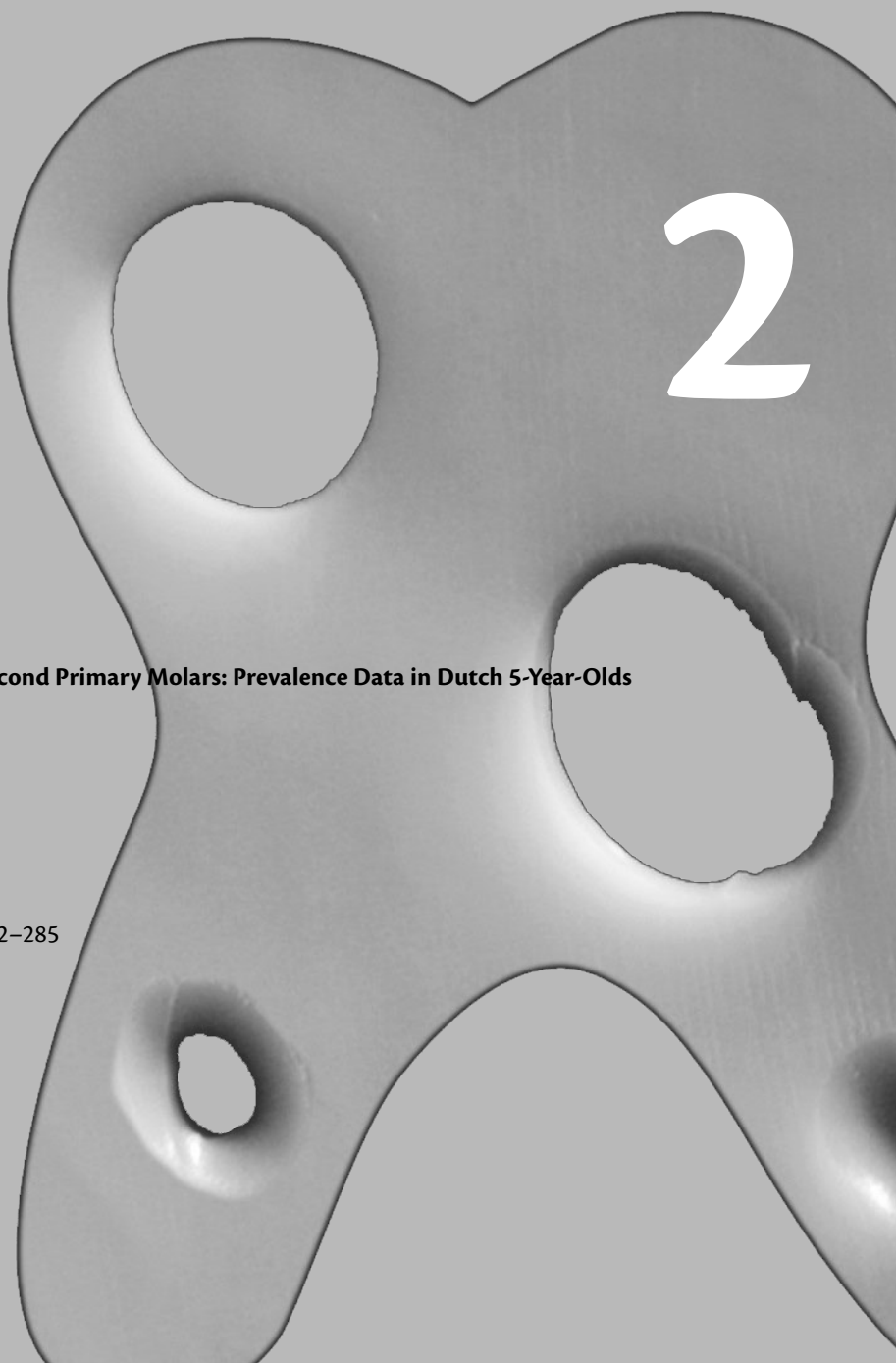
Prevalence of Deciduous Molar Hypomineralisation in 5-year-old Dutch children



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Based on:

Hypomineralised Second Primary Molars: Prevalence Data in Dutch 5-Year-Olds

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ABSTRACT

Aim: The aim of this cross-sectional observational study was to report on the prevalence of hypomineralisations in second primary molars in 5-year-old Dutch children.

Materials and methods: In the study 386 (45% girls) 5-year-old Dutch children, all insured by a Health Insurance Fund, participated. Scoring criteria for Molar Incisor Hypomineralisation (MIH) were adapted to score the second primary molars on Deciduous Molar Hypomineralisation (DMH).

Results: In 19 (4.9%) children a second primary molar was seen with a demarcated opacity, an atypical restoration or posteruptive enamel loss, with a mean of 2.5 DMH molars per child. At tooth level, 55 of the 1517 scored primary second molars were diagnosed as DMH (3.6%) of which most had more than one of the required characteristics. No differences were seen in the presence of MIH characteristics between lower and upper jaws, or between left and right sides. Opacities (87%) were most frequently scored in the DMH molars followed by posteruptive enamel loss (40%). In the population studied, atypical restorations were hardly found (15%).

Conclusion: The prevalence of Deciduous Molar Hypomineralisation (DMH) was 4.9% at child level and 3.6% at tooth level. Most DMH molars (87%) showed demarcated opacities, followed by posteruptive enamel loss (40%).

INTRODUCTION

Developmental defects of tooth enamel are not uncommon, both in the primary and permanent dentitions, and can be divided into hypomineralisation and hypoplasia (1, 2). Enamel hypoplasia is a quantitative defect of the enamel, while enamel hypomineralisation is a qualitative defect of the enamel identified visually as an alteration in the translucency of the enamel with a clear border, variable in degree and can be white, yellow or brown in colour. It is also denominated as a demarcated opacity (1, 3).

First permanent molars with hypomineralisations are often associated with affected permanent upper incisors and, more rarely, lower incisors (4). Therefore the name Molar Incisor Hypomineralisation (MIH) is used nowadays (3, 5, 6). The definition of MIH is: hypomineralisation of systemic origin of 1-4 permanent first molars, frequently associated with affected incisors (5).

In the literature a number of possible causes for MIH are mentioned. Many factors, such as diseases early in life and environmental pollution with dioxin, may be responsible for MIH (1, 2, 7). The cause of MIH is possibly a combination of factors (2, 6). Probably a threshold level has to be reached before enamel defects are caused (6).

In the primary dentition enamel hypomineralisations similar to those observed in MIH in the permanent dentition are present as well. Weerheijm et al. (3) stated that MIH can also be noticed on second primary molars. For these developmental defects, the same possible causes are mentioned as for MIH molars, though somewhat earlier in life (perinatal instead of postnatal) (8-10).

Investigations on second primary molars with hypomineralisations comparable to those observed in MIH are scarce. The quality of the investigations is often poor, because important variables are not given. The prevalence of hypomineralisations varies. In only a few articles it is stated that in the primary dentition second molars are most often affected by hypomineralisation (10-12). Hypomineralisations can be an important explanation for the differences in caries prevalence between first and second primary molars (13). The aim of this study is to report on the prevalence of Deciduous Molar Hypomineralisation (DMH) in 5-year-old Dutch children. In this investigation, we refer to DMH, defined as idiopathic hypomineralisation of 1-4 second primary molars.

MATERIALS AND METHODS

Participants. As part of a Dutch standardized epidemiological survey in 2005, the second primary molars of 386 children were examined for hypomineralisations. The parents of 974 5-year-old children living in Gouda, Alphen aan de Rijn, 's Hertogenbosch or Breda received a letter about the investigation and were asked to give permission for participation of their child in the investigation. The parents of 495 children (51%) gave permission and in the clinical part of the study 386 children (37.8%) participated. The parents of these children were insured by Health Insurance Funds, under which approximately 60% of the Dutch population is insured. Professional

oral care for children is included in this insurance (14). The dental examination was performed by 5 calibrated dentists in a dental van. Ethical approval was given for this study. All teeth were examined registering the dmfs score.

Measures. Second primary molars of 5-year-olds were evaluated by visual examination for MIH-characteristic hypomineralisation such as demarcated opacities, posteruptive enamel loss and atypical restorations, using criteria adapted from the EAPD criteria for diagnosing MIH in the permanent dentition (3), so teeth with fluorosis were excluded.

Calibration. During calibration sessions the examiners were trained in diagnosing hypomineralised molars, using the photographs shown in Figure 2.1. In 12% of the children a repeat investigation was done to determine interexaminer agreement.

There is no water fluoridation in the Netherlands. The most common source of fluoride is toothpaste. Toothbrushing is done with fluoridated toothpaste with an age-related concentration between 250 and 1500 ppm.

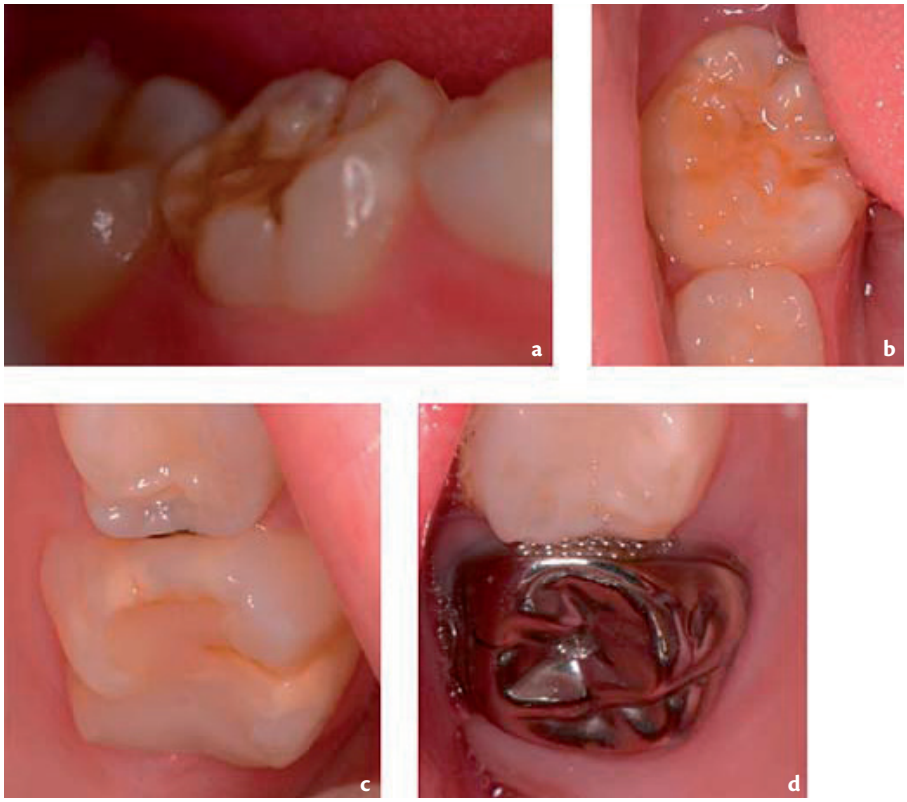

Figure 2.1 Photographs used for calibrating examiners. **a** Deciduous Molar Hypomineralisation (DMH) with white to yellow-brown demarcated opacity on the occlusal and buccal surface. **b** DMH with a yellow-brown demarcated opacity on the occlusal surface. Also some enamel loss is seen on the buccal cusps. **c** DMH with white-yellow demarcated opacity on the buccal and occlusal surface, next to a compomere restoration. **d** DMH with an atypical restoration: a stainless steel crown in a caries-free dentition.

RESULTS

In this study 386 (45% girls) of the 974 selected children participated (37.8%). Causes for non-participation were: not interested (41%), lack of time (5%), fearful child (15%), language problems (16%), not present (16%), other reasons (18%). In 19 (4.9%) children a second primary molar was seen with a demarcated opacity, an atypical restoration or posteruptive enamel loss, with a mean of 2.5 DMH molars per child. Among the 19 affected children, 4 had 1 molar affected with DMH, 4 had 2 DMH molars, 1 had 3 DMH molars and 10 had 4 DMH molars. More boys than girls had DMH (13 vs. 6), however, without a statistically significant difference (χ^2 test; p=0.222). At tooth level, 55 of the 1517 scored primary second molars were diagnosed as DMH (3.6%) of which most had more than one of the required characteristics. No differences were seen in the presence of DMH characteristics between lower and upper jaws, or between left and right sides. Opacities (87%) were most frequently scored in the DMH molars followed by posteruptive enamel loss (40%). In the population studied atypical restorations were hardly found (15%) (Table 2.1).
Inter-examiner agreement, expressed as the test-retest correlation, was r=0.96.
At the time of publication only the total numbers of restorations and carious lesions were available, resulting in a restorative care index of 17%.

Table 2.1 Distribution of demarcated opacities, posteruptive enamel loss, atypical restorations and number of teeth diagnosed with DMH in the total population

Tooth	Demarcated opacity		Posteruptive enamel loss		Atypical restoration		DMH	
	n	%	*n*	%	*n*	%	*n*	%
55	13	3.4	6	1.6	1	0.3	15	3.9
65	12	3.1	3	0.8	2	0.5	14	3.7
75	11	2.9	7	1.9	2	0.5	13	3.5
85	12	3.2	6	1.6	3	0.8	13	3.5

DISCUSSION

The study population consisted of children insured by the Health Insurance Funds, so in this sample the lower social classes were overrepresented. Nation et al. (15) did not find differences in developmental enamel defects in the primary dentition between different social classes. It is assumed that non-participation is associated with less favourable dental health, especially in terms of caries experience. This means that caries experience could be underestimated in the group participants (14). However, it is uncertain whether there is an association between non-participation and the prevalence of DMH. In this study we only scored second primary molars on MIH criteria. Other investigations in which all primary teeth are scored also found that second primary molars are most affected by demarcated opacities (10-12). The second primary molars develop just before the permanent first molars and incisors start to develop (16). For DMH, the same possible causes are mentioned as for MIH molars, though somewhat earlier in life (perinatal

instead of postnatal) (8-10). If a molar was diagnosed with DMH in this investigation, most of the time it had a demarcated opacity. Atypical restorations were only seen a few times. Of the caries lesions in the primary dentition, 17% were restored. This fact could possibly also explain the low prevalence of atypical restorations. The prevalence of DMH in the primary dentition was 4.9% at child level and 3.6% at tooth level. Thus, in a child with DMH, not all second primary molars were affected. This is in line with studies on permanent MIH molars (2, 6).

Our prevalence falls within the lower range compared to other studies looking at hypomineralisations. For example, Slayton et al. (10) reported a prevalence of 27% in the primary dentition, Seow et al. (17) found 20%, and Nation et al. (15) reported 12.3%. Lower prevalence rates have also been reported: Lunardelli and Peres (12) found a prevalence of 6.1% at child level and 4.6% at surface level, while Li et al. (8) even found 1.6% at child level.

The first reason for the differences found between the investigations might be that the criteria used to score enamel hypomineralisation were different. Unfortunately there is no unambiguous definition for hypomineralisations in the primary dentition. In this study for the first time the strict MIH criteria were adapted for use in second primary molars. No (modified) Developmental Defects of Enamel ((m)DDE) index was used because this index does not differentiate well between hypomineralisation and other enamel defects such as opacities due to fluorosis (3). In many other studies fluorosis was not excluded and drinking water fluoridation or the use of fluoride toothpaste were not described. Second, we only looked at the second primary molars in our investigation, whereas the others included all teeth, sometimes without distinguishing between different teeth, so their prevalence at child level would have been higher. Third, the conditions in which the teeth were scored were very different. Sometimes the teeth were dried or cleaned (15). Also the illumination of the teeth varied. In some investigations an external light source was used (15), while in others no dental lamp or other light source was used (8, 12). It is thus very difficult to compare the scarce studies on hypomineralisations in the primary dentition.

In the primary dentition, molars are the teeth most often affected by caries (13, 18, 19) and second molars are more often affected than first molars (13, 18, 19). A positive correlation between enamel hypoplasia and caries in the primary dentition was found in some investigations (10). In teeth with hypomineralisations we can also expect more caries, so DMH can be an explanation for the differences in caries seen between first and second primary molars. Further investigations, including especially the other teeth, have to be done to confirm this.

CONCLUSION

From this study we can conclude that in the Netherlands, the prevalence of DMH molars in the primary dentition is 4.9% at child level and 3.6% at tooth level and most DMH molars (around 87%) show demarcated opacities.

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