

## Prevalence of Molar Incisors Hypomineralisation (MIH) in primary school children

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### ABSTRACT

**Introduction:** Molar Incisor Hypomineralisation (MIH) is an enamel defect with white, yellow or black colour due to minerals insufficient during tooth development. The abnormality of prismatic enamel structures and tooth hypersensitivity on patients with MIH may disturb the success rate of restoration. The objective of this research was to determine the prevalence of MIH in primary school children. **Methods:** A cross-sectional study with purposive sampling on 619 primary school children at Pasteur Urban Village of Bandung City, Indonesia. All dentition were scored using the European Association of Paediatric Dentist (EAPD) MIH scoring sheet, and oral hygiene status assessment with simplified OHI. All data were descriptively described using distribution table. **Results:** Distribution of MIH on total of 619 children were scored as follows: 0, 1, 1a, 2, 2a, 3, 4, 5, 6, 7, 8, 9, 10 (0 = free enamel defect; 6, 7, and 8 = alteration to non MIH; 1 -5 and 9 -10 = MIH) with frequencies 417(67.36%), 39(6.30%), 60(.65%), 13(2.10%), 0(0.00%), 7(1.13%), 0(0.00%), 4(0.65%), 0(0.00%), 26(4.20%), 58(9.36%), 0(0.00%), and 49(7.91%) respectively. **Conclusion:** Prevalence of children with MIH in primary school is quite high (19% (118 out of 619 participants)). The highest prevalence is found at the 11 years old group with 49 participants (36.84%), while the prevalence in boys (83 (62.4%)) is found to be higher than girls (50 (37.59%)).

**Keywords:** Prevalence, Molar Incisor Hypomineralisation (MIH), primary school children

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### INTRODUCTION

Molar incisor hypo-mineralization (MIH) clinically shown and described as mottling enamel, hypoplasia enamel, cheesy molars, non-fluoride

opacities and idiopathic enamel spot.<sup>1,2</sup> The term of MIH firstly used by Weejeim<sup>3</sup>, it is defined as demarcated, qualitative development defects of systemic origin of enamel of one or more permanent first molar with or without the

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affection of incisors.<sup>4</sup> Histologically, the tooth with MIH show less distinct prism sheaths and a lack of arrangement of the enamel crystals. It shows lower mechanical properties and lower hardness and modulus elasticity. The etiology of this alteration had been formulated. The exposures can be during prenatal (mother illness, smoking), perinatal (prolonged birth, premature, caesarean or another birth complication) and postnatal (early childhood caries, trauma, systemic diseases). Furthermore, genetic seems as a causative factor. The affected tooth and the severity depend of the timing exposure during tooth development.<sup>5</sup>

Due to the alteration defect, the enamel affected required complex treatment, thus it is a great clinical challenge in dental practice.<sup>6</sup> In some severe cases, the enamel can be lost sooner after tooth erupted followed by the dentin exposure. Hypersensitivity due to open dentine can be as another sequela for this condition. The irregular enamel prisms also contribute to the longevity of restoration in the oral cavity. Therefore, the challenges include adequate anaesthesia, cavity design preferences and choice of restorative materials must be determined carefully. Early diagnosis to have an appropriate treatment is compulsory since breakdown of tooth structure may occur rapidly, resulting acute symptoms and complicated treatment.<sup>1</sup>

Some epidemiology study had been conducted in several countries in Europe and Asia with varies of result range from 19% to 40% for each population.<sup>7</sup> However, the research about MIH in Indonesia has not been done regionally. This research was a preliminary study in the two primary schools at Kelurahan Pasteur, Bandung, Indonesia. The objective of this research was to determine the prevalence of MIH in primary school children.

## METHODS

Ethical approval obtained from Bandung Ministry Polytechnic of Health Research Committee prior to study. A cross sectional study with purposive sampling on 619 primary school children at Pasteur Urban Village, namely Sukagalih VII State Elementary School (SDN), Luginasari I State Elementary School and Luginasari II State Elementary School, Pasteur Urban Village,

Sukajadi Subdistrict, Bandung Regency, from September 2013 to July 2014.

The inclusion criteria was having first permanent molar, incisors or both and registered as a member of regularly dental check-up under Bandung Health Polytechnic of Health. MIH examinations were performed on wet teeth after cleaning. The instruments used during examination were mouth mirror, probe, tweezers, excavator and DSLR camera.

The dentition was scored using the European Association of Pediatric Dentist (EAPD) MIH scoring sheet was devised using the translate-retranslate technique. The data of oral hygiene status was using simplified oral hygiene indexed score (OHIS). Two investigators did the validation before study based on the previous study. The demographic data, MIH and OHIS were collected during regular examination time schedule and descriptively described using distribution Table 1.

Table 1. Criteria for Molar Incisor Hypomineralisation (MIH) (European Academy of Paediatric Dentistry /EAPD) score

Code	Criteria
0	Enamel defect free
1	White/creamy demarcated opacities, no post eruption breakdown (PEB)
1a	White/creamy demarcated opacities, with post eruption breakdown (PEB)
2	Yellow/brown demarcated opacities, no post eruption breakdown (PEB)
2a	Yellow/brown demarcated opacities, with post eruption breakdown (PEB)
3	Atypical restoration
4	Missing because of MIH
5	Partially erupted (i.e., less than one-third of the crown high) with evidence of MIH
6	Unerupted/partially erupted with no evidence of MIH
7	Diffuse opacities (not MIH)
8	Hypoplasia (not MIH)
9	Combined lesion (diffuse opacities/hypoplasia with MIH)
10	Demarcated opacities in incisors only
Total	

## RESULTS

As much as 619 (83.6%) out of 750 primary school children who fulfilled the inclusion criteria participated in this study. Table 2 shows the

average age of the participants were 10.1 years old. The youngest was 7 years old and the oldest was 14 years old. The numbers of each age were 2 (0.32%), 80 (12.76%), 125 (20.19%), 152 (24.55%), 183 (29.56%), 63 (10.17%), 12 (1.93%) and 2 (0.3%) respectively.

Table 2. Age distribution of participants

Age	N	%
7	2	0.32
8	80	12.76
9	125*	20.19
10	152*	24.55
11	183*	29.56
12	63	10.17
13	12	1.93
14	2	0.3
Total	619	

From 619 children examined, 250(40%) were girls and 369(60%) were boys, as shown on Figure 1.

Girls 250(40%)

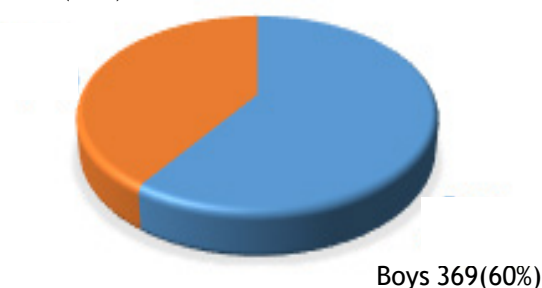


Figure 1. The participants' gender distribution

The distribution of primary school children with MIH were 118(19.1%) out of 619. The distribution of MIH on total 118 children scored 1, 1a, 2, 2a, 3, 4, 5, 9, and 10 were 39(33.1%), 6(5.1%), 13(11.0%), 0(0.00%), 7(5.9%), 0(0.00%), 4(3.4%), 0(0.00%), and 49(41.5%) respectively, as shown on Figure 2 and Table 3.

The age of participants with MIH are shown on Table 3. The highest was 11-years-old followed by 10, 9, 12, 8, and 14-years-old. The distribution were 49(36.84%), 29(24.6%), 23(19.45%), 11(9.3%), 5(4.51%) and 1(0.8%) respectively; while Figure 3 shows that 44(37%) girls and 74(63%) boys out of 118 participants were affected by MIH.

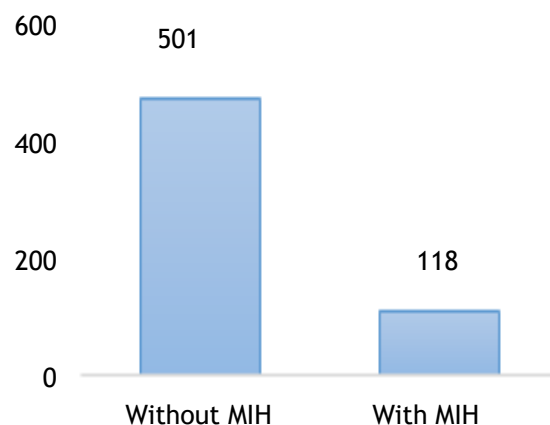


Figure 2. Distribution frequencies of primary school's students without and with MIH

Table 3. Distribution of students with MIH based on EAPD Scoring

MIH Scoring	N	%
0	417	67.36
1	39	6.30
1a	6	0.65
2	13	2.10
2a	0	0.00
3	7	1.13
4	0	0.00
5	4	0.65
6	0	0.00
7	26	4.20
8	58	9.36
9	0	0.00
10	49	7.91
Total	619	

Table 4. Age distribution of students with MIH

Age	N	%
7	0	0.00
8	5	4.51
9	23	19.5
10	29	24.6
11	49	41.5
12	11	9.3
13	0	0.0
14	1	0.8
Total	619	

## DISCUSSION

This study was conducted at the public primary school in Bandung, Indonesia. The school have

Girls 37.59%)

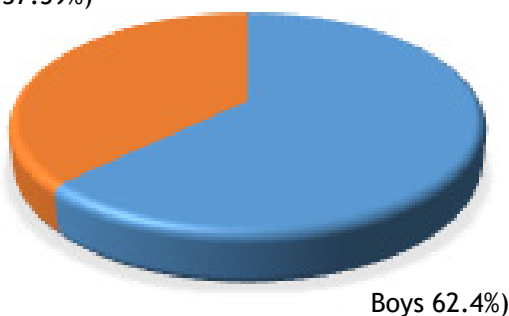


Figure 3. Distribution frequencies of primary school's students with MIH based on gender; n = 118

dental treatment facilities running by dental therapist students under dentist supervision from Bandung Polytechnic of Health. Students dental health record can be monitoring regularly and this is good for maintain uniformity of the data. The age of students registered were represent common age of Indonesian education system required. The age range of registered students from class 1 to 6 were from 7 to 14-year-old. However, in term of gender, the numbers of boys were larger than girls. It is in line with gender composition of children at 0-14-year-old from the Bandung statistic data centre.

It is no doubt that sensitivities, trauma and high cost for dental treatment are factors that can be reduce quality of life of children and their family. Commonly, children will be traumatized because of the sensitivity during tooth brushing or treatment. They may become an uncooperative and more anxious to get dental treatment.<sup>8,9</sup> Children will avoid to eats or drinks properly, then it will affect to their systemic health. Additional budget for several visiting dentist because of complicated treatment such as dislodge of restoration due to easily breakdown tooth structure, pulp exposure or extraction is needed. It will be affected to family financial.<sup>10</sup> All the difficulties above are the signs and symptoms of MIH. Out of 619 primary school children in this study proven that more than 19.1% had MIH. The number was quite great compare to some previous study in Europe and Asia which demonstrated rates of 14.% until 15.9%<sup>1,7</sup> Dental team must be able to differentiate this case from another alteration to avoid any difficulties due to wrong diagnosis and treatment.<sup>11</sup> Dental team and government should be aware for this finding.

Rather than caries, MIH was a new finding and need a special treatment due to the sequelae that can be happen during and inappropriate post treatment. The possibility of broken email increase by the age because of untreated the affected tooth. The disturbance of MIH occur during dental development of the permanent incisors and first molars in early of life. It is clear that MIH can be diagnosed as soon as permanent incisors and first molars erupted. The highest prevalence was in 11 years old, the condition probably already breakdown while the early sign of MIH couldn't be detected properly in the younger age. In this study the numbers of MIH increased at age 9 to 11. This finding is in line with previous study, that the ideal age range of samples should be about 7-8 years, just after first permanent have erupted but before the affected tooth required to be extracted. However, the sample was not enough to represent the participants more than 11-years-old.

The index chosen for the identification of MIH was EAPD score sheet. The index has been validated for the collection of the data. Given that part, Bandung is an area with fluoride in the drinking water. This is important to distinguish between demarcated and fused defect due to fluorosis. The facility inside the school allow the calibration to get validity by re-examination in between investigators.

One of the limitation of the study in regard of aetiology of the alteration. The causative factors are broad and starting in early of life. Those factors can be environment, which consists of socio-economy, nutrition, consumption of antibiotic, vaccination and feeding milk. Medical factors, which includes chickenpox, infectious disease, respiratory disorders, fever, birth disturbances, hypocalcemia, vitamin D deficiency and another systemic disease such as malnutrition, billirubin disorders and et cetera. Genetic disorders such as Enamelysia Protein (Mmp20).<sup>1,3</sup> The most possible factors in this study was socio economic factors, because most of the parents in that school were in the middle to lower class economy. This will certainly have an impact on their baby's health. It is interesting to do further research if the risk factors of the alteration come from systemic

disease. It can find the endemic disease in the population during the time period when they were babies until 3 years old. However, those causative factors must be further investigated in order to strengthen the finding.

Based on the results of the study, it was shown that boys more affected by MIH compare to the girls (63%). In accordance with previous research conducted in Spain showed that from 51% cases occurred in boys. However, no one study explain why MIH is more common in boys than female. At the same chronological age, tooth development in girls earlier than boys.<sup>12</sup> Therefore, if the disturbance happens at the same time when the dental calcification and mineralization stage of girls already completed, while the impact of disturbance in boys still possible because the mineralisation still occurred. The influencing of gene should be as one of the consideration factor.<sup>5</sup>

Surprisingly, the finding revealed that oral hygiene scores in most of children with MIH were good and fair. It can be mean that they can maintain their oral hygiene. Probably, it because they have dental treatment facility and regularly get caries prevention or dental treatment at the school. Even the appearance of tooth affected nearly same with caries, the disease is happened before tooth erupting and not because of oral microorganism activity. Even though, the enamel irregularities of affected tooth become a susceptible caries due to plaque accumulation. Therefore, early diagnosis is needed to avoid complex treatment.

Beside caries, MIH has been arising in recent years as an alteration which has significant numbers and it can't be ignore by dental team<sup>11</sup>. The dental team including dental nurse, dental therapist, dental hygienist and dentist itself need to be aware about this alteration. Due to disturbances of MIH occur during the first 3 years of life, the education of the alteration with the risk factors can give to the expected mother. Further research in the bigger sample and training of determination between MIH and caries to avoid mistreatment is required.

## CONCLUSION

The prevalence of children with MIH in the primary school are quite high 19% (118 out of 619 participants). The highest prevalence is found

at 11 years-old age group with 49 participants (36.84%), while the prevalence in boys (83 (62.4%)) is higher than girls 50 (37.59%). Further research with bigger sample and training of MIH, caries and another alteration determination to avoid mistreatment is required.

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