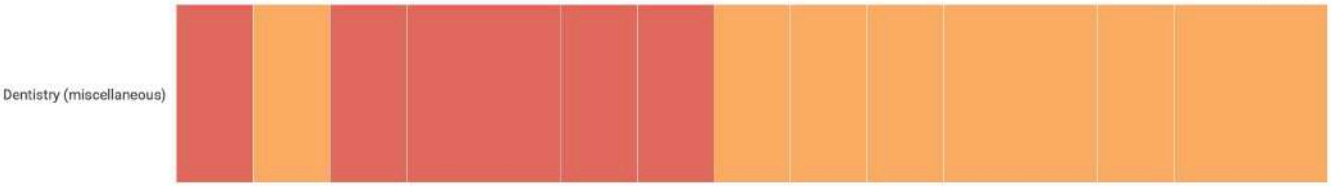

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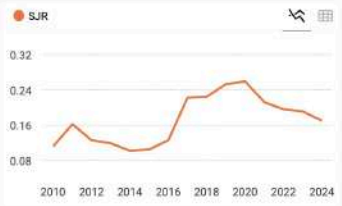

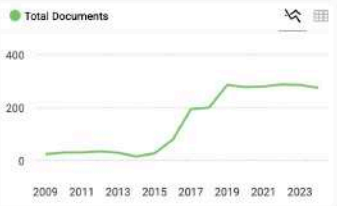

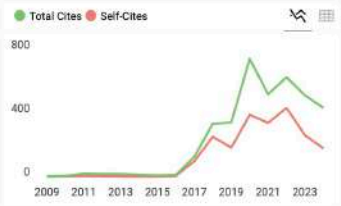

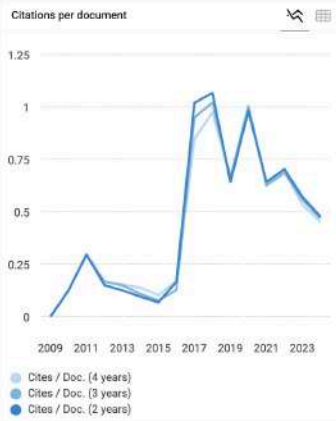

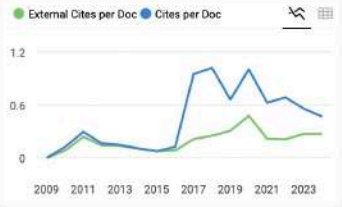

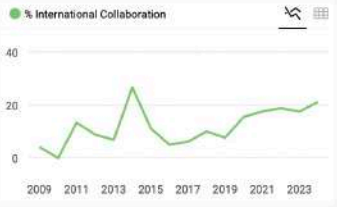

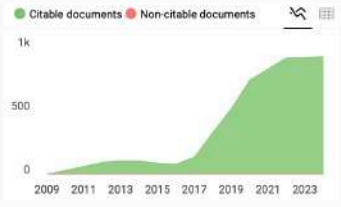

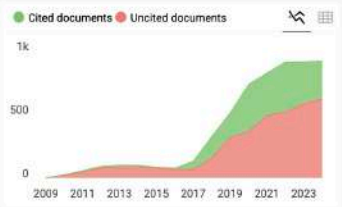

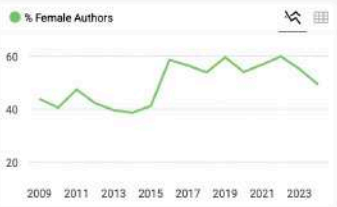

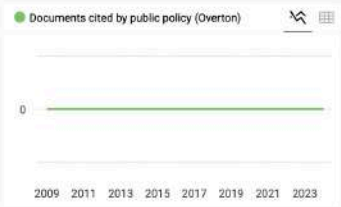

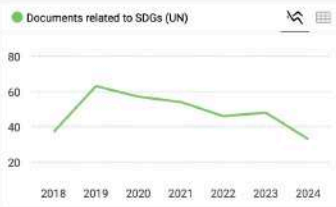

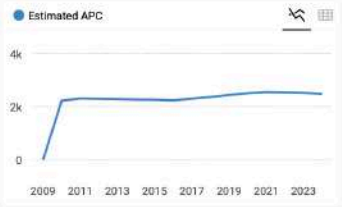

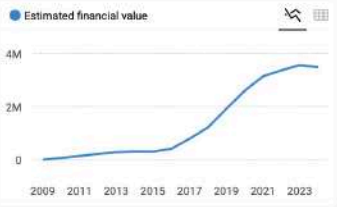

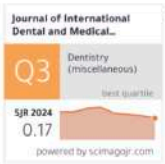

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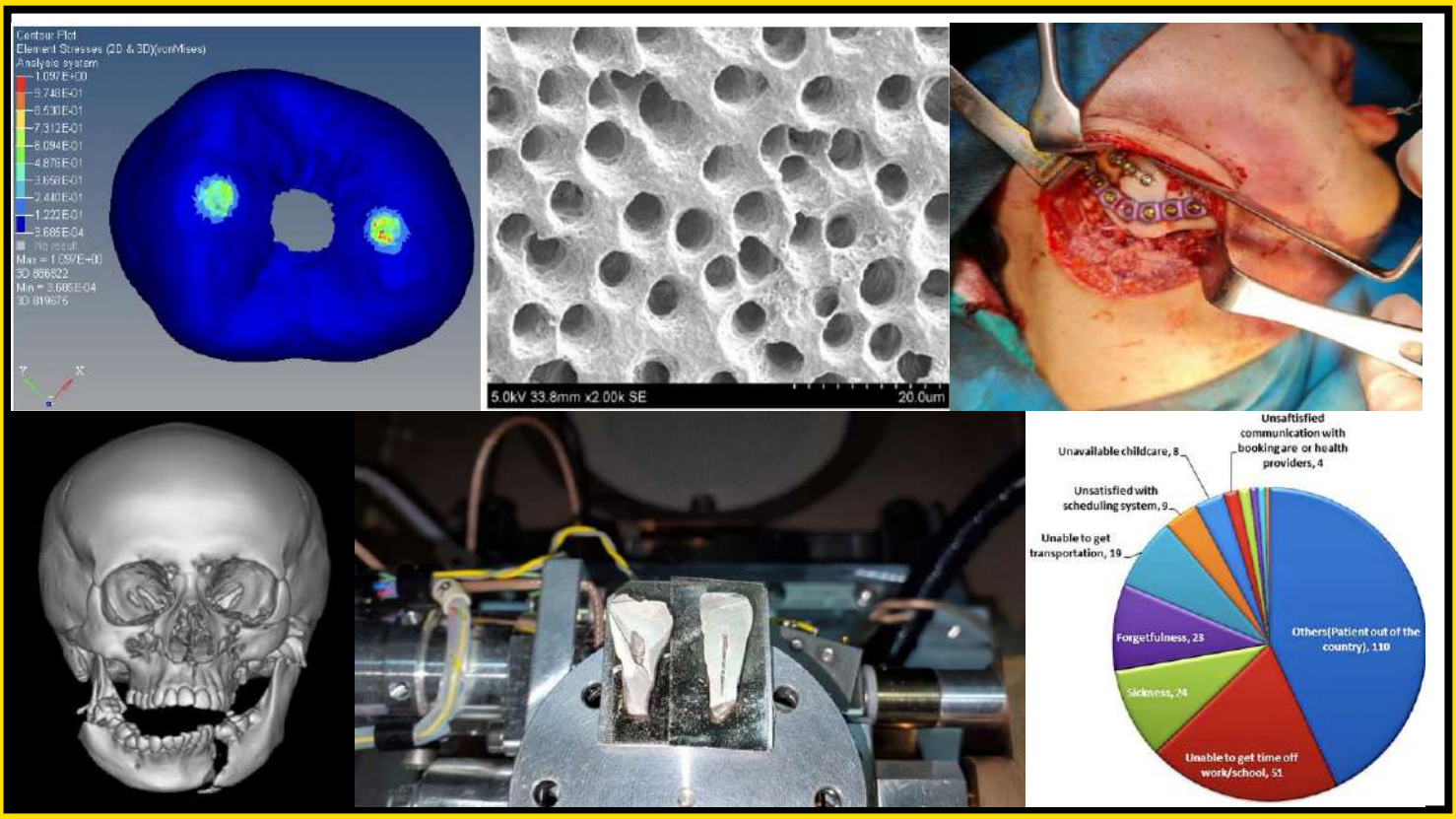

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Knowledge and Perceptions on Molar Incisor Hypomineralization among Dental Students in Indonesia

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Abstract

Challenges in managing Molar incisor hypomineralization (MIH) are still apparent. The knowledge and perception of MIH among dental students in Indonesia is currently unknown.

This study aimed to analyse knowledge and perception in undergraduate clinical stage and paediatric dentistry postgraduate dental students in Indonesia. A cross-sectional study was conducted by disseminating a self-administered questionnaire about knowledge and perceptions among dental students in four dental schools in Indonesia. Chi-square tests and t-tests were employed to analyse the data. A total of 145 students, 83 undergraduate students and 62 postgraduate students completed the online questionnaire. There was a statistically significant difference in knowledge score between undergraduate and postgraduate students ($p<0.05$), with scores of 45.1±6.6 and 51.2±5.4 respectively. Most postgraduate students (88.7%) knew that the caries pattern related to MIH is different to the classic caries pattern. Nonetheless only 42.2% of undergraduate students knew. Undergraduate students (67.5%) were unconfident and very unconfident in treating MIH.

Almost all students in both groups would like to have further training about MIH. Knowledge and perceptions on MIH still need to be improved. MIH shall be included in the undergraduate curriculum to increase the knowledge, perception, and confidence in managing MIH.

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Keywords: knowledge, perception, Molar-Incisor Hypomineralization, dental students, Indonesia.

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Introduction

Molar-Incisor Hypomineralization (MIH) is a qualitative defect of systemic origin that affects one to four first permanent molars and may or may not involve permanent incisors. The term Molar-Incisor Hypomineralization (MIH) was introduced by Weerheijm in 2001.[1] MIH-like lesions also can appear in primary molars and are called hypomineralization in second primary molar (HSPM). This type of lesion can be used as a predictor of MIH in permanent teeth.[2-4] The etiologic factors of MIH are still being studied. However, many researchers suggested the involvement of genetic factors[5-11] and environmental factors such as acute and chronic illness during pregnancy through the first three years of age in children contributes to the occurrence of MIH.[12-17]

The clinical appearance varies from mild creamy white to yellow brown opacities lesions to severe lesions such as post eruptive enamel breakdown, atypical caries, and restoration. MIH usually presents as asymmetrical lesions both in location, size, and severity to other collateral teeth.[18-20] Poor oral hygiene due to hypersensitivity of MIH teeth and porosities of enamel structure that can lead to enamel breakdown soon after the molars erupted makes MIH teeth vulnerable to dental caries.[21-23]

Difficulties to anaesthetise and hypersensitive on molar teeth often found in severe cases, which make clinical management of MIH teeth a big challenge to dental practitioners. Rapid and progressive development of caries and repeated marginal

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breakdown, high level anxiety in children with MIH also determined the success rate of its clinical management.[20]

MIH has a high incidence globally (14.2%), and differs between regions, ranging between 2.4 and 44%.[24-26] Currently, there is scares data on MIH prevalence in Indonesian children. However, caries prevalence in 12-year-old Indonesian school children remained high (61%).[27] This might be caused to some undiagnosed developmental enamel defects, such as MIH. In Indonesia, paediatric dentists are trained to provide oral health for children and adolescents. However, the number and distribution of paediatric dentists in Indonesia are not yet sufficient, therefore general practitioners act as primary dental care service.[28]

The knowledge and perception of MIH are related to its recognition by dental practitioners in Indonesia is currently unknown. Previously, it was reported that most of the dental practitioners' experience difficulties in the diagnosis and clinical management of MIH affected teeth.[29] Therefore perception and behaviour of future dentists encounter clinical challenges determined by the knowledge acquisition and experiences gained during their academic and profession years for the under- and postgraduates students.

Growing research in MIH are reported, nonetheless there are limited numbers of MIH studies in Indonesia. Therefore, the aim of this questionnaire-based study was to gain a better understanding of the knowledge and how dental students in Indonesia perceive MIH. In addition, to compare these findings with results of existing international studies.

Materials and methods

Ethical approval was granted by the Research Ethics Committee at the Faculty of Dentistry, Universitas Indonesia. The survey was distributed online using Google Form. Participation was anonymous and voluntary. The study population was undergraduate dental students and paediatric dentistry postgraduate students from four dental schools in Indonesia. Data was collected for four weeks in November-December 2021. A structured questionnaire, modified from Gamboa et al[30], based on previous studies, was employed, and distributed to four dental schools in Indonesia by social media. The questionnaire included sociodemographic data, questions regarding knowledge, confidence in diagnosing and treating MIH, along with preferences about continuing education and views on the necessity for MIH clinical training. The questionnaire consists of 3 sections, the first section contains sociodemographic data such as age, gender, and qualification. The second section was about knowledge regarding MIH, including questions on the participant's awareness, prevalence, aetiology of MIH, time occurrence, and the difference in caries pattern seen in MIH compared to original caries pattern. Since there was no data of MIH prevalence in Indonesia, therefore the score of prevalence was modified and adjusted to fit local context. The last section consists of the participation's perception, continuing education aspects of MIH and their confidence in diagnosing and managing MIH.

Questionnaire was tested by pilot study conducted among undergraduate dental students, paediatric postgraduate dental students and general dental practitioners and expected to complete the questionnaire in not more than 15 minutes. Clinical photograph used in this study was courtesy from a previous study.[31] The participants consented to participate in this study by filling the consent form prior to the questionnaire. The questionnaire was distributed by social media and the data were analysed using SPSS statistical software with a level of significance set at $p<0.05$. Chi-squared tests were carried out to compare between variables. The frequency distributions of sociodemographic in each group were tabulated and compared. Distribution and frequency tables were presented for descriptive analysis. Knowledge Score (KS) was computed based on previous studies. There were ten points in the knowledge section, each point was answered and scored a total of 9 points. The KS for each participant was obtained by summing all the 10 points (ranging from 20 to 60). Independent t-test was used to compare the knowledge score between the groups of respondents.

Results

The total number of respondents were 146 dental students, comprising 83 (57.2%) undergraduate students and 62 (42.8%) paediatric dentistry postgraduate students. Only one undergraduate dental student was excluded because consent form and the questionnaire was

not properly filled, leaving a total of 145 participants. Most of the respondents were females 116 (79.5%) with the mean age of undergraduate and postgraduate students were 23.1±1.4 and 30.9±4.5, respectively.

The mean KS for all respondents was 47.7±6.8 ranging from 26–60 (Table 1). There was a statistically significant difference in KS between undergraduate and postgraduate students ($p<0.05$), with KS 45.1±6.6 and 51.2±5.4, respectively. Postgraduate students have higher knowledge about MIH. Both undergraduate and postgraduate students were mostly aware that MIH is a developmental defect that is different from hypoplasia and fluorosis. From all respondents, 46.2% (n=62) knew that there was no data available regarding prevalence of MIH in Indonesia. Results regarding knowledge about aetiology of MIH showed that chronic medical conditions and acute medical conditions affecting mother and child were the only factors that had significant difference between two groups.

Both undergraduate and postgraduate students had varied opinions regarding time or period the insult leading to MIH occurred. One third of undergraduate students and 24.2% (n=15) of postgraduate students considered the insult leading to MIH happened during pregnancy, while 27.4% (n=17) postgraduate students and 16.9% (n=14) undergraduate students stated that the insult happened occurs during pregnancy to 1st year of life. Further, 24.2% (n=15) of postgraduate students and 16.9% (n=14) of undergraduate students thought the insult occurs during pregnancy to the 3rd year of life. There were statistically significant differences between undergraduate and postgraduate students regarding the knowledge that the pattern of caries related to MIH is different from the classical caries pattern ($p<0.05$). Most postgraduate students agreed that the caries pattern related to MIH is different to classic caries pattern, while only 42.2% (n=35) agree on that term.

Perception and continuing education aspects for both undergraduate and postgraduate students regarding MIH are presented in table 2. There were significant differences regarding the confidence for diagnosing MIH between two groups ($p<0.05$). More than half of postgraduate students (n=35, 56.4%) feel confident and very confident, while only 27.7% (n=23) of undergraduate students feel confident and very confident in diagnosing MIH. Over half of postgraduate students (n=35, 56.5%) felt confident in treating MIH, but only 32.5% (n=27) of undergraduate students felt confident and very confident. Almost all postgraduate students received information on MIH. On the other hand, only 68.7% (n=57) undergraduate students received the information ($p<0.05$). Majorities of undergraduate and postgraduate students would like to have further training regarding diagnosis, aetiology, and treatment of MIH teeth.

Discussion

This study is the first study conducted to learn about knowledge and perceptions regarding MIH among dental students in Indonesia. Even though this study may not represent overall Indonesian dental students, the findings of the current study provided a baseline data with regard to knowledge and perception of MIH in Indonesia. This study highlighted the knowledge gap that needs to be focused to improve any information about diagnosis, aetiology, and management of MIH in Indonesia. Significant difference in knowledge between undergraduate and postgraduate students was reported in this study. Postgraduate students had better knowledge about caries patterns related to MIH compared to undergraduate students.

Prevalence of MIH in the world varies between each country and region.[25] It was difficult to compare the results of epidemiologic studies in the past because various diagnostic index criteria, unstandardized methods, and different age groups was used.[2,26] Recent studies used diagnostic criteria indexes published by European Academy of Paediatric Dentistry with standardized aged groups.[2,24] Most of the data were collected in European countries, and only a few data from Asia. Unfortunately, the MIH prevalence in Southeast Asia is only available from Singapore, Thailand and Malaysia.[32-34] There was no data yet on the prevalence of MIH in Indonesia. This reflected on the answer about the knowledge of prevalence from both undergraduate and postgraduate students. In addition, there is a need for further study to analyse the prevalence of MIH and its severity in Indonesia.

The knowledge about MIH in postgraduate

students are significantly higher than undergraduate students. This reflects where postgraduate students received more information about MIH than undergraduate students. Almost all postgraduate students received information about MIH, while only 68.7% of undergraduate students received the information. One third of undergraduate students received information from dental journals and 24% from educational curriculum on campus. Postgraduate students received information about MIH from dental journals and from continuing education. This result was almost similar to the study results in Saudi Arabia.[35] Data from dental students in Switzerland shows 99% of students received information about MIH, 92% from lectures and 35% from lecture notes[36], while in Indonesia only 43.5% received MIH lectures. This data shows that there is a need to put more information about MIH in the curriculum for dental students in Indonesia.

Regarding aetiology of MIH, both postgraduate and undergraduate students' responses reflect the assumption that MIH is caused by multifactorial factors and similar to previous studies.[16,37] Although aetiology of MIH still remains unclear, it was reported that genetic factors and chronic illness affecting mother and child play important roles in aetiology of MIH.[16,37-40] This study showed that genetic factors and chronic illness from mother and child were frequently selected by students in both groups. The same responses were also reported from studies in Switzerland and Hong Kong.[30,36] Genetic factors and acute medical conditions were frequently selected by respondents in Chiles while Australian respondents frequently selected chronic and acute medical conditions.[41] Studies in Saudi Arabia showed genetic factors and environmental contaminants were frequently selected by respondents.[35]

Postgraduate students were more confident in diagnosing and treating MIH than undergraduate students. Confidence in diagnosing and treating MIH might be associated with information and training exposure. Similar result was reported by a previous study, where almost all paediatric dentistry trainees felt confident in diagnosing MIH.[42]

Postgraduate students were more exposed to information about MIH through dental journals and continuing education during their postgraduate training course. Lack of clinical experience for undergraduate dental students in treating children might influence the confidence both in diagnosing and treating MIH. Similar results were reported from dental students in Switzerland showing almost all students were not confident and slightly confident in diagnosing MIH.[36] Other study reported over half of dental students were not prepared in diagnosing MIH.[35]

This study showed that both groups expressed the needs for further training in diagnosis, aetiology, and treatment of MIH. Similar results are reported in other countries.[28-30,35,43]

This study has some limitations; therefore, the results must be interpreted with caution. Selection bias might occur due to the low response rate, influencing the external validity in representing dental students in Indonesia. Further, this study used a self-administered questionnaire which was disseminated using social media. Response bias might occur due to the participants might only represent students who have already positive nature to the objective of this study, hence it might suggest possible overestimation of perception on MIH. Regardless of these limitations, the result of this study provides valuable information about current MIH knowledge and perception of Indonesian dental students since no prior survey has studied this topic in Indonesia. Additionally, there is a need for further studies to analyse MIH prevalence, severity, distribution, and the impact on quality of life in Indonesian children.

Conclusions

Knowledge, and perception about MIH of undergraduate dental students in Indonesia needs to be improved. Undergraduate students have little exposure to MIH and are likely to have similar concerns upon commencement of dental practice. Diagnosis and management of MIH shall be included in the undergraduate curriculum to increase confidence of future dentists when confronted with such challenges.

Declaration of Interest

The authors report no conflict of interest.

Knowledge questions	Knowledge Scores		Percentage distribution of students answered 'YES' n (%)			p-value
	Yes	No	All	Undergraduate n = 83	Postgraduate n = 62	
Have you been aware that MIH is a developmental defect that differs from fluorosis and hypoplasia?	9	0	131 (90.3)	72 (86.7)	59 (95.2)	0.153
How prevalent do you think MIH might be in your community? (one option chosen)						
< 5%	0	^	24 (16.6)	18 (21.7)	6 (9.7)	0.005*
5-10%	1	^	27 (18.6)	17 (20.5)	10 (16.1)	
10-20%	1	^	13 (9.0)	6 (7.2)	7 (11.3)	
>20%	1	^	14 (9.7)	2 (2.4)	12 (19.4)	
No data in Indonesia	6	^	67 (46.2)	40 (48.2)	27 (43.5)	
Do you think they are involved in the aetiology of MIH?						
Genetic factors	5	4	122 (84.1)	69 (83.1)	53 (85.5)	0.878
Environmental contaminants	5	4	108 (74.5)	59 (71.1)	49 (79.0)	0.372
Chronic medical conditions affecting mother and child	6	3	124 (85.5)	64 (77.1)	60 (96.8)	0.002#
Acute medical conditions affecting mother or child	6	3	102 (70.3)	50 (60.2)	52 (83.9)	0.004#
Antibiotics or medications	5	4	103 (71.0)	54 (65.1)	49 (79.0)	0.099
Fluoride exposure	1	8	62 (42.8)	39 (47.0)	23 (37.1)	0.307
What period do you think the insult occurs? (one option chosen)						
During pregnancy	1	^	45 (31.0)	30 (36.1)	15 (24.2)	0.151
1st year of life	3	^	21 (14.5)	11 (13.3)	10 (16.1)	
3rd year of life	0	^	19 (13.1)	14 (16.9)	5 (8.1)	
Pregnancy to 1st year of life	3	^	31 (21.4)	14 (16.9)	17 (27.4)	
Pregnancy to 3rd year of life	2	^	29 (20.0)	14 (16.9)	15 (24.2)	
Do you think the pattern of caries related to MIH is different from the classical caries pattern?	7	1	90 (62.1)	35 (42.2)	55 (88.7)	0.000*
Mean Knowledge Score (SD)			47.7 (6.8)	45.16 (6.6)	51.26 (5.4)	0.000**
Ranges	Min 20	Max 60	26 – 60	26 – 60	41 – 60	
Total Sample			145	83	62	

Table 1. Percentage distribution of Molar Incisor Hypomineralization (MIH) knowledge scores of undergraduate and postgraduate students in Indonesia.

^ Answer "No" does not apply as it was analysed as a single choice question
* Pearson's chi-square test ($p<0.05$)
# Fisher's exact test ($p<0.05$)
** Independent sample t-test ($p<0.05$)

Questions	All	Undergraduate	Postgraduate	p-value
How do you feel about diagnosing MIH?				
Very confident	3 (2.1)	2 (2.4)	1 (1.6)	0.002*
Confident	55 (37.9)	21 (25.3)	34 (54.8)	
Unconfident	77 (53.1)	51 (61.4)	26 (41.9)	
Very unconfident	10 (6.9)	9 (10.8)	1 (1.6)	
How do you feel about treating MIH?				
Very confident	1 (0.7)	1 (1.2)	0 (0.00)	0.008*
Confident	61 (42.1)	26 (31.3)	35 (56.5)	
Unconfident	69 (47.6)	44 (53.0)	25 (40.3)	
Very unconfident	14 (9.7)	12 (14.5)	2 (3.2)	
Are you receiving any information on MIH? (YES)	118 (81.4)	57 (68.7)	61 (98.4)	0.000#
Would you like further training regarding tooth hypomineralization? (Yes)	140 (96.6)	79 (95.2)	61(98.4)	0.393
Diagnosis	138 (95.2)	77 (92.8)	61 (98.4)	0.239
Aetiology	130 (89.7)	73 (88.0)	57 (91.9)	0.614
Treatment	138 (95.2)	77 (92.8)	61 (98.4)	0.239

Table 2. Perceptions and continuing education aspects of dental students regarding MIH.
* Pearson's chi-square test (p<0.05)
# Continuity correction test (p<0.05)

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Knowledge and Perceptions on Molar Incisor Hypomineralization among Dental Students in Indonesia

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Abstract

Challenges in managing Molar incisor hypomineralization (MIH) are still apparent. The knowledge and perception of MIH among dental students in Indonesia is currently unknown.

This study aimed to analyse knowledge and perception in undergraduate clinical stage and paediatric dentistry postgraduate dental students in Indonesia. A cross-sectional study was conducted by disseminating a self-administered questionnaire about knowledge and perceptions among dental students in four dental schools in Indonesia. Chi-square tests and t-tests were employed to analyse the data. A total of 145 students, 83 undergraduate students and 62 postgraduate students completed the online questionnaire. There was a statistically significant difference in knowledge score between undergraduate and postgraduate students ($p<0.05$), with scores of 45.1±6.6 and 51.2±5.4 respectively. Most postgraduate students (88.7%) knew that the caries pattern related to MIH is different to the classic caries pattern. Nonetheless only 42.2% of undergraduate students knew. Undergraduate students (67.5%) were unconfident and very unconfident in treating MIH.

Almost all students in both groups would like to have further training about MIH. Knowledge and perceptions on MIH still need to be improved. MIH shall be included in the undergraduate curriculum to increase the knowledge, perception, and confidence in managing MIH.

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Introduction

Molar-Incisor Hypomineralization (MIH) is a qualitative defect of systemic origin that affects one to four first permanent molars and may or may not involve permanent incisors. The term Molar-Incisor Hypomineralization (MIH) was introduced by Weerheijm in 2001.[1] MIH-like lesions also can appear in primary molars and are called hypomineralization in second primary molar (HSPM). This type of lesion can be used as a predictor of MIH in permanent teeth.[2-4] The etiologic factors of MIH are still being studied. However, many researchers suggested the involvement of genetic factors[5-11] and environmental factors such as acute and chronic illness during pregnancy through the first three years of age in children contributes to the occurrence of MIH.[12-17]

The clinical appearance varies from mild creamy white to yellow brown opacities lesions to severe lesions such as post eruptive enamel breakdown, atypical caries, and restoration. MIH usually presents as asymmetrical lesions both in location, size, and severity to other collateral teeth.[18-20] Poor oral hygiene due to hypersensitivity of MIH teeth and porosities of enamel structure that can lead to enamel breakdown soon after the molars erupted makes MIH teeth vulnerable to dental caries.[21-23]

Difficulties to anaesthetise and hypersensitive on molar teeth often found in severe cases, which make clinical management of MIH teeth a big challenge to dental practitioners. Rapid and progressive development of caries and repeated marginal

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breakdown, high level anxiety in children with MIH also determined the success rate of its clinical management.[20]

MIH has a high incidence globally (14.2%), and differs between regions, ranging between 2.4 and 44%.[24-26] Currently, there is scares data on MIH prevalence in Indonesian children. However, caries prevalence in 12-year-old Indonesian school children remained high (61%).[27] This might be caused to some undiagnosed developmental enamel defects, such as MIH. In Indonesia, paediatric dentists are trained to provide oral health for children and adolescents. However, the number and distribution of paediatric dentists in Indonesia are not yet sufficient, therefore general practitioners act as primary dental care service.[28]

The knowledge and perception of MIH are related to its recognition by dental practitioners in Indonesia is currently unknown. Previously, it was reported that most of the dental practitioners' experience difficulties in the diagnosis and clinical management of MIH affected teeth.[29] Therefore perception and behaviour of future dentists encounter clinical challenges determined by the knowledge acquisition and experiences gained during their academic and profession years for the under- and postgraduates students.

Growing research in MIH are reported, nonetheless there are limited numbers of MIH studies in Indonesia. Therefore, the aim of this questionnaire-based study was to gain a better understanding of the knowledge and how dental students in Indonesia perceive MIH. In addition, to compare these findings with results of existing international studies.

Materials and methods

Ethical approval was granted by the Research Ethics Committee at the Faculty of Dentistry, Universitas Indonesia. The survey was distributed online using Google Form. Participation was anonymous and voluntary. The study population was undergraduate dental students and paediatric dentistry postgraduate students from four dental schools in Indonesia. Data was collected for four weeks in November-December 2021. A structured questionnaire, modified from Gamboa et al[30], based on previous studies, was employed, and distributed to four dental schools in Indonesia by social media. The questionnaire included sociodemographic data, questions regarding knowledge, confidence in diagnosing and treating MIH, along with preferences about continuing education and views on the necessity for MIH clinical training. The questionnaire consists of 3 sections, the first section contains sociodemographic data such as age, gender, and qualification. The second section was about knowledge regarding MIH, including questions on the participant's awareness, prevalence, aetiology of MIH, time occurrence, and the difference in caries pattern seen in MIH compared to original caries pattern. Since there was no data of MIH prevalence in Indonesia, therefore the score of prevalence was modified and adjusted to fit local context. The last section consists of the participation's perception, continuing education aspects of MIH and their confidence in diagnosing and managing MIH.

Questionnaire was tested by pilot study conducted among undergraduate dental students, paediatric postgraduate dental students and general dental practitioners and expected to complete the questionnaire in not more than 15 minutes. Clinical photograph used in this study was courtesy from a previous study.[31] The participants consented to participate in this study by filling the consent form prior to the questionnaire. The questionnaire was distributed by social media and the data were analysed using SPSS statistical software with a level of significance set at $p<0.05$. Chi-squared tests were carried out to compare between variables. The frequency distributions of sociodemographic in each group were tabulated and compared. Distribution and frequency tables were presented for descriptive analysis. Knowledge Score (KS) was computed based on previous studies. There were ten points in the knowledge section, each point was answered and scored a total of 9 points. The KS for each participant was obtained by summing all the 10 points (ranging from 20 to 60). Independent t-test was used to compare the knowledge score between the groups of respondents.

Results

The total number of respondents were 146 dental students, comprising 83 (57.2%) undergraduate students and 62 (42.8%) paediatric dentistry postgraduate students. Only one undergraduate dental student was excluded because consent form and the questionnaire was

not properly filled, leaving a total of 145 participants. Most of the respondents were females 116 (79.5%) with the mean age of undergraduate and postgraduate students were 23.1±1.4 and 30.9±4.5, respectively.

The mean KS for all respondents was 47.7±6.8 ranging from 26–60 (Table 1). There was a statistically significant difference in KS between undergraduate and postgraduate students ($p<0.05$), with KS 45.1±6.6 and 51.2±5.4, respectively. Postgraduate students have higher knowledge about MIH. Both undergraduate and postgraduate students were mostly aware that MIH is a developmental defect that is different from hypoplasia and fluorosis. From all respondents, 46.2% (n=62) knew that there was no data available regarding prevalence of MIH in Indonesia. Results regarding knowledge about aetiology of MIH showed that chronic medical conditions and acute medical conditions affecting mother and child were the only factors that had significant difference between two groups.

Both undergraduate and postgraduate students had varied opinions regarding time or period the insult leading to MIH occurred. One third of undergraduate students and 24.2% (n=15) of postgraduate students considered the insult leading to MIH happened during pregnancy, while 27.4% (n=17) postgraduate students and 16.9% (n=14) undergraduate students stated that the insult happened occurs during pregnancy to 1st year of life. Further, 24.2% (n=15) of postgraduate students and 16.9% (n=14) of undergraduate students thought the insult occurs during pregnancy to the 3rd year of life. There were statistically significant differences between undergraduate and postgraduate students regarding the knowledge that the pattern of caries related to MIH is different from the classical caries pattern ($p<0.05$). Most postgraduate students agreed that the caries pattern related to MIH is different to classic caries pattern, while only 42.2% (n=35) agree on that term.

Perception and continuing education aspects for both undergraduate and postgraduate students regarding MIH are presented in table 2. There were significant differences regarding the confidence for diagnosing MIH between two groups ($p<0.05$). More than half of postgraduate students (n=35, 56.4%) feel confident and very confident, while only 27.7% (n=23) of undergraduate students feel confident and very confident in diagnosing MIH. Over half of postgraduate students (n=35, 56.5%) felt confident in treating MIH, but only 32.5% (n=27) of undergraduate students felt confident and very confident. Almost all postgraduate students received information on MIH. On the other hand, only 68.7% (n=57) undergraduate students received the information ($p<0.05$). Majorities of undergraduate and postgraduate students would like to have further training regarding diagnosis, aetiology, and treatment of MIH teeth.

Discussion

This study is the first study conducted to learn about knowledge and perceptions regarding MIH among dental students in Indonesia. Even though this study may not represent overall Indonesian dental students, the findings of the current study provided a baseline data with regard to knowledge and perception of MIH in Indonesia. This study highlighted the knowledge gap that needs to be focused to improve any information about diagnosis, aetiology, and management of MIH in Indonesia. Significant difference in knowledge between undergraduate and postgraduate students was reported in this study. Postgraduate students had better knowledge about caries patterns related to MIH compared to undergraduate students.

Prevalence of MIH in the world varies between each country and region.[25] It was difficult to compare the results of epidemiologic studies in the past because various diagnostic index criteria, unstandardized methods, and different age groups was used.[2,26] Recent studies used diagnostic criteria indexes published by European Academy of Paediatric Dentistry with standardized aged groups.[2,24] Most of the data were collected in European countries, and only a few data from Asia. Unfortunately, the MIH prevalence in Southeast Asia is only available from Singapore, Thailand and Malaysia.[32-34] There was no data yet on the prevalence of MIH in Indonesia. This reflected on the answer about the knowledge of prevalence from both undergraduate and postgraduate students. In addition, there is a need for further study to analyse the prevalence of MIH and its severity in Indonesia.

The knowledge about MIH in postgraduate

students are significantly higher than undergraduate students. This reflects where postgraduate students received more information about MIH than undergraduate students. Almost all postgraduate students received information about MIH, while only 68.7% of undergraduate students received the information. One third of undergraduate students received information from dental journals and 24% from educational curriculum on campus. Postgraduate students received information about MIH from dental journals and from continuing education. This result was almost similar to the study results in Saudi Arabia.[35] Data from dental students in Switzerland shows 99% of students received information about MIH, 92% from lectures and 35% from lecture notes[36], while in Indonesia only 43.5% received MIH lectures. This data shows that there is a need to put more information about MIH in the curriculum for dental students in Indonesia.

Regarding aetiology of MIH, both postgraduate and undergraduate students' responses reflect the assumption that MIH is caused by multifactorial factors and similar to previous studies.[16,37] Although aetiology of MIH still remains unclear, it was reported that genetic factors and chronic illness affecting mother and child play important roles in aetiology of MIH.[16,37-40] This study showed that genetic factors and chronic illness from mother and child were frequently selected by students in both groups. The same responses were also reported from studies in Switzerland and Hong Kong.[30,36] Genetic factors and acute medical conditions were frequently selected by respondents in Chiles while Australian respondents frequently selected chronic and acute medical conditions.[41] Studies in Saudi Arabia showed genetic factors and environmental contaminants were frequently selected by respondents.[35]

Postgraduate students were more confident in diagnosing and treating MIH than undergraduate students. Confidence in diagnosing and treating MIH might be associated with information and training exposure. Similar result was reported by a previous study, where almost all paediatric dentistry trainees felt confident in diagnosing MIH.[42]

Postgraduate students were more exposed to information about MIH through dental journals and continuing education during their postgraduate training course. Lack of clinical experience for undergraduate dental students in treating children might influence the confidence both in diagnosing and treating MIH. Similar results were reported from dental students in Switzerland showing almost all students were not confident and slightly confident in diagnosing MIH.[36] Other study reported over half of dental students were not prepared in diagnosing MIH.[35]

This study showed that both groups expressed the needs for further training in diagnosis, aetiology, and treatment of MIH. Similar results are reported in other countries.[28-30,35,43]

This study has some limitations; therefore, the results must be interpreted with caution. Selection bias might occur due to the low response rate, influencing the external validity in representing dental students in Indonesia. Further, this study used a self-administered questionnaire which was disseminated using social media. Response bias might occur due to the participants might only represent students who have already positive nature to the objective of this study, hence it might suggest possible overestimation of perception on MIH. Regardless of these limitations, the result of this study provides valuable information about current MIH knowledge and perception of Indonesian dental students since no prior survey has studied this topic in Indonesia. Additionally, there is a need for further studies to analyse MIH prevalence, severity, distribution, and the impact on quality of life in Indonesian children.

Conclusions

Knowledge, and perception about MIH of undergraduate dental students in Indonesia needs to be improved. Undergraduate students have little exposure to MIH and are likely to have similar concerns upon commencement of dental practice. Diagnosis and management of MIH shall be included in the undergraduate curriculum to increase confidence of future dentists when confronted with such challenges.

Declaration of Interest

The authors report no conflict of interest.

Knowledge questions	Knowledge Scores		Percentage distribution of students answered 'YES' n (%)			p-value
	Yes	No	All	Undergraduate n = 83	Postgraduate n = 62	
Have you been aware that MIH is a developmental defect that differs from fluorosis and hypoplasia?	9	0	131 (90.3)	72 (86.7)	59 (95.2)	0.153
How prevalent do you think MIH might be in your community? (one option chosen)						
< 5%	0	^	24 (16.6)	18 (21.7)	6 (9.7)	0.005*
5-10%	1	^	27 (18.6)	17 (20.5)	10 (16.1)	
10-20%	1	^	13 (9.0)	6 (7.2)	7 (11.3)	
>20%	1	^	14 (9.7)	2 (2.4)	12 (19.4)	
No data in Indonesia	6	^	67 (46.2)	40 (48.2)	27 (43.5)	
Do you think they are involved in the aetiology of MIH?						
Genetic factors	5	4	122 (84.1)	69 (83.1)	53 (85.5)	0.878
Environmental contaminants	5	4	108 (74.5)	59 (71.1)	49 (79.0)	0.372
Chronic medical conditions affecting mother and child	6	3	124 (85.5)	64 (77.1)	60 (96.8)	0.002#
Acute medical conditions affecting mother or child	6	3	102 (70.3)	50 (60.2)	52 (83.9)	0.004#
Antibiotics or medications	5	4	103 (71.0)	54 (65.1)	49 (79.0)	0.099
Fluoride exposure	1	8	62 (42.8)	39 (47.0)	23 (37.1)	0.307
What period do you think the insult occurs? (one option chosen)						
During pregnancy	1	^	45 (31.0)	30 (36.1)	15 (24.2)	0.151
1st year of life	3	^	21 (14.5)	11 (13.3)	10 (16.1)	
3rd year of life	0	^	19 (13.1)	14 (16.9)	5 (8.1)	
Pregnancy to 1st year of life	3	^	31 (21.4)	14 (16.9)	17 (27.4)	
Pregnancy to 3rd year of life	2	^	29 (20.0)	14 (16.9)	15 (24.2)	
Do you think the pattern of caries related to MIH is different from the classical caries pattern?	7	1	90 (62.1)	35 (42.2)	55 (88.7)	0.000*
Mean Knowledge Score (SD)			47.7 (6.8)	45.16 (6.6)	51.26 (5.4)	0.000**
Ranges	Min 20	Max 60	26 – 60	26 – 60	41 – 60	
Total Sample			145	83	62	

Table 1. Percentage distribution of Molar Incisor Hypomineralization (MIH) knowledge scores of undergraduate and postgraduate students in Indonesia.
^ Answer "No" does not apply as it was analysed as a single choice question
* Pearson's chi-square test ($p<0.05$)
# Fisher's exact test ($p<0.05$)
** Independent sample t-test ($p<0.05$)

Questions	All	Undergraduate	Postgraduate	p-value
How do you feel about diagnosing MIH?				
Very confident	3 (2.1)	2 (2.4)	1 (1.6)	0.002*
Confident	55 (37.9)	21 (25.3)	34 (54.8)	
Unconfident	77 (53.1)	51 (61.4)	26 (41.9)	
Very unconfident	10 (6.9)	9 (10.8)	1 (1.6)	
How do you feel about treating MIH?				
Very confident	1 (0.7)	1 (1.2)	0 (0.00)	0.008*
Confident	61 (42.1)	26 (31.3)	35 (56.5)	
Unconfident	69 (47.6)	44 (53.0)	25 (40.3)	
Very unconfident	14 (9.7)	12 (14.5)	2 (3.2)	
Are you receiving any information on MIH? (YES)	118 (81.4)	57 (68.7)	61 (98.4)	0.000#
Would you like further training regarding tooth hypomineralization? (Yes)	140 (96.6)	79 (95.2)	61(98.4)	0.393
Diagnosis	138 (95.2)	77 (92.8)	61 (98.4)	0.239
Aetiology	130 (89.7)	73 (88.0)	57 (91.9)	0.614
Treatment	138 (95.2)	77 (92.8)	61 (98.4)	0.239

Table 2. Perceptions and continuing education aspects of dental students regarding MIH.
* Pearson's chi-square test (p<0.05)
# Continuity correction test (p<0.05)

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