ANALYSIS RISK FACTOR OF MOLAR INCISOR HYPOMINERALIZATION OF STUDENT ELEMENTARY SCHOOL IN BANDUNG

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Abstract: *Background:Molar incisor HypomineralIzation is a defect in tooth enamel due to disruption of the mineralization process during enamel maturation in the pre natal, perinatal and post natal phase of life. The lack of mineral in enamel and dentin of the teeth is qualitatively characterized by white and yellow to brown spot particularly on first molar and central incisor. MIH increased of caries occurence in children because of enamel surface of MIH tooth is soft, porous and had irregularities prismatic enamel thar facilitate dental plaque formation. Teeth become very sensitif. The treatment become more difficult and expensive.*

Methods*. This is an analytic survey research with case control design, The aim of this research is to determine the risk factor of Molar Incisor Hypomineralization in the student of SD Harapan 1 and 2 Kota Bandung, by comparing the case group of respondents who experience Molar Incisor Hypomineralization (MIH) as many as 30 people with the control group of respondents who did not have MIH 30 person.*

Results. *The prevalence of MIH in the students of SD Harapan 1 and 2 Kota Bandung is 21%. The result of bivariate statistic test using chi square on environmental factor (antibiotic usage) showed a significant correlation between antibiotic and MIH. Risk factors of medical history in the postnatal periode also showed significant correlation with the occurence of Molar Incisor Hypomineralization ((p value = 0,000 (p ≤ 0,05)). While the risk factor of maternal health problem to MIH was obtained by p value = 0,096 (p>0,05), so it was concluded that there was no correlation between maternal condition during pregnancy and MIH. Multivariate analysis to see the level of influence of risk factor to MIH partially used coefficient of determination from Nagelkerke's R square.*

Conclusion*.The result showed that risk factor of antibiotic usage and health disorder of child during post natal period and maternal health disorder during the pre natal period was synergized 43,6% to Molar Incisor Hypomineralization risk. Further research is needed with other risk factors related to the incidence of MIH with more respondents.*

BACKGROUND

Molar Incisor Hypomineralization (MIH) is a term that refers to systemic hypomineralization disorders in fixed first molars (first permanent molar / FPM) which also occur in permanent incisors (central incisors) occurs due to lack of minerals in enamel and dentin Qualitatively characterized by white and yellow to brown spots, especially in molars and incisors (FDI, 1992 in Santos and Maia, 2012). Caries in normal circumstances is a structural change in e-mail and dentine due to the demineralization process in e-mail and dentine which occurs after eruption teeth whereas in the case of MIH the damage has occurred before and after the eruption (post-eruption breakdown / PEB), the structure of the tooth, brittle and rheumatic. This

situation causes teeth affected by MIH to be susceptible to caries, which further increases the risk of caries. In the MIH enamel, the teeth become soft and porous so that the teeth become more sensitive, rheumatic even when exposed to a toothbrush. As a result, maintenance of dental health is increasingly difficult and the teeth are increasingly prone to caries (Kilpatrick, 2009).

The etiology of MIH is not known with certainty but many studies have linked systemic factors, genetic factors, environmental factors and medical factors (Alalusua, 2010; Lygidakis, 2010; Crombie, 2009; Brook, 2009). MIH risk factors according to Singh, et al. 2017 are divided into 3 stages, namely prenatal (ie maternal health during pregnancy), natal care (such as premature birth and LBW) and postnatal such as children's health in the first year of life (1-3 Clinically, the presence of MIH often results in failure of clinical dental care in children who experience it, usually associated with rapid caries development during eruption of permanent first molars and more sensitive teeth due to the opening of dentine tissue, enamel pores larger and softer, so that the teeth require special care, this situation causes children to be more susceptible to pain during treatment so that dental fear often arises which actually worsens their caries. Based on the severity of the case, treatment for MIH is the Topical Application of Fluorine (TAF). fillings with glass ionomers or composites, in some cases it may be possible orthodontic treatment is performed by extracting the teeth affected by MIH (Lygidakis, 2010). Other problems that often occur are a misdiagnosis of MIH with caries so that the handling becomes less precise.

The MIH prevalence rate based on Prayitno's (2014) research at Luginasari Elementary School which is a school assisted by the Bandung Health Polytechnic Dental Nursing Department is 21.48% with a total of 133 students. where the male sex more experienced incisor hypomineralization molar disorder in his teeth with a percentage of 62, 40% or as much as 83 compared to female students. The average age of students who experience MIH disorder is at the age of 11 years with a percentage of 36.48% or as many as 49 students. The results of a survey in 2017 of Hope 1 and 2 Elementary School students as UKGS assisted by the Bandung Health Polytechnic Dental Nursing Department turned out that there were 20.9% of students who experienced hypomineralization (Adistiani, 2017).

In children with MIH conditions need special attention because Molar teeth or Incisal with MIH disorders are very susceptible to caries and the treatment is more specific. Teeth become more sensitive even when exposed to a toothbrush, causing children to be lazy to brush their teeth. This condition causes the maintenance of the teeth to be less good and the teeth more vulnerable to caries. Dental care is even more difficult because of sensitive teeth. The existence of an email prism irregularity in the teeth of the MIH causes the teeth to be difficult to patch, patches are easily separated because the bond between the fillings and the teeth is less strong. At a certain level of severity, the treatment of MIH is very different from the treatment of dental caries without MIH, it needs special care and is expensive.

Given the large prevalence of MIH and its effects on teeth, it is necessary to conduct research on the risk factors for MIH and the most dominant factors affecting MIH. The results of this study are expected to be the basis for prevention, early detection, and treatment of MIH.

METHODS

This research is analytic survey research with case-control study design. This study compared between case groups, namely respondents who experienced Molar Incisor Hypomineralization (MIH) with a control group, namely respondents who did not experience MIH. Dependent variable: Molar Incisor Hipomineralisasi (MIH) while the independent variable is Environmental factor is a condition that can affect the formation of tooth enamel in the early period of child growth and development, namely the use of antibiotics in respondents; Medical History Factor is a disease that is suffered in the early period of growth and development of a child that affects the formation of tooth enamel (age 1 to 3 years), namely the presence of smallpox/ disease / respiratory disease asthma / high fever suffered by respondents; Systemic factors are the condition of the mother's body during the initial growth and development of the child (prenatal period) which can affect the formation of enamel, namely the mother of the respondent who experiences health problems during pregnancy such as high fever, maternal diabetes.

The population in this study were all elementary school students of Hope 1 and 2 in Bandung. Samples of elementary school children in the

age range of 8 - 12 years (whose first permanent molars and first incisors had erupted) and experienced hypomineralization in their molar teeth and incisors as a Case group. The control group was children who did not experience cases of hypomineralization in their molar teeth and incisivus with or without caries. Data regarding risk factors are asked of the child's parents. Sampling is done by simple random sampling technique. Determination of the sample is done by random. The sample size is calculated based on the sample size formula for case-control research, which is 30 cases and 30 control groups.

RESULTS AND DISCUSSION

To find out the relationship between independent variables consisting of Environmental Factors (Use of Antibiotics), Medical History Factors (Having Respiratory Disease / Asthma / Smallpox / High fever) and Systemic Factors (Mothers experiencing health problems during pregnancy) with
Molar Incisor Hypomineralization (MIH) , bivariate analysis was performed using chi-square ()2) analysis or cross-tabulation analysis (crosstab).

Relationship of Environmental Factors (Use of Antibiotics) with Molar Incisor Hypomineralization (MIH)

Table 1

Antibiotic factor	Molar Incisor Hypomineralization (MIH)				Results	
	No		Yes			
	F	%	f	%	χ^2	p
Yes	2	6.7%	17	56.7%	15,096	0,000
No	28	93.3%	13	43.3%		
Total	30	100.0%	30	100.0%		

Respondents who experienced Molar Incisor Hypomineralization (MIH) and had conditions that could affect the formation of tooth enamel, namely the use of antibiotics in respondents at the beginning of the growth period (0-3 years) there were 17 people (56.7%), while respondents who did not use antibiotics at the beginning growth period (0-3 years) there are as many as 13 people (43.3%). Testing the hypothesis by using the chi-square test (cross tabulation) gives the results of □2 = 15,096, p-value = 0,000 (p 5 0,05), then h0 is rejected and Ha is accepted, meaning that there is a significant relationship between the Environmental Factors (Use of antibiotics) with Molar Incisor Hypomineralization (MIH).

Relationship of Medical History Factors (Having Respiratory Disease/Asthma/Smallpox / High fever) with Molar Incisor Hypomineralization (MIH)

Table 2

Medical History Factors	Molar Incisor Hypomineralization (MIH)				Results	
	No		Yes			
	f	%	f	%	χ^2	p
Yes	4	13.3%	18	60.0%	12,129	0,000
No	26	86.7%	12	40.0%		
Total	30	100.0 %	30	100.0 %		

Respondents who experienced Molar Incisor Hypomineralization (MIH) and had a disease suffered during the early stages of child growth and development, i.e Respiratory Disease/ Asthma/Smallpox/high fever were 18 people (60.0%), while respondents MIH who had no such disease are 12 children(40.0%). Hypothesis test by chi-square test (cross tabulation) gives the results of 2 = 12,129, p-value = 0,000 (p 5 0,05), then H0 is rejected and Ha is accepted, meaning that there is a significant relationship between the Medical History Factors (Having Asthma / Smallpox with Molar Incisor Hypomineralization (MIH).

Relationship of Systemic Factors (Mothers experience health problems during pregnancy) with Molar Incisor Hypomineralization (MIH)

Table 5.3

Sistemic Factor	MIH				Results	
	Yes		No			
	f	%	f	%	χ^2	p
Yes	6	20.0%	13	43.3%	2,773	0,096
No	24	80.0%	17	56.7%		
Total	30	100.0 %	30	100.0 %		

Respondents who experienced Molar Incisor Hypomineralization (MIH) and had a mother's body condition at the beginning of the child's growth and development (prenatal period up to the first 3 years) which could affect enamel formation (mothers with health problems during

pregnancy) were 17 people (56.7 %), while respondents who did not have the condition of the mother's body at the beginning of the child's growth and development (prenatal period up to the first 3 years) that could influence enamel formation (maternal diabetes) were 13 respondents (43.3%). Testing the hypothesis with chi square (cross tabulation) gives the results of =2 = 2.773, p-value = 0.096 (p> 0.05), then H0 is accepted, meaning that there is no significant relationship between the Systemic Factors (Mothers with health problems during pregnancy) with Molar Incisor Hypomineralization (MIH).

Multivariat Analysis

To find out analysis model of molar incisor Hypomineralization was used binary logistic regression to predict the incidence of molar incisor hypomineralization namely, environmental factors (use of antibiotics) (X1), medical history factors (XD) such as smallpox/high fever (X2), systemic factors e.g healthproblems during pregnancy) (X3).

Table 4 Logistic Regression Test Results

	Koefsien Reg (B)	Statistik Uji Wald	Sig.	Keterangan
Environmen factors	-2,300	6,868	0,009	Had significant effect
Medical history factors	-1,529	4,266	0,039	Had significant effect
Systemic factor	-,085	0,012	0,913	No significant effect

Environmental Factors (Use of Antibiotics) effect on the risk predictions of MIH. Environmental factors (use of antibiotics) have a significant effect to predict the risk of molar incisor hypomineralization. From the table, it can be seen that the Wald statistic value for variable X1 (Environmental Factor (Use of Antibiotics)) is 6,868 with a significance value (p-value) = 0,009. The Chi-square value of the table obtained from the Chi-square table for = 0.05 and the free degree 1 is 3.841. Because the value of Wald statistics for the variable Environmental Factor (Use of Antibiotics) (X1) is greater than the Chi-square value of the table (6.868> 3.841) with a 95% confidence level and the significance value (0.009) <0.05, then it can be concluded that Environmental Factors (The use of antibiotics) has a significant influence on the risk prediction of the incidence of Molar Incisor Hypomineralization.

Medical history effects on the risk prediction of MIH.

the Wald statistic value for variable X2 Factor Medical History (Having Respiratory / Asthma / Chickenpox / High fever) infection is 4,266 with a significance value (p-value) = 0.039 (table 4). The Chi-square value of the table obtained from the Chi-square table for = 0.05 and the free degree 1 is 3.841. Because the value of Wald statistics for the Medical History Factor variable (Having Respiratory / Asthma / Chickenpox / High fever) (X2) infection is greater than the Chi-square value of the table (4.266> 3.841) and the significance value (0.039) <0.05, then with a 95% confidence level it can be concluded that the Medical History Factor has a significant influence on the risk predictions of molar incisor hypomineralization events..

Systemic factors effects on the risk prediction of MIH.

The Wald statistic value for X3 variable Systemic Factor (health problems during pregnancy) is 0.012 with a significance value (p-value) = 0.913. The Chi-square value obtained from the Chi-square table for = 0.05 is 3.841. smaller than the Chi-square value of the table (0.012 <3.841) so concluded that Systemic Factors eg health problems during pregnancy did not have a significant effect on the risk predictions of molar incisor hypomineralization

Nagelkerke's R Square(determination coefficient)

The Nagelkerke's R Square determination coefficient was used to see how much the influence of the independent variables on the dependent variable.

Table 5
Effect on the risk of molar incisor hypomineralization

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	59.410[a]	.327	.436

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than.001.

The results obtained showed in table 5 that Environmental Factors (Use of Antibiotics) (X1), Medical History Factors (Asthma/ Smallpox) (X2), Systemic Factors (Maternal Diabetes) (X3) had an effect of 43.6% on the risk of molar incisor hypomineralization

DISCUSSION

MIH occurs due to disruption of the mineralization process of enamel maturation during the prenatal, perinatal and postnatal phases of life. Based on previous research, the influential postnatal factor is environmental factors, conditions that can affect the formation of tooth enamel. In this study limited to the use of antibiotics in postnatal and at the beginning of the growth period of children (the age of 0 - 3 years). The results of the bivariate statistical tests showed a correlation between antibiotic administration at the beginning of the growth period and the disruption of the process of amelogenesis in the teeth. The antibiotics that are widely assumed to cause MIH are amoxicillin, penicillin, and erythromycin. Antibiotics, especially amoxicillin, induce early enamel formation and/or accelerate the rate of thickening of the enamel, which does not occur in dentine. It is suspected that antibiotics interfere with the function of ameloblast, which further disrupts the process of amelogenesis. This disorder causes changes in the stages of amelogenesis (Laisi, 2009; Wuolet, 2016). Now widely accepted theory that disruption of resorptive potential of ameloblasts and inhibited proteolytic enzymes will change protein retention, especially amelogenin that causes disruption of crystal growth and maturation of enamel crystals, which results in MIH (Singh, et al. 2017).

There are differences of opinion regarding antibiotics especially amoxicillin which causes MIH. Some argue that the use of this antibiotic in childhood is certainly related to the health problems of children/diseases suffered by children during the postnatal period (0-3 years), such as respiratory diseases, otitis media, and high fever. Ciarrocchi et al. (2012) stated that the possibility of antibiotic factors and disease in the postnatal period of the child synergized, causing disruption of ameloblast function during the growth of dental crowns resulting in hypomineralization in four molars and sometimes also involving central incisor teeth.

Further research is needed to determine the risk factors for antibiotics as a cause of MIH. As mentioned earlier regarding the risk factors for medical history in the postnatal period in the form of respiratory tract infections, asthma, or high fever due to chickenpox or other diseases to predict the risk of MIH events. Hypothesis testing with chi-square obtained the results of p-value = 0,000 so that it was concluded that there was a significant relationship between the factors of medical history and the incidence of MIH. This is in line with research on the medical etiology of MIH by Lygidakis (2008), El Meligy et al (2014) Atul and Singh (2017). Poor health or systemic conditions in the early phase of life are closely related to the incidence of MIH. In studies conducted in Greece (Lygidakis, 2008) and Iraq (Ghanim, 2013) and Finland (Wuolett, 2016) it was concluded that the period of 0 to 3 years early in the child's life is a critical period of MIH. Health problems during this period cause interference with the ameloblast. High fever, respiratory tract infections, asthma, and otitis media can cause reduced oxygen supply to the ameloblast and ultimately cause interference with amelogenesis. The resulting enamel has a defect, contains a lot of protein and the email prism that is produced is irregularly shaped.

Maternal health problems during pregnancy (prenatal) are also thought to be one of the risk factors for MIH (Sing, 2017). But in the research conducted on elementary school students Hope I and Hope 2 who experienced MIH obtained p-value = 0.096 (p> 0.05). So those conclusions were drawn there was no correlation between the condition of the mother during the period of pregnancy and the incidence of MIH. This is in line with the research conducted by Alsakarma in 2009, that no link was found between maternal factors and the incidence of MIH. This may be related to the process of growth and development of the teeth where the prenatal phase is more dominant in the growth and development phase of the milk teeth. Whereas for permanent first molars and incisor teeth, the mineralization/calcification phase actually occurs at the age of 1 year to 5 years.

The results of multivariate analysis showed risk factors for antibiotic use, maternal health problems in the postnatal period and maternal health problems in the prenatal period synergized at 43.6% of the occurrence of MIH. The results of the logistic regression test showed that antibiotic factors and health problems in the postnatal period had a significant effect on predicting the risk of MIH occurrence. While pregnancy disturbance factors during prenatal have no significant effect

CONCLUSSION

1) Environmental factors (antibiotic use) have a significant influence in predicting the risk of MIH events with a value of p = 0.009
2) Medical history factors have a significant influence on the risk predictions of MIH events with a value of p = 0.039
3) Systemic factors (health problems during pregnancy) did not have a significant effect on the predictions of the risk of MIH events with a value of p = 0.913

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