

Review article

Developmental defects of enamel and dental caries in the primary dentition: A systematic review and meta-analysis



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ABSTRACT

Objectives: This systematic review and meta-analysis evaluated the association between developmental defects of enamel and dental caries in the primary dentition.

Sources: Electronic searches were performed in PubMed, Web of Knowledge, Scopus and Scielo for the identification of relevant studies.

Study selection: Observational studies that examined the association between developmental defects of enamel and dental caries in the deciduous dentition were included. Additionally, meta-analysis, funnel plots and sensitivity analysis were employed to synthesize the available evidence. Multivariable meta-regression analysis was performed to explore heterogeneity among studies.

Data: A total of 318 articles were identified in the electronic searches. Of those, 16 studies were included in the meta-analysis. Pooled estimates revealed that children with developmental defects of enamel had higher odds of having dental caries (OR 3.32; 95%CI 2.41–4.57), with high heterogeneity between studies (I^2 80%). Methodological characteristic of the studies, such as where it was conducted, the examined teeth and the quality of the study explained about 30% of the variability. Concerning type of defect, children with hypoplasia and diffuse opacities had higher odds of having dental caries (OR 4.28; 95%CI 2.24–8.15; OR 1.42; 95%CI 1.15–1.76, respectively).

Conclusions: This systematic review and meta-analysis demonstrates a clear association between developmental defects of enamel and dental caries in the primary dentition.

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1. Introduction

Enamel developmental defects (EDD) occur due to biological imbalances that affect the cells involved in enamel formation and maturation, depending of the type of defect [1]. The influence of these defects on the risk of tooth decay is ongoing, especially in respect of biofilm retention [2], and its plausibility should be considered with respect to the types of defects involved. Enamel defects can be broadly categorised as quantitative defects

(hypoplasia) or qualitative ones (demarcated or diffuse opacities), with opacities the most prevalent type [3–5].

Reported prevalence estimates for any enamel defect in the deciduous dentition range from 3.9% to 81.5% [6–10]. Some EDD may predispose the tooth to dental caries due to structural defects in the tooth surface [1,6]. In deciduous teeth, the affected enamel has a lower mineral content and may predispose to plaque accumulation and subsequent carious activity [7]. The association between DDE and caries may be underestimated, however, since the carious lesion may have masked the initial, undiagnosed enamel defect [11].

Dental caries in primary teeth is caused by a complex interaction among environmental, maternal, and child factors [12]. The treatment of dental diseases exacts a high economic cost at both individual and health system levels [13]. Untreated dental caries in primary teeth is the main cause of dental pain among children [14]. It also impacts on dental fear and avoidance of dental

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treatment [15]. Dental caries and enamel defects can negatively affect the oral health related quality of life of both children and their parents [16,17].

A recent systematic review showed that EDD were associated with a higher chance of having dental caries [18], but there is a lack of consensus about the association between EDD and dental caries in primary teeth. Methodological differences (such as the teeth examined and the method used for EDD detection) contribute to the conflicting findings [8]. Accordingly, the aim of the present study was to systematically review the literature in order to evaluate the association between development defects of enamel and dental caries experience in the primary dentition.

2. Methods

The research question behind this systematic review was: *Is there an association between developmental defects of enamel and dental caries in primary dentition?*

Original observational studies that investigated the association between developmental defects of enamel (EDD) and primary dentition dental caries among a representative sample of children were included. Additionally, EDD and dental caries experience must have been assessed by clinical examination. The case definitions for DDE and dental caries were accepted as declared by the authors.

Animal studies, letters to the editor, reviews and studies with explicit convenience sample (institutionalized/hospitalized individuals, vulnerable population, sample selection performed according to the researcher interest) were excluded. Studies in languages other than English, Spanish or Portuguese were also excluded.

Electronic searches were conducted to identify the published literature from 1945 to November 2016 in databases including PubMed, Web of Knowledge, Scopus and Scielo for the identification of relevant studies. An initial search was conducted on PubMed with the following MeSH and free terms: (“Dental Enamel Hypoplasia”[Mesh] OR “Enamel Defects”[all] OR “Developmental

Defects of Enamel”[all] OR “Dental Hypoplasia”[all] OR “Opacities”[all] OR “Enamel Hypoplasia”[all]) AND (“Dental Caries”[Mesh] OR “Tooth Decay”[all] OR “Tooth Cavity”[all]) AND (“Tooth, Deciduous”[Mesh] OR “Primary Tooth”[all] OR “Primary Dentition”[all] OR “Deciduous Tooth”[all] OR “Deciduous Teeth”[all] OR “Primary Teeth”[all])). No language restrictions were applied within the search.

All papers were managed using the software EndNote X7 (Thomson Reuters, New York, NY, US). Duplicate papers were excluded. Titles and abstracts were screened based on the aforementioned criteria independently by two reviewers (ERS and FSC). The screened lists were compared and, in case of any disagreement, a consensus was reached through discussion. After initial screening of titles and abstracts, full articles were evaluated by the same two reviewers. In addition to the electronic search, the reviewers also undertook a hand search in the references list of each included study. Structured data collection worksheets were employed for the assessment of each publication. This systematic review followed the PRISMA statement for reporting [19].

The Critical Appraisal Checklist described by the Joanna Briggs Institute [20] was used for quality assessment of the selected studies. The 10-item checklist is available as Supplemental Material. Reviewers answered ‘Yes’, ‘No’ or ‘Unclear’ for each item. To categorize studies according to quality, an overall score for each study was calculated based on the number of ‘Yes’ answers, so that scores could range from 0 to 10. Finally, studies were categorised according to their scores: low quality [score between 0 and 3]; moderate quality [4–6]; or high quality [7–10] [21,22]. The same two reviewers conducted the quality assessment, and disagreements were resolved by discussion until agreement.

Relevant data were extracted from the selected articles broadly under the categories of: study description (setting, sample and design); EDD and dental caries measure employed; results on association; and methodological quality. Furthermore, in order to conduct the meta-analysis, crude and adjusted association measures (Relative Risk/Odds Ratio) with respective 95% Confidence Intervals (95%CI) were recorded. The original authors were

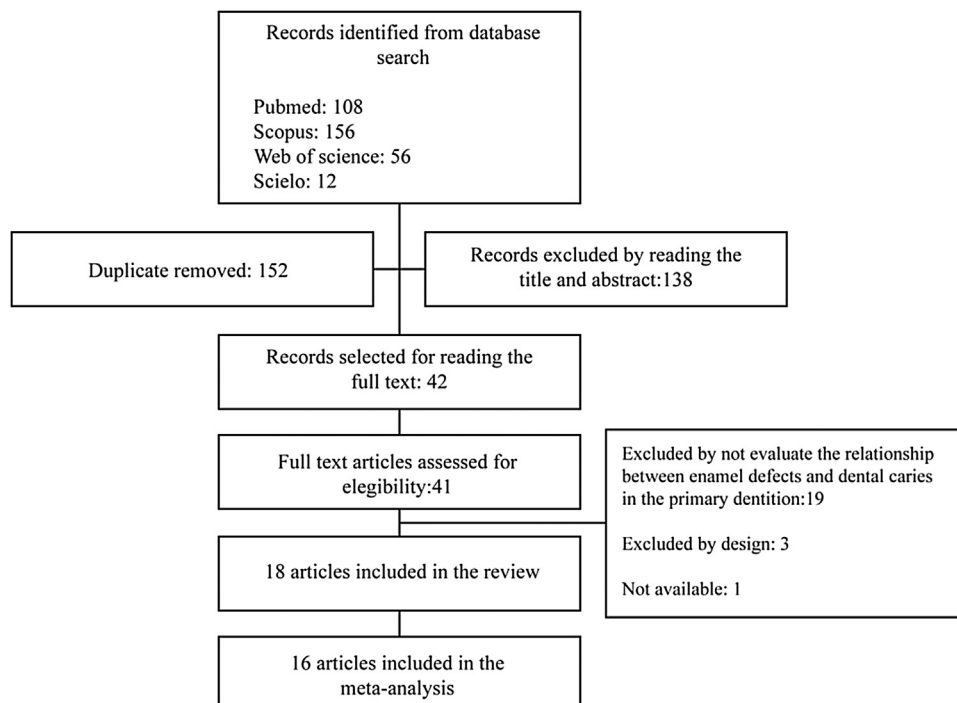


Fig. 1. Flowchart of selection process.

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