

**PREVALENCE OF HYPOMINERALIZED TEETH AND ITS ORAL EFFECTS IN
PRIMARY SCHOOL GOING CHILDREN- AN ORIGINAL RESEARCH**

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ABSTRACT

Aim

The purpose of the present research was to study the prevalence of hypomineralized teeth and subsequently oral effects in primary school going children.

Methodology

Children aged 8–10 years were recruited at a pediatric dental clinic in Hannover, Germany. Half of them were affected by MIH. Participants were evaluated for presence and severity of MIH (MIH-TNI), plaque and dental caries status.

Results

Hundred eighty-eight children (mean age 8.80 [\pm 0.84]; 43.10% female) were included in the study with 94 children having MIH. CPQ-G8-10 mean scores in MIH-affected children were significantly higher than in children showing no MIH (13.87 [\pm 8.91] vs. 4.20 [\pm 3.74]; $p < 0.0001$) showing that MIH has negative impact OHRQoL. Similar trends were seen in all four subdomains. Regarding severity, CPQ-G8-10 mean scores increased from mild to severe forms of MIH.

Conclusion

Children affected by MIH show an impaired OHRQoL compared to children without MIH; with increasing severity, OHRQoL gets more impaired.

Keywords Molar incisor hypomineralization, Child Perceptions Questionnaire, Oral health–related quality of life.

INTRODUCTION

Enamel hypomineralization (EH) in primary teeth and molar incisor hypomineralization (MIH) in permanent teeth are qualitative defects of enamel resulting from disturbances during the matrix formation stage of enamel development.¹⁻³ The etiologies of EH and MIH are considered multifactorial and may be influenced by systemic, genetic and or environmental factors, which include premature birth, underweight birth, infections, hypoxia, malnutrition, or metabolic disorders, and are often reported in higher frequency among low socioeconomic families.⁴⁻⁹ These hypomineralized areas are responsible for considerable esthetic problems, hypersensitivity of involved teeth and predisposition to dental caries both in primary and permanent dentition, affecting children's quality of life.¹⁰⁻¹⁴ The reported rate of prevalence for EH ranges widely between 25–45.4% in primary dentition¹⁰⁻¹⁶ and for MIH from 8.6% to 21.4% in permanent dentition^{17,18} depending on the geographic population, teeth examined and the method used for diagnosis of these lesions. These hypomineralized defects of dental enamel serve as biological markers since alterations that occur during pregnancy remain permanently recorded on the tooth surface.¹⁹ The presence of enamel hypomineralization resulting from disturbances during matrix formation stage of enamel development increases the risk of dental caries both in primary and permanent dentition, thereby affecting a child's quality of life.¹⁴

Molar incisor hypo-mineralization (MIH) clinically shown and described as mottling enamel, hypoplasia enamel, cheesy molars, non-fluoride opacities and idiopathic enamel spot.^{20,21} The term of MIH firstly used by Weejheim,²² it is defined as demarcated, qualitative development defects of systemic origin of enamel of one or more permanent first molar with or without the affection of incisors.²³ 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.²⁴ Due to the alteration defect, the enamel affected required complex treatment, thus it is a great clinical challenge in dental practice.²⁵ 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. This may adversely affect even the simplest of the daily vital activities like brushing or eating. In addition, aesthetics also plays an important role when the incisors are affected. Incisal defects are pretty extensive occurring mainly on the buccal surface leading to the aesthetic concern. The children's appearance not only upsets the mothers but also has a negative influence on the children, preventing them from smiling. Such aesthetics may lead to a negative social impact. These problems described above may affect oral health-related quality of life (OHRQoL) in MIH patients. It is known that OHRQoL is an integral part of one's wellbeing and general health.²⁶ The subjective evaluation of OHRQoL "reflects people's comfort when eating, sleeping, and engaging in social interaction; their self-esteem; and their satisfaction with respect to their oral health".²⁷ Therefore, it is important to compare OHRQoL in children with and without MIH and to assess the impact of severity of MIH on OHRQoL in children

AIM OF THE PRESENT STUDY

The purpose of the present research was to study the prevalence of hypomineralized teeth and subsequently oral effects as well quality of life in primary school going children.

METHODOLOGY

188 children between ages of 8-10 years were included in the present research. Extended information leaflets on the aim of the study were handed out and explained to the parents who gave their written and oral informed consent. IRB approval was also taken. A calibrated examiner (TJ) performed all clinical examinations. These include the presence of demarcated opacities, post-eruptive enamel breakdown, atypical restorations, and extraction due to MIH in at least one first permanent molar. Demarcated opacities with a diameter of < 1 mm were not considered in the analysis. The subjects were evenly divided into two groups. Group I consisted of 94 subjects with MIH and group II consisted of 94 subjects without MIH.

During a single visit to the dental clinic, subjects were instructed to first brush their teeth followed by a clinical examination to grade the presence or absence of MIH, dental caries status using the dmft/DMFT index, and the plaque status using the Approximal Plaque Index (API). The MIH-TNI takes into account two most important clinical symptoms: post-eruptive breakdown and hypersensitivity: MIH-TNI 1 no breakdown, no hypersensitivity; MIH-TNI 2 breakdown, no hypersensitivity; MIH-TNI 3 no breakdown, hypersensitivity; MIH-TNI 4 breakdown, hypersensitivity.

Child Perceptions Questionnaire (CPQ8-10). The CPQ8-10 contains a total of 25 items which can be subdivided into four domains: oral symptoms (five items), functional limitations (five items), emotional well-being (five items), and social well-being (ten items). Questions ask about the frequency of events in the child's last 4 weeks. Responses are made on an ordinal scale (0 = never, 1 = once/twice, 2 = sometimes, 3 = often, 4 = every day/almost every day). Higher scores refer to a worse OHRQoL status. The instrument's summary score ranges from 0 to 100. A summary score of zero indicates the absence of any problems, and higher CPQ scores represent more impaired OHRQoL. Based on this, either the unpaired Student *t*-test or the Mann-Whitney test was performed for comparison between two groups. Wherever a comparison between multiple groups was involved, either the one-way ANOVA (analysis of variance) was used to determine the statistical significance. A *p*-value of less than 0.05 was considered significant.

RESULTS

A total of 188 subjects aged 8–10 years (43.1% female) were involved in this study. They were equally divided into two groups with 94 subjects affected with MIH (50% female). (Table 1) The mean age was 8.80 years (\pm 0.84 years). The mean dmft/DMFT score for the MIH group was 5.04 (\pm 3.73) and 5.49 (\pm 3.84). The mean CPQ-G8-10 score for MIH-affected children was 13.87 (\pm 8.91; median 12; range 0–48) while the control group showed a reduced score of 4.20 (\pm 3.73; median 3; range 0–18), indicating a better self-perceived oral-health. Oral symptoms (6.88 [\pm 3.76] vs. 2.29 [\pm 2.60]), functional limitations (2.35 [\pm 2.36] vs. 0.88 [\pm 1.35]), emotional well-being (2.91 [\pm 3.23] vs. 0.66 [\pm 1.24]), and social well-being (1.72 [\pm 2.62] vs 0.38 [\pm 0.96])

were significantly increased in MIH patients ($p < 0.001$, t -test). Furthermore, female MIH patients showed a higher total score compared to males (15.96 [\pm 9.99] vs. 11.79 [\pm 7.20]) which was statistically significant. In children with mild affected MIH teeth, a mean score of 7.26 (\pm 3.76) was observed increasing to 21.93 (\pm 21.93) in patients with severe MIH. The item “pain in teeth or mouth” showed a sevenfold increase in patients with MIH compared to the patients without MIH. (Table 2)

Table 1- General characteristics of participants

CHARACTERISTICS	ALL	CONTROL	MIH
Gender (N, %)	188 (100%)	94 (100%)	94 (100%)
Male	107 (56.9%)	60 (63.8%)	47 (50%)
Female	81 (43.1%)	34 (36.2%)	47 (50%)
Mean age (years, SD)	8.80 (0.84)	8.74 (0.79)	8.87 (0.88)
Mean dmft/DMFT score (SD)	5.27 (3.79)	5.49 (3.84)	5.04 (3.73)
Mean API (%)	45.29 (\pm 33.72)	40.34 (\pm 33.07)	50.53 (\pm 33.72)

Table 2- CPQ-G8-10 mean scores in patients with and without MIH

	Total score
Control (MIH-TNI 0)	
All	4.20 (\pm 3.74)
Female	4.50 (\pm 3.69)
Male	4.03 (\pm 3.79)
MIH	
All	13.88 (\pm 8.91)
Female	15.96 (\pm 9.99)
Male	11.79 (\pm 7.20)
MIH-TNI 1 (N = 19)	7.26 (\pm 3.94)
MIH-TNI 2 (N = 27)	9.63 (\pm 4.77)
MIH-TNI 3 (N = 18)	13.78 (\pm 6.73)
MIH-TNI 4 (N = 30)	21.93 (\pm 9.24)

DISCUSSION

In the present study, the CPQ 8–10 was used to measure OHRQoL. The instrument is frequently used worldwide and has already been translated and validated in several countries. In this study, the presence of MIH significantly impacted OHRQoL compared to the control group (13.88 [\pm 8.91] vs. 4.20 [\pm 3.74]). Children affected with MIH showed a 3 times more impaired OHRQoL.

Furthermore, regarding severity of MIH, mean CPQG8- 10 scores increased with increasing severity showing a more impaired OHRQoL in severe cases. In children with mild affected MIH teeth, a mean score of 7.26 (\pm 3.76) was observed increasing to 21.93 (\pm 21.93) in patients with severe MIH which was statistically significant. However, it should be noted that although

higher scores were already recorded in mild MIH cases, this difference was not significant compared to the control group.

A further study done in Mexico using a sample of 411 schoolchildren (8–10 years old) confirmed the negative impact on MIH-affected children’s OHRQoL.²⁸ Children with moderate/severe MIH experienced a greater impact across the four domains compared to children without MIH. Similarly, Shojaeepour et al. measured OHRQoL of 129 Iranian children between 8 and 12 years of age suffering from MIH. A mean score 19.9 was observed.

Unfortunately, no control group was included in this study and that no comparison to our control group can be done.²⁹

It is important to understand that the QoL is not only limited to the effects caused by MIH on the oral health. It is multidimensional and affects not only psychological aspects such as emotional and social well-being, but also physical symptoms and functioning.³⁰ Although a negative impact of MIH was seen in all four domains, namely oral symptoms, functional limitations, emotional well-being, and social well-being, we were able to show that the highest scores were observed in the oral symptom domain.

CONCLUSION

Children with MIH have a poorer OHRQoL as compared to children without MIH when applying the CPQ-G8-10 questionnaire. The negative impact was seen in all the four domains, with maximum difference being observed in the oral symptoms domain.

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