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Hypomineralized Second Primary Molar: Prevalence, Clinical Presentation and Distribution of the Lesion

Mo'ath M Ghozlan[1], Hasan F Alsmadi[1], Nader N Alrawabdeh[2], Murad A ALghzawi[3], Ashraf M Tashtoush[4], Rami A Sa'adeh[5]

[1]Department of Pediatric Dentistry, Royal Medical Services

[2]Department of Periodontics, Royal Medical Services

[3]Department of Conservative Dentistry, Royal Medical Services

[4]Department of Vendodontics, Royal Medical Services

[5]Department of Public Health, Jordan University of Science and Technology

[1]Corresponding Author Email: *mghuzlan79[at]yahoo.com*

Abstract: ***Objective**: To determine the clinical presentation, distribution of hypomineralized lesions in second primary molars, and the associated defects in the primary dentition in Jordanian children. **Method**: A prospective study was conducted on patients diagnosed with Hypomineralized Second Primary Molar who attended pediatric dental clinic at Prince Rashid Bin Al Hassan military hospital in the north of Jordan in the period between May and September of 2021. Collected data included gender, age, the severity of the lesions, and the presence of other hypomineralized lesions on the first primary molar and the primary canine. The criteria for the diagnosis of hypomineralized second primary molar and other primary teeth were based on the criteria of the European Academy of Paediatric Dentistry. **Results**: Two hundred and fifty-six patients were diagnosed with hypomineralized second primary molar with over a half of them had the severe form. Most of the affected children had either two or four hypomineralized second primary molars with a mean average 2.8/affected child. Hypomineralized first primary molar and hypomineralized primary canine co – occurred with 57.4% of hypomineralized second primary molar cases, occurring more frequently when there were two or four affected second primary molars and with severely hypomineralized second primary molars. **Conclusion**: The findings in this sample which showed a high number of teeth affected per child and a high percentage of cases classified as severe cases are warning. Although the exact cause of hypomineralization in second primary molar and other primary teeth is not yet well known, early detection with a proper treatment plan assist in the control of the deteriorating effects that usually result from hypomineralization.*

Keywords: Hypomineralized second primary molar, prevalence, severity, primary teeth hypomineralization,

1. Introduction

Hypomineralized dental enamel is a common dental defect of systemic origin that could affect both primary and permanent dentitions. When these defects occur in the permanent teeth the condition is called Molar Incisor Hypomineralization (MIH) and could involve one or more of the permanent first molars and occasionally permanent incisors[1]. On the other hand, hypomineralization that affects primary second molar is called hypomineralized second primary molar (HSPM) and involves at least one primary second molar[2]. Despite the significant increase in the rate of these developmental enamel defects[3], only few studies are available on them[4].

HSPM was first described by Elfrink in 2008[5], and was known also as deciduous molar hypomineralization (DMH) [2, 4, 6] it was defined as idiopathic hypomineralization of one to four second primary molars[7]. Hypomineralization results from the disruption of enamel mineralization in second primary molar(s) during tooth development[7]. The disruption to ameloblasts during calcification and maturation stages of amelogenesis produces demarcated white, yellow or brown patches in the enamel [8, 9], this enamel easily breaks down under normal occlusal forces shortly after the eruption of the affected teeth because of their porosity and low mineral contents. Hence, hypomineralization in second primary molar explains the high risk for caries in this tooth relative to that of the first primary molar [1, 10], despite the earlier eruption of the later[1, 11].

The cause of HSPM is currently unknown with little information about the associated risk factors[8]. However, many factors have been claimed to contribute for the development of HSPM, and the cause may be combination of many of these factors[12, 13]. These factors can be environmental or genetic factors [13, 14, 15]. The environmental factors such as maternal alcohol consumption or smoking were considered as prenatal factors [16, 17], while asthma and high fever were considered as post-natal factors[18, 19]. Further, premature childbirth[20] and Vitamin D deficiency are considered perinatal[16].

The pathology and the clinical features of HSPM are similar to that of MIH, since the periods of development of the second primary molars and the first permanent molars overlap[21]. So it is thought that both MIH and HSPM share

the same pathology and etiology, and they have the same clinical features[5].

Some authors reported co-association between the occurrence of HSPM with hypomineralization in other primary teeth such as primary first molar and canine, which can be explained that by the coincident periods of mineralization of these teeth[21, 36].

There are several advantages of studying HSPM. First, it assists in early diagnosis of the lesions, which prevents destruction of the affected teeth that could result from late diagnosis and treatment. Second, hypomineralization is an important risk factor for caries in primary dentition[22] because of the increase in porosity, disorganization in rod structure of hypomineralized teeth[23, 24] and poor oral hygiene in children with HSPM[25] .Third, hypomineralized teeth are usually sensitive to heat and cold, and may produce severe pain[26, 27] which necessitates professional intervention. Fourth, hypomineralized teeth can present management problems for clinicians[23]. Fifth, HSPM can serve as a predictor and a warning sign for the development of hypomineralization in permanent teeth[28].

The prevalence of HSPM ranged between 4% and 14.5% in literature[5, 29]. There is no published study in Jordan that describes HSPM in Jordanian children regarding its clinical presentation and distribution. Thus, the aim of the study was to describe the clinical picture and distribution of hypomineralized lesions in primary second molar, in addition to the co – occurrence in other primary teeth for children attending pediatric dental clinic at Prince Rashid Al-Hassan hospital in the north of Jordan.

2. Methods

Children attending the pediatric dental clinic during May and September of 2021 at Prince Rashid Al- Hasan hospital in the north of Jordan and diagnosed with HSPM were considered in the study. The clinical presentation of the lesions regarding the severity and associated hypomineralized lesions in other primary teeth were reported, in addition to the distributions of the lesions according to gender and age.

Inclusion criteria: Medically free children with the selected age range, who had the four second primary molars erupted and who had been diagnosed as cases of HSPM.

Exclusion criteria: Children with systemic diseases or syndromes that cause missing, discoloration or deformation of teeth were excluded. Also, children with extracted primary teeth weren't included in the sample since it cannot be guaranteed whether the extracted teeth were hypomineralized or not.

The confirmation of the diagnosis was carried out at dental clinic by a specialized pediatric dentist, with clean and dry teeth, and using sterile dental mirror. The patient has been considered to have HSPM according to the criteria adapted from the European Academy of Paediatric Dentistry (EAPD), and published by Weerheijm and Elfrink[1, 2, 7]. Besides, the modified EAPD system which was adopted by many researchers[7, 30, 31, 32] was used to classify the severity of the lesion. According to this modified system, there are two phenotypes of severity: mild hypomineralization, manifested by demarcated opacities of different colors, and severe hypomineralization manifested by posteruptive breakdown, atypical caries, and atypical restoration.

3. Results

The studied sample included 256 children (116 males and 140 females), with age range of 4 to 11 years and a mean of 6.8 years. Distribution of HSPM according to the gender and age are shown in Table 1 and Table 2 respectively. Although there were almost equal number of mild cases among males and females, females had more severely hypomineralized teeth than males as shown in Table 1. Furthermore, all age groups had fewer mild cases than severe ones, except the (4-5) age group that had more mild than severe cases, as demonstrated in Table 2.

Table 1: Distribution of HSPM according to the gender

Severity	N	Female	Male
Severe	132 (51.6%)	77 (58.3%)	55 (41.7%)
Mild	124 (48.4%)	63 (50.8%)	61 (49.2%)
Total	256 (100%)	140 (54.7%)	116 (45.3%)

Table 2: Distribution of HSPM according to age

Age (years)	Total n (%)	Mild n (%)	Severe n (%)
4-5	80 (31.2%)	43 (53.8%)	37 (46.2%)
6-7	70 (27.3%)	34 (48.6%)	36 (51.4%)
8-9	58 (22.7%)	26 (44.8%)	32 (55.2%)
10-11	48 (18.8%)	21 (43.8%)	27 (56.3%)
Total	256	124 (45.3%)	132 (54.7%)

Children diagnosed with HSPM varied in the number of teeth affected by hypomineralization. Most of them (40%) had all their Second Primary Molars (SPM) affected by hypomineralization, as opposed to those who had only one tooth affected (15.2%); Table 3. However, the total number of SPM affected hypomineralization in both arches was 722 out of 1024 SPM that were examined, which is illustrated in Table 4.

Table 3: Number of affected SPM per child and the severity of the lesions

No of affected SPM(s)	Total n (%)	Mild	Severe
1	39 (15.2%)	33	6
2	70 (27.3%)	30	40
3	45 (17.6%)	12	33
4	102 (39.9%)	49	53
Total	256 (100.0%)	124	132

Table 4: Distribution of hypomineralization among SPMs in both arches

Tooth	Total n (%)	Mild HSPM	Severe HSPM
Upper left SPM	195 (27.0%)	127 (65.1%)	68 (34.9%)
Lower left SPM	160 (22.2%)	82 (51.2%)	78 (48.8%)
Lower right SPM	172 (23.8%)	76 (44.2%)	96 (55.8%)
Upper right SPM	195 (27.0)	105 (53.8%)	90 (46.2%)
Total	722 (100.0%)	390 (54.0%)	332 (46.0%)

In this sample, some children had hypomineralized primary canine (HPC) and hypomineralized first primary molar (HFPC) co – presented with the (HSPM). Table 5 shows

number of children who experienced the co – occurrence of HPC and HFPM with HSPM and those who didn't according to the number of hypomineralized SPM. Generally, the presence of HFPM and HPC with HSPM was noticed in 42.2% of HSPM cases, and was more prevalent with the presence of two or four hypomineralized SPM than with cases with one or three. The distribution of HFPM and HPC according to the severity of HSPM showed higher association of HPC and HFPM with severe cases of HSPM in comparison with mild cases, as illustrated in Table 6.

Table 5: The distribution of HFPM and HPC according to the number of affected SPM

Number of SPM	With HPC and HFPM	Without HPC and HFPM
1	16(41.0%)	23(59.0%)
2	28(41.8%)	39(58.2%)
3	12(24.5%)	37(75.5%)
4	44(43.6%)	57(56.4%)
Total # of patients	108(42.2%)	148(47.8%)

Table 6: Distribution of HFPM and HPC according to the severity of HSPM

Severity of HSPM	With HPC and HFPM	Without HPC and HFPM	Total
Severe	60(55.6%)	72(48.6%)	132
Mild	48(44.4%)	76(51.4%)	124
Total # of patients	108(100%)	148(100%)	256

4. Discussion

Hypomineralized second primary molar is an important condition encountered in pediatric dentistry where it causes stress to both dentist and parents regarding its management especially among young children. Management programs aim to prevent the destructive sequela that may cause loss of the affected primary teeth, and to prevent the effects that may extend to the permanent teeth such as malocclusion due to early loss of primary teeth. In addition, HSPM has a negative effect on patient's cooperation due to multiple dental visits of the child at an early age[23]. Therefore, efforts given toward developing preventive programs are worthy, but this need extensive studies of this condition in terms of its epidemiological trends, clinical presentation, diagnosis, distribution of the lesions, and resulting complications.

In this study, although there were almost equal number of mild cases among males and females, but severely hypomineralized SPM were seen more among females, which contradicts findings by Singh R *et al*[33] that indicated no difference between males and females in the distribution of the lesions, and findings by Temilola OD *et al*[29] that concluded the absence of sex predilection for the occurrence of the lesions.

The severe cases of HSPM, formed 51.6% of the cases, were slightly more common than the mild cases, formed 48.4% of the cases, in most age groups, which goes against what was reported by Mittal R[3] who found that 76%-80% of the cases were demarcated opacities (mild HSPM), and by other researchers [9, 18] that found mild cases more frequently seen than severe cases. There is no clear explanation for the higher number of severe cases but could be attributed to the fact that parents only visit the dentist when their child suffers, and the defect is clearly noticed by them, and such characteristic is common among many uneducated communities in Jordan. However, this is only limited to this study sample and cannot be a general explanation to other communities.

In this study, the tendency for the occurrence of severe HSPM with the presence of two or four hypomineralized SPMs was higher than the presence of one or three hypomineralized SPM. The presence of four hypomineralized SPM was 40%, followed by two SPM (27%), while the occurrence of one hypomineralized SPM was the least common (15%). This is in accordance with studies carried out by Singh R[33]. The mean number of hypomineralized SPMs in this study was 2.8/ affected child (1.5 mild, 1.3 severe). This is slightly higher than the mean number found by N. Mittal *et al*[34], which was 2.47, and much higher than what was published by Negre-barber A.[9] where the mean number was 1.96 (1.86 mild and 0.1 severe), and by Elfrink ME *et* al[5] (1.9). This indicating a higher prevalence of HSPM among Jordanian children. Additionally, children in this sample had a higher prevalence of hypomineralization in maxillary molars than mandibular molars, which is opposed to Singh R[33], Bhaskar SA[35], and Jasulaityte L[36] who reported a higher rate of hypomineralization in mandibular molars. Such differences in prevalence and distribution of HSPM is distinguished in our sample.

The co – occurrence of HFPM and HPC along with HSPH could be explained by the coincidence of the periods of formation and mineralization of these teeth[21, 37]. Further, these conditions increase in prevalence with increased number of affected SPMs, except in the case of affected 3 SPMs. Nonetheless, such conditions were more prevalent with severe HSPM than with mild HSPM.

5. Limitations

This study was limited to one hospital and cannot be generalized to all children in Jordan; indicating the need for more studies in Jordan that are comprehensive and representative to the population in order to identify the prevalence and distribution of HSPM in country.

6. Recommendations

The high rate of severe cases of HSPM, and the serious consequences of the condition, it is advised that more longitudinal studies are carried out to investigate the associated medical and environmental conditions. It is also recommended to increase the level of knowledge and training among the general dental practitioners and pediatric dentists in Jordan about HSPM regarding its diagnosis, consequences, and treatment options. Moreover, dental screening programs for schoolchildren in Jordan are important to early identify children with HSPM for the sake of early management. Educational programs for the parents and care givers are helpful in making them aware of the condition, and to encourage them to seek dental consultation once they suspect the condition.

7. Conclusion

HSPM is an annoying and disturbing condition; it appears to be more clinically destructive in Jordanian children than in other populations, which urges pediatric dentists to initiate a preventive and management programs that could contain the problem and protect affected children as early as the disease is detected. Serious consequences including adverse dental manifestations are inevitable if no interventions are applied.

References

[1] Weerheijm KL. Molar incisor hypomineralization (MIH). Eur J Paediatr Dent. 2003 Sep; 4 (3):114-20
[2] Elfrink ME, Ghanim A, Manton D.J, Weerheijm K.L. Standardized studies on molar incisor hypomineralization and hypomineralized second primary molars: a need. Eur Arch Paediatr Dent .2015 June; 16 (3):247-255.
[3] Mittal R, Chandak S, Chadwani M, Singh P, Pimpale J. Assessment of association between molar incisor hypomineralization and hypomineralized second primary molar. J Int Soc Prev. Community Dent 2016 Jan-Feb;6(1):34-39
[4] Mukul Joshi, Bibin Jacob Emmanuel, Dr RakhshundaManzoor, Dr MarikindaManzoor, Mukesh Kumar, Jacob Raja, Krishna Popat. Hypomineralized second primary molar. Int. J. Dental and Medical Sciences2021; 3(1)895-7
[5] Elfrink ME, Schuller AA, Weerheijm KL, Veerkamp JS, Hypomineralized second primary molars: Prevalence data in Dutch 5-year olds. Caries Res. 2008; 42 (4):282-5
[6] Oyedele TA, Folayan MO, Adekoya-Sofowora CA, Oziegbe EO. Prevalence, pattern and severity of molar incisor hypomineralization in 8 to 10 year-old children in Ile-Ife, Nigeria. Eur Arch Paediatr Dent. 2015, 16(3):277-82
[7] Elfrink ME, Veerkamp JS, Aartman IH , Moll HA, Ten Cate JM . Validity of scoring caries and primary molar Hypomineralization (DMH) on intraoral photographs. Eur Arch Paediatr Dent 2009; 10 suppl. 1:5-10 definition
[8] Oyedele TA, Folayan MO, , Oziegbe EO, Hypomineralized second primary molars: prevalence, pattern and associated co morbidities in 8 to 10 year-old children in lle-lfe, Nigeria.BMC Oral Health 2016;16(65):1-7.
[9] Negre-Barber A. Montiel-Company J M, Boronat-Catala M, Catala-Pizarrom, Almerich-Silla J M. Hypomineralized second primary molars as predictor of MIH. Sci Rep 2016; 6:31929.
[10] Montero MJ, Douglass JM, Mathieu GM, Prevalence of dental caries and enamel defects in Connecticut Head Start Children. Paediatr. Dent. 2003; 25:235-9
[11] Weerheijm KL , Duggal M , Mejare I, Papagiannoulis L, Koch G, Martens LC, Hallonsten A-L. Judgment criteria for molar incisor Hypomineralisation (MIH) in epidemiologic studies: a summary of the European meeting on MIH in Athens, 2003, Eur J Paediatr Dent 2003;4(3):110-113
[12] Vieira A.R, Kup E. On the etiology of molar incisor hypomineralization. Caries Res. 2016; 50(2):166-9.
[13] Teixeira R J, Andrade N S, Queiroz L C et al. Exploring the association between genetic and environmental factors and molar incisor hypomineralization: evidence from a twin study. Int J Paediatr Dent 2018; 28:198-206.
[14] S Alaluusua. Aetiology of molar incisor hypomineralization: A systematic review. Eur Arch Paediatr Dent, 2010; 11(2):53-8.
[15] Jermias F, Koruyucu M, Kuchler E C et al. Gene expressed in dental enamel development are associated with molar- incisor hypomineralization. Arch Oral Biol 2013; 58:1434-1442.
[16] Silva MJ, Scurrah KJ, Craig JM, Manton DJ, Klipatric N. Etiology of molar incisor hypomineralization- A systematic review. Community Dent Oral Epidemiol. 2016; 44(4)342-353
[17] van der Tas, JT, Elfrink, MEC, Heijboer, AC, Rivadeneira, F, Jaddoe, VWV, Tiemeier, H, Schoufour, JD, Moll, HA, Ongkosuwito, EM, Wolvius, EB, et al. Foetal, neonatal and child vitamin D status and enamel hypomineralization. Community Dent. Oral Epidemiol. 2018, 46, 343-351.
[18] Ghanim A, Manton D, Bailey D, Marino R, Morgan M. Risk factors in the occurrence of molar incisor hypomineralization amongst a group of Iraqi children. Int J Paediatr Dent. 2013;23(3):197-206.
[19] Lima LRS, Pereira AS, de Moura MS, Lima CCB, Paiva SM, Moura LFAD, de Deus Moura de Lima, M.Pre-term birth and asthma is associated with hypomineralized second primary molars in pre-schoolers: A population-based study. Int. J. Paediatr. Dent. 2020, 30, 193-201.
[20] Koruyucu M, Ozel S, Tuna EB. Prevalence and etiology of molar incisor Hypomineralization in the city of Istanbul. J Dent Sci.2018; 13: 318-328.
[21] Profitt W, Fields H. Contemporary orthodontics. 3rd ed. St. Louis: Mosby Inc; 2000.
[22] Elfrink ME, Sculler AA, Veerkamp JS, Poorterman JH, Moll HA, ten Cate JM. Factors increasing the caries risk of second primary molars in 5-year-old Dutch children. Caries risk of second primary molars in 5-year-old Dutch children. Int J Paediatr Dent. 2010 Mar; 20(2):151-7
[23] Jalevik B, Klingberg GA. Dental treatment, dental fear and behavior management problems in children with severe enamel Hypomineralization of their permanent first molars. Int J Paediatr Dent 2002; 12(1):24-32
[24] Costa-Silva CM, de Paula JS, Bovi Ambrosano GM, Mialhe FL. Influence of deciduous molar hypomineralization on the development of molar incisor hypomineralization. Braz. J Oral Sci. 2013; 12(4):335-338.
[25] Oyedele TA, Folayan MO, Adekoya-Sofowora CA, Oziegbe EO. Comorbidities associated with molar-incisor hypomineralization in 8 to 16 year old pupils in lle-lfe, Nigeria. BMC Oral Health. 2015; 15: 37
[26] P. Avisa, S. Mallineni, R. Kamatham, S. Nuvvula. Deciduous molar hypomineralization (DMH) - a rare entity and its clinical management approach. RSBO.2017; 14(2):94-7

[27] Alshahrani I, Tikare S, Zakirulla Metal. Prevalence of dental caries among male students aged 15-17 years in southern Asir, Saudi Arabia. Saudi Dent J.2018; 30(3)214-8
[28] Elfrink ME, ten Cate JM, Jaddoe VW, Hofman A, Moll HA, Veerkamp JS. Deciduous molar hypomineralization and molar incisor hypomineralization. J Dent Res. 2012; 91 (6)551-5
[29] Temilola OD, Folayan MO, Oyedele T. The prevalence and pattern of deciduous molar Hypomineralization and molar incisor Hypomineralization in children from s suburban population in Nigeria. BMC Oral health. 2015; 15:73
[30] Kevrekidou A, Kosma I, Arapostathis K, Kotsanos N molar incisor hypomineralization of eight and 14-year old children: prevalence, severity, and defect characteristics. Paediatr Dent 2015; 37(5):455-461
[31] Parikh DR, Gannesh M, Bhaskar V. Prevalence and characteristics of molar incisor hypomineralization in the child population residing in Gandhingar, Gujarat, India. Eur Arch Paediatr Dent. 2012 Feb; 13(1):21-6
[32] Lygidakis NA, Dimou G, Briseniou E. Molar incisor hypomineralization. Retrospective clinical study in Greek children. Prevalence and defect characteristics. Eur Arch Paediatr Dent. 2008 Dec; 9(4):200-6
[33] Singh R, Srivastava B, Gupta N. Prevalence and pattern of Hypomineralized Second Primary Molar in children in Delhi-NCR. Int J Clin Paediatr Dent 2020;13(5):501-503.
[34] Mittal N, Sharma BB. Hypomineralised second primary molars: Prevalence, defect characteristics and possible association with Molar incisor hypomineralization in Indian children. Eur Arch Paediatr Dent.2015 Dec; 16(6):441-7
[35] Bashkar SA, Hedge S, Molar incisor hypomineralization: prevalence, severity and clinical characterestics in 8 to 13-year-old children of Udaipur.India. J Indian Soc Pedod Prev Dent 2014; 32(4)322-329.
[36] Jasulaityte L, Veerkamp JS, Weerheijm KL. Molar incisor hypomineralization: review and prevalence data from the study of primary school children in Kaunas/Lithuania. Eur Arch Paediatr Dent 2007;8(2):87-94.
[37] Da Silva Figueiredo Se MJ, Ribeiro APD, Dos Santos-Pinto Lam, De Cassia Loiola Cordeiro R, Cabral RN, Leal SC. Are hypomineralized primary molars and canines associated with molar incisor hypomineralization? Paediatr Dent 2017; 39 (7):445-449.