Received: 9 June 2021 | Revised: 21 July 2021 | Accepted: 31 July 2021

DOI: 10.1111/ipd.12892

INTERNATIONAL JOURNAL OF PAEDIATRIC DENTISTRY WILEY

SYSTEMATIC REVIEW

# Prevalence of hypomineralised second primary molars (HSPM): A systematic review and meta-analysis

**Charlotte McCarra** | **Isabel Cristina Olegário** | **Anne C. O'Connell** | **Rona Leith**

Division of Public and Child Dental Health, Dublin Dental University Hospital, Trinity College, Dublin, Ireland

**Correspondence**
Charlotte McCarra, Division of Public and Child Dental Health, Dublin Dental University Hospital, Trinity College, Lincoln Pl, Dublin, D02 F859, Ireland.
Email: charlotte.mccarra@dental.tcd.ie

## Abstract

**Aim:** To evaluate the prevalence of HSPM worldwide on a child and a tooth level and investigate the influence of diagnostic criteria on the prevalence of HSPM.

**Design:** A comprehensive literature search was performed through MEDLINE/PubMed, Scopus, and Web of Science databases. The grey literature was also screened as were the reference lists of included studies. An adaptation of the Newcastle-Ottawa Scale was used to evaluate the quality of the studies. A meta-analysis was performed to determine the pooled prevalence of HSPM.

**Results:** The search strategy identified 1,988 articles, 487 were retrieved for full-text evaluation, and 37 studies were included in the meta-analysis (32 for child and 23 for tooth level prevalence), providing data from 26,805 individuals and 81,107 molars. The prevalence of HSPM was 6.8% (95% CI 4.98%-8.86%) on a child level and 4.08% on a tooth level (95% CI = 2.80%-5.59%). The diagnostic criteria used did not seem to influence the prevalence results ($P > .05$). The majority of the papers (75%) showed a low-to-moderate risk of bias.

**Conclusion:** There was a broad variation in the prevalence reported that may be attributed to differences in the study population. The present meta-analysis showed a HSPM prevalence worldwide of 6.8% on a child level and 4.1% on a tooth level.

KEYWORDS

children, hypomineralised second primary molars, meta-analysis, prevalence, systematic review

## 1 | INTRODUCTION

Enamel hypomineralisation is a qualitative defect of the enamel resulting from a disturbance during initial calcification and/or maturation.[1,2] This condition in first permanent molars/incisors is known as molar incisor hypomineralisation (MIH).[2] In the primary dentition, a similar presentation has been observed in the second primary molar, which is now termed hypomineralised second primary molars (HSPM).[2-4] HSPM is currently defined as

PROSPERO registration: CRD42020220498.

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.
© 2021 The Authors. *International Journal of Paediatric Dentistry* published by BSPD, IAPD and John Wiley & Sons Ltd.

hypomineralisation of one to four second primary molars including the presence of demarcated opacities, post-eruptive breakdown (PEB), atypical caries/restorations, and extractions due to HSPM.[3,5]

The detection of demarcated opacities in both the primary and permanent dentitions has been reported in the literature using different indices, such as the developmental defects of enamel (DDE), modified DDE (mDDE), and self-devised indices.[6] More recently, a new diagnostic criterion, the MIH/HSPM index, has been developed combining elements of the European Academy of Paediatric Dentistry (EAPD) and mDDE indices.[7] This index focuses specifically on hypomineralised defects, whereas the DDE indices included a broader range of enamel defects such as diffuse opacities, hypoplasia, and other defects. In addition, the MIH/HSPM index records the presence of PEB, atypical caries lesions, atypical restorations, and extractions due to MIH/HSPM.

The prevalence of HSPM has varied widely in the literature.[6] Despite the development of the 2003 EAPD criteria, comparability between studies remains challenging because of the use of different diagnostic criteria, examination variability, and different age groups. To date, no systematic review on HSPM prevalence has been conducted. The aim of this systematic review was to evaluate the prevalence of HSPM in the population worldwide on a child and tooth level and investigate the influence of the diagnostic criteria on the prevalence of HSPM.

**Key points**

- The present systematic review is the first to explore HSPM prevalence on a global level with a pooled child prevalence of 6.80%
- The use of a HSPM-specific criterion allows the recording of demarcated opacities, PEB, and atypical caries/restorations/extractions.
- There is a need for more high-quality prevalence studies worldwide with standardised criteria.

## 2 | METHODS

This systematic review and meta-analysis was reported according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement checklist recommendations and was registered on PROSPERO (International Prospective Register of Systematic Reviews) (protocol number CRD42020220498).

### 2.1 | Search strategy

A comprehensive literature search was performed through MEDLINE/PubMed and then adapted for the others based on the following PICO question: 'What is the prevalence of hypomineralised second primary molars (HSPM)?'

MEDLINE/PubMed, Scopus, and Web of Science databases were used to identify all relevant papers published up to and including March 2021. The grey literature search was done at Opengrey.eu. The reference lists of the included studies were manually searched to retrieve all eligible papers that could not have been identified during the main search. A language restriction existed with only English publications included.

#### 2.1.1 | MEDLINE/PubMed/OpenGrey search strategy

( "primary tooth" OR "primary teeth" OR "deciduous tooth" OR "deciduous teeth" OR "primary molar*" OR "deciduous molar*" OR child* OR pre-schooler* ) AND ("hypomineralized second primary molar*" OR "hypomineralised second primary molar*" OR HSPM OR "deciduous molar hypomineralization" OR "deciduous molar hypomineralisation" OR hypomineralisation OR hypomineralization OR "demarcated opacities" OR opacity OR "deciduous molar hypoplasia" OR "hypoplastic primary teeth" OR "hypoplastic primary tooth" OR "primary molar hypoplasia" OR "hypoplasia of primary molars") AND (Prevalence (MeSH) OR prevalence (all) OR incidence OR epidemiolog* )

#### 2.1.2 | Scopus search strategy

TITLE-ABS-KEY ( prevalence OR incidence OR epidemiolog* ) AND ( "primary tooth" OR "primary teeth" OR "deciduous tooth" OR "deciduous teeth" OR "primary molar*" OR "deciduous molar*" OR child* OR pre-schooler* ) AND ( "hypomineralized second primary molar* " OR "hypomineralised second primary molar*" OR "HSPM" OR "deciduous molar hypomineralization" OR "deciduous molar hypomineralisation" OR "hypomineralisation" OR "hypomineralization" OR "demarcated opacities" OR "deciduous molar hypoplasia" OR "hypoplastic primary teeth" OR "hypoplastic primary tooth" OR "primary molar hypoplasia" OR "hypoplasia of primary molars" ).

#### 2.1.3 | Web of Science search strategy (combined searches)

TS = ( "primary tooth" OR "primary teeth" OR "deciduous tooth" OR "deciduous teeth" OR "primary molar*" OR "deciduous molar*" OR child* OR pre-schooler* )

TS=( "hypomineralized second primary molar*" OR "hypomineralised second primary molar*" OR "HSPM" OR "deciduous molar hypomineralization" OR "deciduous molar hypomineralisation" OR "hypomineralisation" OR "hypomineralization" OR "demarcated opacities" OR "deciduous molar hypoplasia" OR "hypoplastic primary teeth" OR "hypoplastic primary tooth" OR “primary molar hypoplasia” OR “hypoplasia of primary molars” ) TS=( prevalence OR incidence OR epidemiolog* )

### 2.2 | Inclusion criteria

Potentially eligible references were imported into an Excel file. Databases were merged into one spreadsheet file and organised in an alphabetical order with duplicates removed manually. Two independent reviewers (CMC and IO) were involved in the screening of articles by title and abstract according to predetermined inclusion criteria described below:

Criteria 1—DDE/enamel defect description: This was related to the presence of any developmental defect of enamel including both quantitative and qualitative enamel defects such as enamel hypoplasia, enamel hypomineralisation, diffuse opacities (fluorosis), and Amelogenesis imperfecta (AI).

Criteria 2—Child population: It was required that the study population include children. Studies involving adult participants (defined as an individual aged 18 years and older) were not included.

Criteria 3—Epidemiological study design: This study design was a requirement for inclusion, which included cohort, case-control, and cross-sectional studies. Systematic reviews, literature reviews, case reports, and case series were not included.

Criteria 4—English language: Only articles published in the English language were accepted.

In the case of disagreement regarding inclusion, a third reviewer (RL) was involved in reaching a consensus. If there was a lack of clarity in any of the criteria evaluated, the study was included for full-text evaluation.

### 2.3 | Exclusion criteria

The full texts of articles were read by the same two examiners involved in the inclusion process (CMC and IO), and articles were excluded based on predetermined criteria. When a disagreement arose, a third examiner (RL) was involved in reaching a consensus. Articles were excluded when any one of five exclusion criteria described below were not met:

Criteria 1—Was the defect described HSPM? HSPM was defined as enamel hypomineralisation affecting one to four second primary molars characterised by demarcated opacities, PEB, atypical caries, atypical restorations, and atypical extractions. Criteria that have been designed specifically for HSPM diagnosis include the EAPD judgement criteria and MIH/HSPM diagnostic criteria, and articles using these criteria were retained.[7,8] Description of demarcated opacity was required to be classified as a HSPM diagnosis. Therefore, other diagnostic criteria, such as mDDE and other self-devised indices, were included as long a clear description of the above was provided.

Criteria 2—Prevalence data: The authors needed to provide sufficient data in order to calculate the prevalence of HSPM. It was a requirement of the meta-analysis to include child- and tooth-level prevalence, and therefore, the total sample size (children/SPM) and the total number (children/SPM) affected by HSPM needed to be available for calculation.

Criteria 3—Full text: Articles were excluded when the full text was unavailable.

Criteria 4—Missing data: Incomplete data included missing the total sample size or missing the total number of participants affected by HSPM. In the case of missing data, authors were contacted and given a period of six weeks to provide required information after which articles were excluded if not provided.

Criteria 5—No repeated data: When more than one study was conducted using the same sample, only the original or the most complete article was included.

### 2.4 | Data extraction

Information on the included studies was collected by two teams of reviewers (CMC/RL and IO/AOC). Should disagreement exist, a consensus was reached by all authors. A data collection proforma was developed (Supplemental material S1) and the following data were systematically collected from each included study: publication details (authors, country, year, and study type), population details (location, population type—general or specific—age range, and gender), evaluation (examination conditions), diagnostic criteria (standardised and self-devised options given), outcomes (child and tooth level prevalence), and defect characteristics.

**TABLE 1** Characteristics of the selected studies

| | | | Examination details | | |
|---|---|---|---|---|---|
| **Study** | **Country** | **Study Design** | **Setting** | **Criteria** | **Wet/Dry** |
| da Silva et al, 2017[23] | Brazil | Cross-sectional | School | EAPD | Wet |
| Mittal et al, 2016[24] | India | Cross-sectional | School | EAPD | NR |
| Norrisgaard et al, 2019[25] | Denmark | RCT | Dental clinic | EAPD | NR |
| Gambetta-Tessini et al, 2018[26] | Australia | Cross-sectional | School | Ghanim et al, 2015 | Dry (cotton rolls/gauze) |
| Murray & Shaw, 1979[27] | England | Cross-sectional | Portable chair | Young, 1973; Al-Alousi, 1977 | Dry (air) |
| Elfrink et al, 2012[4] | The Netherlands | Cohort | Medical Centre | EAPD | Wet |
| Reyes et al, 2019[13] | Brazil | Cross-sectional | School | mDDE | Wet |
| Wagner, 2017[28] | Germany | Cohort | Dental clinic | mDDE | Dry (cotton rolls/gauze) |
| Corrêa-Faria et al, 2013[29] | Brazil | Cross-sectional | Healthcare unit | DDE | NR |
| Farsi, 2010[30] | Saudi Arabia | Cross-sectional | School | mDDE | Wet |
| Temilola et al, 2015[31] | Nigeria | Cross-sectional | Household | EAPD | Wet |
| Chaves et al, 2007[32] | Brazil | Cohort | Household | DDE | Dry (Cotton rolls/gauze) |
| De Lima et al, 2015[14] | Brazil | Cross-sectional | School | EAPD | NR |
| Silva et al, 2019[33] | Australia | Cohort | Research facility/ Household | Ghanim et al, 2015/ DDE | Wet |
| Mittal & Sharma, 2015[34] | India | Cross-sectional | School | EAPD | Wet |
| Oyedele et al, 2016[15] | Nigeria | Cross-sectional | School | EAPD | Wet |
| Negre-Barber et al, 2016[16] | Spain | Cross-sectional | Dental Clinic | Ghanim et al, 2015 | Wet |
| Elfrink et al, 2008[3] | The Netherlands | Cross-sectional | Portable chair | EAPD | NR |
| Costa-Silva et al, 2013[35] | Brazil | Cohort | School | EAPD | Wet |
| Schüttfort et al, 2020[36] | Germany | Cross-sectional | Hospital | DDE | Dry (Gauze) |
| Folayan et al, 2020[37] | Nigeria | Cross-sectional | Suburban area | EAPD | NR |

| | | Sample | | | |
|---|---|---|---|---|---|
| Light | Clean | Child (Total/ HSPM) | Teeth (Total/ HSPM) | HSPM defect characteristics | Age (range in years) |
| Artificial | Toothbrush | 1590/103 | 6360/139 | By tooth<br>Demarcated opacities n = 80 (57.6%)<br>PEB enamel only, n = 17 (12.2%)<br>PEB dentine/ atypical restoration/extraction, n = 42 (30.2%) | 6-11 |
| Natural | NR | 223/10 | - | By child<br>Demarcated opacities =8 (80%)<br>PEB =2 (20%) | 3-5 |
| Artificial | No | 496/61 | - | NR | 6 |
| Artificial | Toothbrush | 327/26 | - | NR | 6-12 |
| Artificial | NR | - | 1140/58 | NR | 6 |
| Photographs | Toothbrush | 5561/499 | 23722/955 | By child<br>Demarcated opacities, n = 382 (76.6%)<br>PEB, n = 159 (31.9%)<br>Atypical restoration, n = 97 (19.4%)<br>Atypical caries, n = 73 (14.6%)<br>Atypical extraction, n = 56 (11.2%) | 5-6 |
| Artificial | Gauze | 731/69 | - | NR | 8 |
| Artificial | Gauze | 377/6 | - | NR | 3 |
| Natural | Gauze | - | 1509/16 | NR | 3-5 |
| Artificial | Clean (not specified) | - | 2003/62 | NR | 4-5 |
| Natural | Gauze | 1169/15 | - | NR | 1-19 |
| Natural | Gauze | - | 816/31 | NR | 1-3 |
| Artificial | Toothbrush | - | 583/7 | NR | 11-14 |
| Artificial | Cotton rolls | 344/68 | 1382/141 | By child<br>Demarcated opacities, n = 36 (52.9%)<br>PEB/atypical caries/restorations/extractions, n = 32 (47.1%) | 6 |
| Artificial | Clean (not specified) | 978/55 | 3912/136 | By surface<br>Demarcated opacities, n = 177 (69.4%)<br>PEB =77 (30.2%) | 6-8 |
| Natural | Gauze | 469/27 | 1876/73 | By child<br>Demarcated opacities, n = 13 (48.14%)<br>PEB/atypical caries/restorations/extractions, n = 14 (51.8%) | 8-10 |
| Artificial | Gauze | 414/60 | - | By child<br>Demarcated opacities, n = 55 (91.7%)<br>PEB/atypical caries/restorations/extractions, n = 5 (8.3%) | 8-9 |
| NR | NR | 386/19 | 1517/55 | By tooth<br>Demarcated opacities, n = 48 (87%)<br>PEB =22 (40%)<br>Atypical restorations, n = 8 (15%) | 5 |
| Natural | Toothbrush | 134/27 | 864/64 | Demarcated opacities, n = 134 (100%) | 4-6 |
| Artificial | Gauze | 31/0 | 124/0 | NR | 2 |
| NR | NR | 1173/25 | - | NR | 3-5 |

(Continues)

**TABLE 1** (Continued)

| | | | Examination details | | |
|---|---|---|---|---|---|
| **Study** | **Country** | **Study Design** | **Setting** | **Criteria** | **Wet/Dry** |
| Fernandes et al, 2020[38] | Brazil | Cross-sectional | School | EAPD | Dry (air) |
| Lima et al, 2020[39] | Brazil | Cross-sectional | School | EAPD | Dry (Gauze) |
| Sidhu et al, 2019[40] | Canada | Cross-sectional | Hospital | Ghanim et al, 2015 | Wet |
| Slayton et al, 2001[41] | USA | Cross-sectional | Portable chair | DDE (Clarkson 1992) | Wet |
| Halal & Raslan, 2020[42] | Syria | Cross-sectional | School | Ghanim et al, 2015 | Wet |
| Zakirulla et al, 2020[43] | Saudi Arabia | Cross-sectional | Dental chair | EAPD | Wet |
| Ng et al, 2015[44] | Singapore | Cross-sectional | School on-site dental clinic | EAPD | NR |
| Ahmed et al, 2020[17] | USA | Cross-sectional | School on portable unit | Ghanim et al, 2015 | Wet |
| Goyal et al, 2019[45] | India | Cross-sectional | School | EAPD | Dry (Cotton rolls) |
| Kühnisch et al, 2014[18] | Germany | Cohort | Hospital | EAPD | Wet |
| Elger et al, 2020[46] | Germany | Cohort | Research centre | EAPD | NR |
| Gambetta-Tessini et al, 2019[47] | Chile | Cross-sectional | School | Ghanim et al, 2015 | Dry (cotton roll) |
| Temilola et al, 2015[48] | Nigeria | Cross-sectional | Field (chair) | Kemoli et al, 2008 | Wet |
| Owen et al, 2018[49] | Australia | Cross-sectional | Early childhood centre | EAPD/M-DDE | Dry (cotton roll) |
| Ghanim et al, 2013[5] | Iraq | Cross-sectional | School | EAPD | Dry (cotton roll) |
| Kar et al, 2014[50] | India | Cross-sectional | Dental Science and Research Institute | mDDE | Dry (gauze) |

Abbreviations: NR, not reported; PEB, post-eruptive breakdown.

| | | Sample | | | |
|---|---|---|---|---|---|
| **Light** | **Clean** | **Child (Total/ HSPM)** | **Teeth (Total/ HSPM)** | **HSPM defect characteristics** | **Age (range in years)** |
| Natural | Toothbrush | 610/7 | 1804/10 | By tooth<br>Demarcated opacities, n = 9 (90%)<br>PEB =1 (10%) | 6-12 |
| Artificial | Toothbrush | 811/121 | 3244/238 | By tooth<br>White/cream demarcated opacities, n = 170 (71.4%)<br>Yellow/brown demarcated opacities, n = 68 (28.6%)<br>PEB, n = 27 (11.34%)<br>Atypical restorations, n = 4 (1.7%)<br>Atypical caries, n = 27 (11.34%) | 5 |
| Artificial | Prophylaxis | 365/19 | - | By tooth<br>White/cream demarcated opacities, n = 170 (71.4%)<br>Yellow/brown demarcated opacities, n = 68 (28.6%)<br>PEB, n = 27 (11.34%)<br>Atypical restorations, n = 4 (1.7%)<br>Atypical caries, n = 27 (11.34%) | |
| Artificial | NR | 694/99 | 2743/155 | By surface<br>White demarcated opacities, 67%<br>Brown demarcated opacities, 9%<br>PEB, 24% | 4-5 |
| Photographs | Toothbrush | 600/246 | 2400/715 | NR | 4-5 |
| Artificial | Toothbrush | 596/32 | 2292/110 | NR | 7-10 |
| NR | NR | 1083/31 | 4277/52 | By tooth<br>White/cream demarcated opacities, n = 15 (28.8%)<br>Yellow/brown demarcated opacities, n = 37 (71.2%) | 7-8 |
| Artificial | Toothbrush | 337/8 | - | NR | 8-10 |
| Artificial | Toothbrush | 3013/249 | 12029/479 | By tooth<br>Creamish demarcated opacities, n = 176 (36.7%)<br>Yellow demarcated opacities, n = 138 (28.8%)<br>Brown demarcated opacities, n = 165 (34.4%)<br>PEB, n = 101 (21.1%)<br>Atypical restoration, n = 20 (4.1%)<br>Atypical extraction, n = 33 (6.9%) | 3-6 |
| Artificial | Toothbrush | 693/28 | 2722/49 | NR | 10 |
| NR | NR | 958/38 | - | NR | 1-6 |
| Artificial | Toothbrush | 577/29 | - | NR | 6-12 |
| Natural | Gauze | 327/15 | 1305/45 | NR | 3-5 |
| Artificial | Toothbrush | 623/88 | 2483/144 | NR | 3-5 |
| Artificial | Toothbrush | 809/53 | - | NR | 7-9 |
| Natural | Prophylaxis | 306/0 | - | NR | 3-5 |

### 2.5 | Training and calibration

Reviewers were trained and calibrated in paper selection. The calibration exercise involved a randomised selection of papers (10% of included articles; n = 147), which were screened for eligibility. Kappa analysis was carried out to determine inter-examiner reliability for inclusion of selected papers (yes/no) (K = 0.954), and for the reasons why the article was not included (criteria 1–4; K = 0.899).

### 2.6 | Risk-of-bias evaluation

Following data extraction, the same two reviewer teams independently assessed possible risk of bias among eligible studies using a bias assessment tool (Modified Newcastle-Ottawa Quality Assessment Scale—adapted for cross-sectional studies).[9,10] This tool was adapted further with minor modifications made to the starring system. Reviewers scored the articles that sufficiently fulfilled each methodological criterion and provided a score with a maximum of 13 stars. The tool consisted of three sections, which included selection, comparability, and outcome. Section 1 included selection criteria, which comprised sample representativeness, sample size, and non-respondents (maximum of 6 stars). Section 2 described comparability referring only to studies that included different groups (maximum of 2 stars). The final section described outcome criteria including diagnostic criteria, training, and calibration (maximum of 5 stars).

Studies that received ≥9 stars were considered to be of high quality or to have a low risk of bias. Those with 7-8 stars were considered to be of medium quality or to have a moderate risk of bias. Those with ≤6 stars had low methodological quality or a high risk of bias. In the case that a certain area was not described in the study, an entry of 'not reported' (NR)was made.

### 2.7 | Data analysis

MedCalc 20 (MedCalc Software Ltd.) statistical software was used to determine inter-examiner reliability for inclusion of selected articles using kappa calculation.

All searches' results were exported and managed in an Excel file (Microsoft Inc, USA). Data collection for the meta-analysis included the number of children evaluated in the study and the respective number of children with HSPM. In relation to tooth prevalence, the total number of second primary molars evaluated and how many presented with HSPM were calculated.

A forest plot was generated using Stata 17.0 statistical software (StataCorp LLC, Texas, USA) using a random-effects model including the subgroup prevalence data and the overall pooled effects. Jamovi software (The Jamovi Project, 2021; version 1.6) was used for meta-regression analysis using criteria as a moderator. The Paul-Mandel mixed-effects model was used for estimating overall pooled prevalence and between-study variability in the meta-regression.

## 3 | RESULTS

One thousand, nine hundred and eighty-eight (1988) potentially relevant articles were identified in the systematic literature search; 519 were considered duplicate and were therefore removed. After screening of titles and abstracts, 983 were considered as non-eligible. The principal reason for non-inclusion was that studies did not describe a DDE (n = 756), followed by non-clinical studies (n = 123), studies not involving children (n = 68), and non-English studies (n = 36).

A total of 487 studies were revised with full-text evaluation carried out, from which 450 articles were excluded. The main reason for exclusion was that the article did not describe HSPM (n = 374). Other reasons included no prevalence data (n = 44), missing data (n = 17), duplicated data (n = 11), and no full text (n = 4). A manual search of references from the included 36 papers was performed with one additional paper retrieved. Finally, 37 papers were included in the systematic review (32 papers showed appropriate data for child prevalence and 23 papers for tooth prevalence meta-analysis). Figure 1 displays the study selection process.

The included studies provided data from 26,805 individuals (ranging from 31 to 5561 children) and 81,107 primary second molars (ranging from 124 to 23,722 teeth). Articles were published between 1979 and 2020 in countries including Europe, Australia, Asia, Africa, and South/North America. The main characteristics of the included studies are presented in Table 1.

A forest plot depicting child prevalence is shown in Figure 2. A total of 32 studies were included in the meta-analysis. Great variation existed between studies with a range of between 0% and 41% prevalence reported. The overall pooled child prevalence of HSPM was 6.80% (95% CI 4.98%-8.86%; $I^2 = 97.35\%$).

For tooth prevalence, a total of 23 studies were included in the meta-analysis. A broad variation existed between studies with a reported prevalence ranging from 0% to 29.79%. The overall pooled prevalence of HSPM was 4.08% (95% CI 2.80%-5.59%; $I^2 = 98.92\%$).

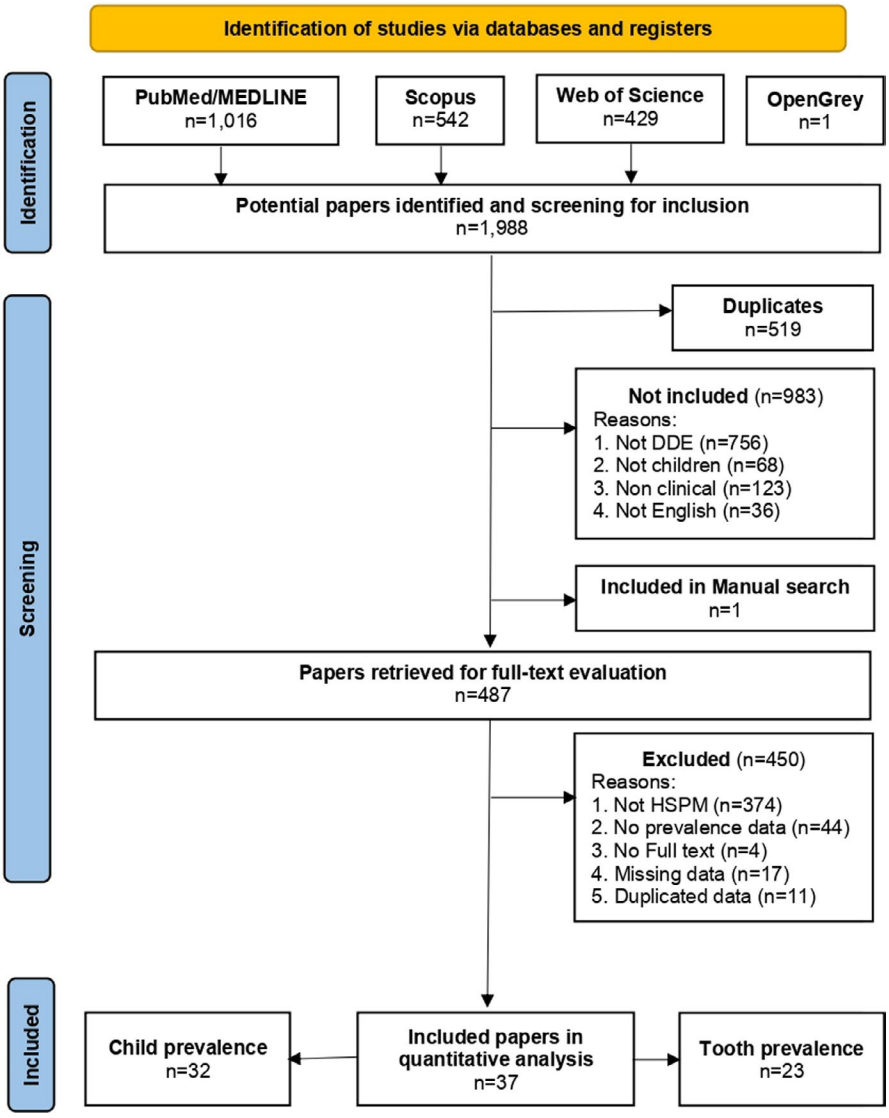


**FIGURE 1** Flow chart of the study selection process

In the studies in which the EAPD or MIH/HSPM index was used (Figure 2), we observed a child level pooled prevalence of 7.54% (95% CI 5.48%-9.89%), whereas in those that used other indices, the pooled prevalence was 3.65% (95% CI 0.43%-9.33%). Figure 3 depicts the pooled prevalence at tooth level as 4.65% (95% CI 2.96%-6.70%; weight =70.34%) for studies that used EAPD or MIH/HSPM index, which represented the majority of the studies included in the meta-analysis. When other indices were used, the prevalence was 2.98% (95% CI 1.73%-4.55%; weight =29.66%). The diagnostic criteria, however, did not influence the pooled prevalence on a child level (estimate −0.034; CI −0.104 to 0.037; $P$ =.347) or a tooth level (estimate −0.024; CI −0.077 to 0.028; $P$ =.359).

Figure 4 illustrates the geographical distribution of studies reporting on HSPM prevalence worldwide with the numer in each yellow zone reflecting the number of studies published in that country. Table 2 illustrates the quality assessment of the included studies in relation to selection, comparability, and outcome-related biases. Bias scores ranged from 3 to 11 stars, and the majority of the papers (75%) showed a low-to-moderate risk of bias. Only nine studies had a high risk of bias (≤6 stars). An equal number of studies (14 each) presented with a low (≥9 stars) and moderate (7-8 stars) risk of bias.

Fifteen studies provided information on HSPM defect characteristics. Demarcated opacities represented the most common HSPM presentation on both a child and tooth level in the majority of studies. PEB prevalence varied between 11.34% and 21.1%, whereas atypical caries/restorations/extractions were less commonly reported, with a prevalence varying between 13.34% and 45.2%. The majority of the papers that used EAPD or MIH/HSPM criteria did not report the data separately by each category, and data were often incomplete (Table 1).

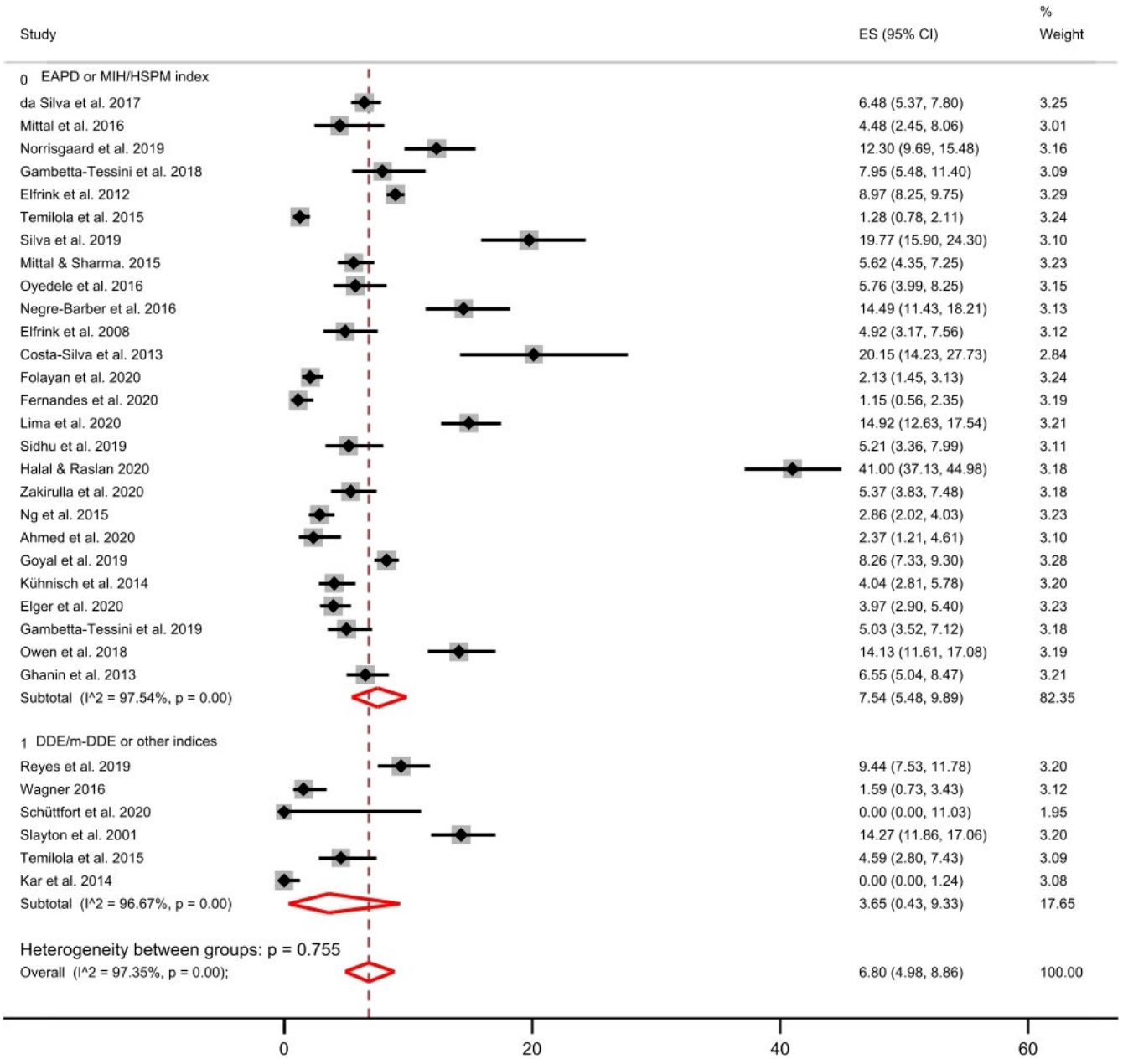


**FIGURE 2** Forest plot using the mixed-effects model for determining child prevalence according to the diagnostic criteria used

## 4 | DISCUSSION

The present systematic review is the first to explore HSPM prevalence on a global level. Great variation existed between studies with a range in child prevalence of between 0% and 41% reported. The overall pooled prevalence of HSPM was 6.80% (95% CI 4.98%-8.86%).

In the subgroup analysis, we observed a pooled prevalence of 7.54% (95% CI 5.48%-9.89%) in the studies in which the EAPD or MIH/HSPM index was used (n = 26). Alternatively, a lower pooled prevalence of 3.65% (95% CI 0.43%-9.33%) was found in those studies that used other indices (n = 6). Although we initially hypothesised that the diagnostic criteria may influence the prevalence results, following meta-regression, we found no differences in the prevalence regardless of the criteria used. This can be explained by the fact that demarcated opacities were the most common presentation reported, which is captured by all indices as reported in Table 1. Although 26 studies used the EAPD/MIH/HSPM criteria, only 14 studies used the index in its entirety (including PEB, atypical caries/restorations, and extractions related to HSPM).

$I^2$ statistic identifies what proportion of the observed variance reflects differences in the true effect sizes rather than sampling error (proportion of observed dispersion that is real, rather than spurious). The $I^2$ statistic revealed

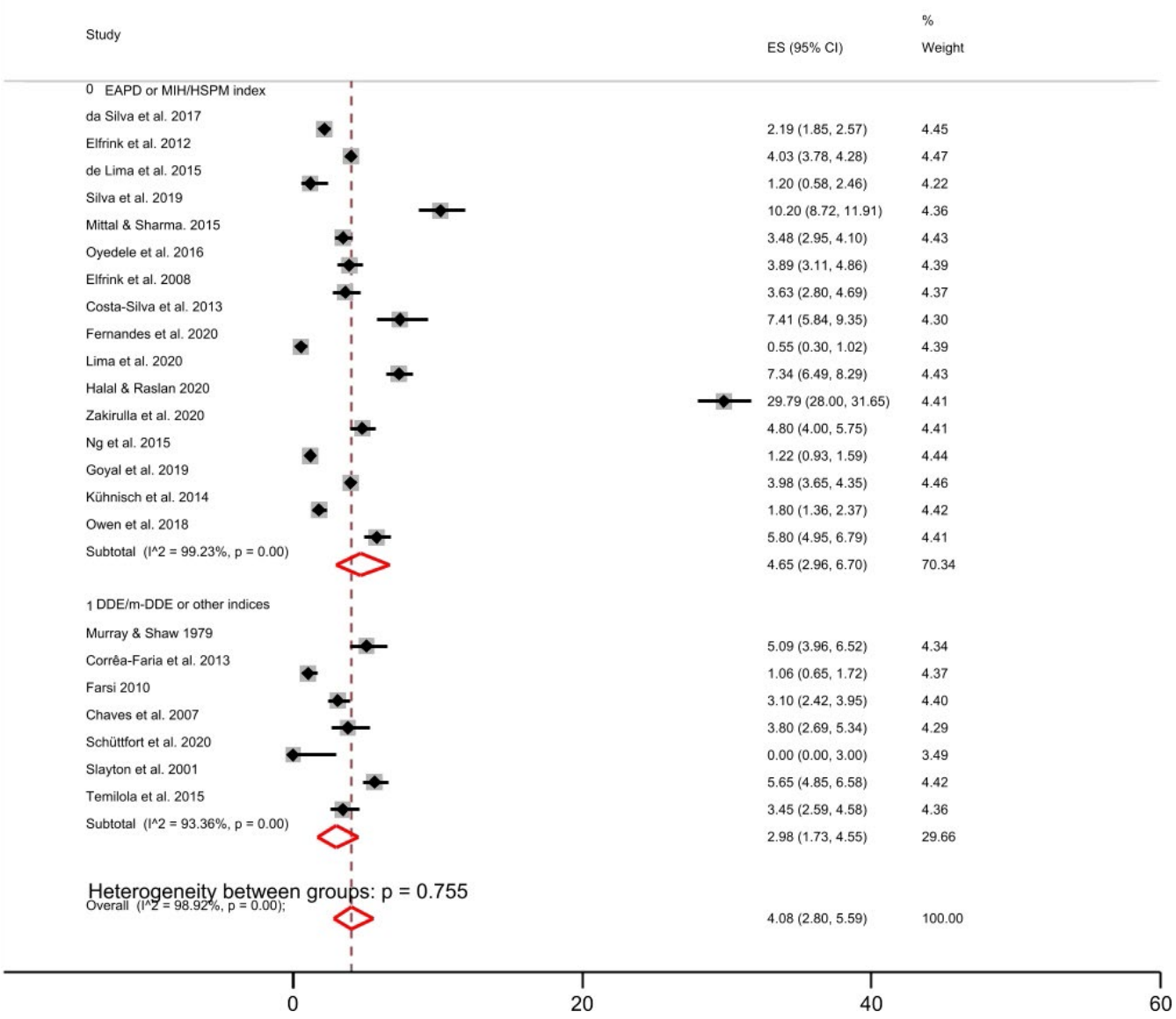


**FIGURE 3** Forest plot using the mixed-effects model for determining tooth prevalence according to the diagnostic criteria used

that 99.75% of the observed variance reflected differences in true effect sizes rather than sampling error. This variance could be explained by the characteristics of the population (age group, environmental factors, socio-economic characteristics, etc) and study methodology (training/calibration of the examiners, examination conditions).

A tooth prevalence range of 0% and 29.8% was reported, with a pooled HSPM tooth prevalence of 4.08% (95% CI = 2.80%-5.59%). As expected, the tooth prevalence was lower than the child prevalence, since not all second primary molars may be affected by HSPM. This result is comparable to MIH prevalence studies where not all first permanent molars are involved.[11,12]

Although the age at examination varied among the studies, the optimal age for HSPM diagnosis has been suggested to be 5 years.[6] Examining this age group is advantageous as gross destruction masking the original defect is less likely to occur in earlier years.[6] Several studies have used older age groups, which could influence the reporting of true defect prevalence.[5,13-18] As age increases, so too does potential for PEB, atypical caries lesions and restorations, which can mask any underlying hypomineralisation defect.[5,15]

Seven of the studies used the DDE or mDDE criteria, which presents major drawbacks. This index does not allow for scoring of PEB or is mistakenly classified as hypoplasia. Furthermore, caries, restorations, and extractions that are atypical in nature are not accounted for.[6] Demarcated opacities were often the only aspect of HSPM which was scored in included studies resulting in a limited

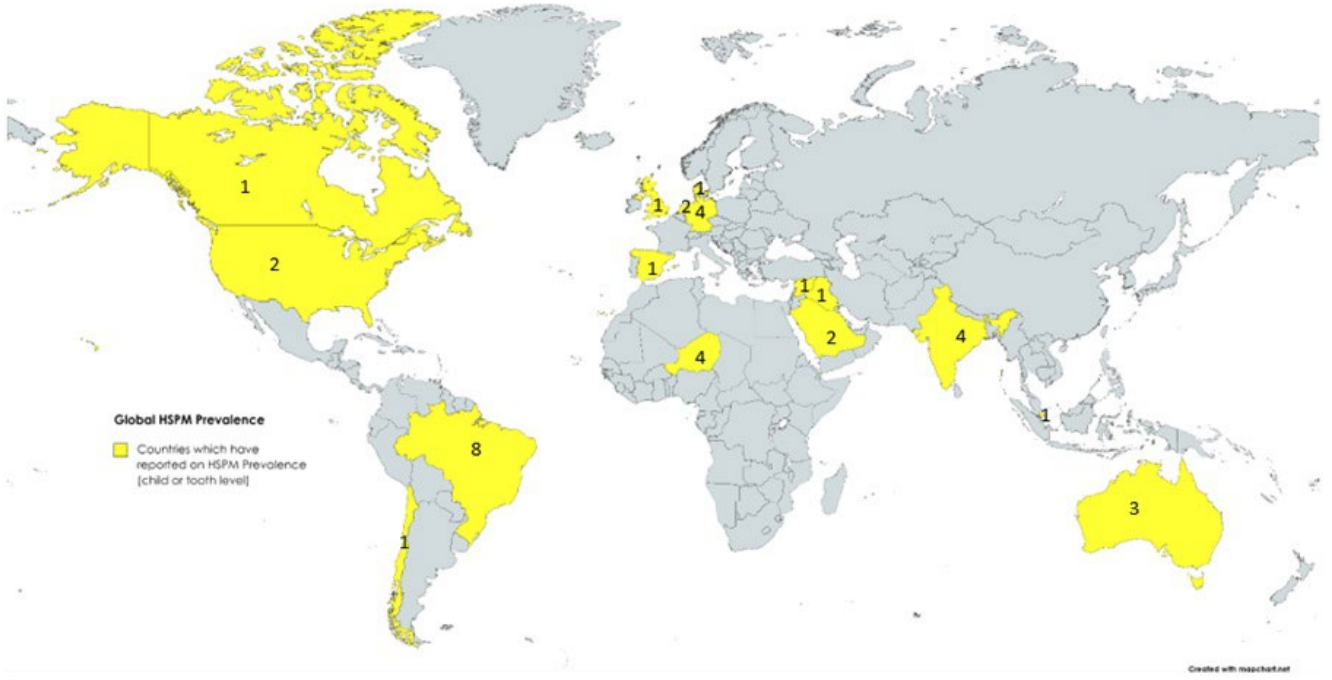


**FIGURE 4** Geographical distribution of HSPM worldwide—yellow zones reflect countries that have reported on HSPM prevalence (child or tooth level)

picture of HSPM prevalence. Adherence to a standardised specific HSPM diagnostic criterion is recommended to decrease the variation between studies. Criteria that include all aspects of HSPM presentation may be helpful in determining the true spectrum of HSPM defects. Moreover, this may also improve the quality of studies recording defect progression over time.

Although the majority of the papers (75%) showed low-to-moderate risk of bias, flaws were identified in the methodology of included studies. Few studies followed the STROBE guidelines for reporting observational data. Regarding sampling procedure, 19 of the studies did not report on sample size, lowering the study quality. A total of 13 studies did not describe the training provided for their examiners in applying the diagnostic criteria. Although data quality depends critically on the examiners' ability to apply the diagnostic criteria consistently over time, not all studies described the examiners' training and calibration data.

As a limitation of the present study, only articles published in the English language were retrieved. Although a comprehensive literature search would ideally not have language restrictions, the majority of papers within medical and health science are published in the English language. Moreover, non-English papers usually represent a small proportion of included articles and rarely impact the results and conclusion of a systematic review.[19] Another limitation of the present study is that only articles indexed on MEDLINE/PubMed, Scopus, Web of Science, and OpenGrey databases were included.[20] This may have resulted in relevant articles being excluded and therefore increase the likelihood of selection bias.

Demarcated opacities represented the most common clinical presentation of HSPM, which is favourable considering that this is the mildest form of the detection that usually requires preventive care alone and monitoring. Those affected by PEB and atypical caries, however, may present with an increased treatment burden including restorative care (atypical restorations) and loss of the second primary molar affected by HSPM. The clinical significance of a child presenting with demarcated opacities also relates to the predictive nature of HSPM for MIH development.[21] This awareness may aid dentists in increasing surveillance of erupting first permanent molars and enabling an earlier MIH diagnosis. The prevalence of HSPM in the present study is lower than the global reported prevalence for MIH (13.1%).[22] This could be explained by the fact that the mineralisation period for the first permanent molar is considerably longer than that for the second primary molar. Therefore, the window of opportunity for aetiological insults is greater for the first permanent molar.

In conclusion, there was a broad variation in the prevalence reported that may be attributed to differences in the study population. The present meta-analysis showed a HSPM prevalence worldwide of 6.8% on a child level and 4.1% on a tooth level. There is a need for more standardised information to be provided on the type of HSPM defect, presence of sensitivity, and respective treatment needs. Further research is also required in certain

**TABLE 2** Quality assessment of the primary studies

| | | 1. Selection | | | 2. Comparability | 3. Outcome | | | BIAS | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Study** | **Country** | **Representativeness Max 3*** | **Sample Size Max 1 *** | **Non respondents Max 2*** | **Specific groups Max 2*** | **Criteria Max 1*** | **Training Max 1*** | **Calibration Max 3*** | **Stars** | **Risk ≤6 = high 7-8 = moderate ≥9 = low** |
| da Silva et al, 2017[23] | Brazil | ** | NR | ** | NA | * | * | * | 7 | Moderate |
| Mittal et al, 2016[24] | India | ** | NR | NR | NA | * | * | *** | 7 | Moderate |
| Norrisgaard et al, 2019[25] | Denmark | * | * | ** | * | * | * | *** | 10 | Low |
| Gambetta-Tessini et al, 2018[26] | Australia | *** | * | * | NA | * | * | *** | 10 | Low |
| Murray & Shaw, 1979[27] | England | ** | NR | NR | NA | No | NR | *** | 5 | High |
| Elfrink et al, 2012[4] | The Netherlands | ** | NR | ** | NA | * | NR | ** | 7 | Moderate |
| Reyes et al, 2019[13] | Brazil | *** | * | ** | NA | No | * | *** | 10 | Low |
| Wagner, 2017[28] | Germany | ** | NR | * | NA | No | * | *** | 7 | Moderate |
| Corrêa-Faria et al, 2013[29] | Brazil | ** | * | ** | NA | No | * | *** | 9 | Low |
| Farsi, 2010[30] | Saudi Arabia | *** | * | NR | NA | No | * | *** | 8 | Moderate |
| Temilola et al, 2015[31] | Nigeria | ** | * | NR | NA | * | NR | *** | 7 | Moderate |
| Chaves et al, 2007[32] | Brazil | ** | * | ** | NA | * | NR | *** | 9 | Low |
| De Lima et al, 2015[14] | Brazil | *** | * | ** | NA | * | NR | *** | 10 | Low |
| Silva et al, 2019[33] | Australia | * | NR | * | ** | * | NR | * | 6 | High |
| Mittal & Sharma, 2015[34] | India | *** | NR | ** | NA | * | * | *** | 10 | Low |
| Oyedele et al, 2016[15] | Nigeria | *** | * | NR | NA | * | NR | *** | 8 | Moderate |
| Negre-Barber et al, 2016[16] | Spain | ** | * | NR | NA | * | * | *** | 8 | Moderate |
| Elfrink et al, 2008[3] | The Netherlands | ** | NR | * | NA | * | * | *** | 8 | Moderate |
| Costa-Silva et al, 2013[35] | Brazil | ** | NR | NR | NA | * | NR | * | 4 | High |
| Schüttfort et al, 2020[36] | Germany | * | NR | NR | NA | No | * | * | 3 | High |
| Folayan et al, 2020[37] | Nigeria | *** | * | NR | NA | * | NR | NR | 5 | High |
| Fernandes et al, 2020[38] | Brazil | *** | NA | ** | NA | * | * | *** | 10 | Low |
| Lima et al, 2020[39] | Brazil | *** | * | ** | NA | * | * | *** | 11 | Low |
| Sidhu et al, 2019[40] | Canada | ** | * | ** | NA | * | * | *** | 10 | Low |
| Slayton et al, 2001[41] | USA | ** | NR | NR | NA | No | * | ** | 5 | High |
| Halal & Raslan, 2020[42] | Syria | *** | * | NR | NA | * | NR | *** | 8 | Moderate |
| Zakirulla et al, 2020[43] | Saudi Arabia | *** | NR | NR | NA | * | NR | *** | 7 | Moderate |
| Ng et al, 2015[44] | Singapore | *** | NR | NR | NA | * | NR | NR | 4 | High |

(Continues)

**TABLE 2** (Continued)

| Study | Country | 1. Selection | | | 2. Comparability | 3. Outcome | | | BIAS | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Representativeness Max 3* | Sample Size Max 1 * | Non respondents Max 2* | Specific groups Max 2* | Criteria Max 1* | Training Max 1* | Calibration Max 3* | Stars | Risk ≤6 = high 7-8 = moderate ≥9 = low |
| Ahmed et al, 2020[17] | USA | ** | NR | * | NA | * | * | *** | 8 | Moderate |
| Goyal et al, 2019[45] | India | *** | * | ** | NA | * | * | *** | 11 | Low |
| Kühnisch et al, 2014[18] | Germany | ** | NR | * | NA | * | * | *** | 8 | Moderate |
| Elger et al, 2020[46] | Germany | NR | NR | NR | NA | * | * | *** | 5 | High |
| Gambetta-Tessini et al, 2019[47] | Chile | *** | * | * | NA | * | * | *** | 10 | Low |
| Temilola et al, 2015[48] | Nigeria | ** | * | NR | NA | No | * | *** | 7 | Moderate |
| Owen et al, 2018[49] | Australia | *** | * | * | NA | * | * | *** | 10 | Low |
| Ghanim et al, 2013[5] | Iraq | *** | NR | ** | NA | * | * | *** | 10 | Low |
| Kar et al, 2014[50] | India | ** | NR | NR | ** | No | * | NR | 5 | High |

Abbreviations: NR, not reported; NA, not applicable.

countries where no prevalence data exist. Determining the prevalence of HSPM will inform early detection and management strategies according to the defect severity.

## ACKNOWLEDGEMENTS

The authors would like to thank the librarian team from the Dublin Dental University Hospital (DDUH) for their kind assistance throughout the systematic review and data collection.

## AUTHOR CONTRIBUTIONS

Charlotte McCarra conceived the ideas, collected the data, analysed the data, and led the writing. Isabel Cristina Olegário conceived the ideas, collected the data, analysed the data, and reviewed the manuscript. Anne C. O'Connell collected the data and reviewed the manuscript. Rona Leith conceived the ideas, collected the data, and reviewed the manuscript.

## ORCID

*Charlotte McCarra* https://orcid.org/0000-0001-5075-6306
*Isabel Cristina Olegário* https://orcid.org/0000-0003-2262-8061
*Anne C. O'Connell* https://orcid.org/0000-0002-1495-3983
*Rona Leith* https://orcid.org/0000-0001-7407-7930

## REFERENCES

1. Jalevik B, Noren JG. Enamel hypomineralization of permanent first molars: a morphological study and survey of possible aetiological factors. *Int J Paediatr Dent*. 2000;10:278-289.
2. Weerheijm KL. Molar incisor hypomineralisation (MIH). *Eur J Paediatr Dent*. 2003;4:114-120.
3. Elfrink ME, Schuller AA, Weerheijm KL, Veerkamp JS. Hypomineralized second primary molars: prevalence data in Dutch 5-year-olds. *Caries Res*. 2008;42:282-285.
4. Elfrink ME, ten Cate JM, Jaddoe VW, Hofman A, Moll HA, Veerkamp JS. Deciduous molar hypomineralization and molar incisor hypomineralization. *J Dent Res*. 2012;91:551-555.
5. Ghanim A, Manton D, Marino R, Morgan M, Bailey D. Prevalence of demarcated hypomineralisation defects in second primary molars in Iraqi children. *Int J Paediatr Dent*. 2013;23:48-55.
6. Elfrink ME, Ghanim A, Manton DJ, Weerheijm KL. Standardised studies on Molar Incisor Hypomineralisation (MIH) and Hypomineralised Second Primary Molars (HSPM): a need. *Eur Arch Paediatr Dent*. 2015;16:247-255.
7. Ghanim A, Elfrink M, Weerheijm K, Mariño R, Manton D. A practical method for use in epidemiological studies on enamel hypomineralisation. *European Archives of Paediatric Dentistry*. 2015;16:235-246.
8. Weerheijm KL, Duggal M, Mejare I, et al. Judgement criteria for molar incisor hypomineralisation (MIH) in epidemiologic studies: a summary of the European meeting on MIH held in Athens, 2003. *Eur J Paediatr Dent*. 2003;4:110-113.

9. Herzog R, Álvarez-Pasquin MJ, Díaz C, Del Barrio JL, Estrada JM, Gil Á. Are healthcare workers' intentions to vaccinate related to their knowledge, beliefs and attitudes? a systematic review. *BMC Public Health*. 2013;13:1-17.
10. Tibúrcio-Machado CS, Michelon C, Zanatta FB, Gomes MS, Marin JA, Bier CA. The global prevalence of apical periodontitis: a systematic review and meta-analysis. *Int Endod J*. 2021;54:712-735.
11. Beentjes VE, Weerheijm KL, Groen HJ. Factors involved in the aetiology of molar-incisor hypomineralisation (MIH). *Eur J Paediatr Dent*. 2002;3:9-13.
12. William V, Messer LB, Burrow MF. Molar incisor hypomineralization: review and recommendations for clinical management. *Pediatr Dent*. 2006;28:224-232.
13. Reyes MRT, Fatturi AL, Menezes JVNB, Fraiz FC, da Silva Assunção LR, de Souza JF. Demarcated opacity in primary teeth increases the prevalence of molar incisor hypomineralization. *Brazilian Oral Research*. 2019;33:1-9.
14. de Lima MD, Andrade MJ, Dantas-Neta NB, et al. Epidemiologic study of molar-incisor hypomineralization in schoolchildren in North-eastern Brazil. *Pediatr Dent*. 2015;37:513-519.
15. Oyedele TA, Folayan MO, Oziegbe EO. Hypomineralised second primary molars: prevalence, pattern and associated co morbidities in 8-to 10-year-old children in Ile-Ife. Nigeria. *Bmc Oral Health*. 2016;16:1-7.
16. Negre-Barber A, Montiel-Company JM, Boronat-Catala M, Catala-Pizarro M, Almerich-Silla JM. Hypomineralized second primary molars as predictor of molar incisor hypomineralization. *Sci Rep*. 2016;6:1-6.
17. Tagelsir Ahmed A, Soto-Rojas AE, Dean JA, Eckert GJ, Martinez-Mier EA. Prevalence of molar-incisor hypomineralization and other enamel defects and associated sociodemographic determinants in Indiana. *J Am Dent Assoc*. 2020;151:491-501.
18. Kuhnisch J, Heitmuller D, Thiering E, et al. Proportion and extent of manifestation of molar-incisor-hypomineralizations according to different phenotypes. *J Public Health Dent*. 2014;74:42-49.
19. Hartling L, Featherstone R, Nuspl M, Shave K, Dryden DM, Vandermeer B. Grey literature in systematic reviews: a cross-sectional study of the contribution of non-English reports, unpublished studies and dissertations to the results of meta-analyses in child-relevant reviews. *BMC Med Res Methodol*. 2017;17:64.
20. Cooper C, Booth A, Varley-Campbell J, Britten N, Garside R. Defining the process to literature searching in systematic reviews: a literature review of guidance and supporting studies. *BMC Med Res Methodol*. 2018;18:85.
21. Garot E, Denis A, Delbos Y, Manton D, Silva M, Rouas P. Are hypomineralised lesions on second primary molars (HSPM) a predictive sign of molar incisor hypomineralisation (MIH)? A systematic review and a meta-analysis. *J Dent*. 2018;72:8-13.
22. Schwendicke F, Elhennawy K, Reda S, Bekes K, Manton DJ, Krois J. Global burden of molar incisor hypomineralization. *J Dent*. 2018;68:10-18.
23. 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? *Pediatr Dent*. 2017;39:445-449.
24. Mittal R, Chandak S, Chandwani M, Singh P, Pimpale J. Assessment of association between molar incisor hypomineralization and hypomineralized second primary molar. *J Int Soc Prev Community Dent*. 2016;6:34-39.
25. Nørrisgaard PE, Haubek D, Kühnisch J, et al. Association of high-dose vitamin d supplementation during pregnancy with the risk of enamel defects in offspring: a 6-year follow-up of a randomized clinical trial. *JAMA Pediatrics*. 2019;173:924-930.
26. Gambetta-Tessini K, Marino R, Ghanim A, Calache H, Manton DJ. Carious lesion severity and demarcated hypomineralized lesions of tooth enamel in schoolchildren from Melbourne. *Australia. Aust Dent J*. 2018;63:365-373.
27. Murray JJ, Shaw L. Classification and prevalence of enamel opacities in the human deciduous and permanent dentitions. *Arch Oral Biol*. 1979;24:7-13.
28. Wagner Y. Developmental defects of enamel in primary teeth - findings of a regional German birth cohort study. *BMC Oral Health*. 2017;17:1-8.
29. Corrêa-Faria P, Martins-Júnior PA, Vieira-Andrade RG, Oliveira-Ferreira F, Marques LS, Ramos-Jorge ML. Developmental defects of enamel in primary teeth: Prevalence and associated factors. *Int J Pediatr Dent*. 2013;23:173-179.
30. Farsi N. Developmental enamel defects and their association with dental caries in preschoolers in Jeddah, Saudi Arabia. *Oral Health Preven Dent*. 2010;8:85-92.
31. Temilola OD, Folayan MO. Distinguishing predisposing factors for enamel hypoplasia and molar-incisor hypomineralization in children in Ile-Ife. Nigeria. *Brazilian J Oral Sci*. 2015;14:318-322.
32. Chaves AM, Rosenblatt A, Oliveira OF. Enamel defects and its relation to life course events in primary dentition of Brazilian children: a longitudinal study. *Community Dent Health*. 2007;24:31-36.
33. Silva MJ, Kilpatrick NM, Craig JM, et al. Etiology of hypomineralized second primary molars: a prospective twin study. *J Dent Res*. 2019;98:77-83.
34. Mittal N, Sharma BB. Hypomineralised second primary molars: prevalence, defect characteristics and possible association with Molar Incisor Hypomineralisation in Indian children. *Eur Arch Paediatr Dent*. 2015;16:441-447.
35. Costa-Silva CM, Paula JSD, Ambrosano GMB, Mialhe FL. Influence of deciduous molar hypomineralization on the development of molar-incisor hypomineralizarion. *Braz J Oral Sci*. 2013;12:335-338.
36. Schüttfort G, Höfler S, Kann G, et al. Influence of tenofovir exposure in utero on primary dentition. *Euro J Pediat*. 2020;179:1761-1768.
37. Folayan MO, El Tantawi M, Oginni AB, Alade M, Adeniyi A, Finlayson TL. Malnutrition, enamel defects, and early childhood caries in preschool children in a sub-urban Nigeria population. *PLoS One*. 2020;15:1-14.
38. Fernandes IC, Forte FDS, Sampaio FC. Molar-incisor hypomineralization (MIH), dental fluorosis, and caries in rural areas with different fluoride levels in the drinking water. *Int J Paediat Dent*. 2020;31(4):475-482.
39. Lima LRS, Pereira AS, de Moura MS, et al. Pre-term birth and asthma is associated with hypomineralized second primary molars in pre-schoolers: A population-based study. *Int J Pediatr Dent*. 2020;30:193-201.
40. Sidhu N, Wang Y, Barrett E, Casas M. Prevalence and presentation patterns of enamel hypomineralisation (MIH and HSPM) among paediatric hospital dental patients in Toronto,

Canada: a cross-sectional study. *Euro Archiv Paediat Dent*. 2019;21(1):263-270.
41. Slayton RL, Warren JJ, Kanellis MJ, Levy SM, Islam M. Prevalence of enamel hypoplasia and isolated opacities in the primary dentition. *Pediatr Dent*. 2001;23:32-36.
42. Halal F, Raslan N. Prevalence of hypomineralised second primary molars (HSPM) in Syrian preschool children. *Euro Archiv Paediat Dentist*. 2020;21(6):711-717.
43. Zakirulla M, Alasiri MA, Alshahrani MR, et al. Prevalence of Hypomineralization in Second Primary Molars (HSPM) in 7 to 10-year-old Saudi children. *J Res Med Dental Sci*. 2020;8:124-127.
44. Ng JJ, Eu OC, Nair R, Hong CH. Prevalence of molar incisor hypomineralization (MIH) in Singaporean children. *Int J Paediatr Dent*. 2015;25:73-78.
45. Goyal A, Dhareula A, Gauba K, Bhatia SK. Prevalence, defect characteristics and distribution of other phenotypes in 3- to 6-year-old children affected with Hypomineralised Second Primary Molars. *Eur Arch Paediatr Dent*. 2019;20:585-593.
46. Elger W, Illge C, Kiess W, et al. Relationship between deciduous molar hypomineralisation and parameters of bone metabolism in preschool children. *Int Dent J*. 2020;70(4):303-307.
47. Gambetta-Tessini K, Marino R, Ghanim A, Calache H, Manton DJ. The impact of MIH/HSPM on the carious lesion severity of schoolchildren from Talca. Chile. *Eur Arch Paediatr Dent*. 2019;20:417-423.
48. Temilola OD, Folayan MO, Oyedele T. The prevalence and pattern of deciduous molar hypomineralization and molar-incisor hypomineralization in children from a suburban population in Nigeria. *BMC Oral Health*. 2015;15:73.
49. Owen ML, Ghanim A, Elsby D, Manton DJ. Hypomineralized second primary molars: prevalence, defect characteristics and relationship with dental caries in Melbourne preschool children. *Aust Dent J*. 2018;63:72-80.
50. Kar S, Sarkar S, Mukherjee A. Prevalence and distribution of developmental defects of enamel in the primary dentition of IVF children of West Bengal. *J Clin Diagn Res*. 2014;8:73-76.

## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

**How to cite this article:** McCarra C, Cristina Olegário I, O'Connell AC, Leith R. Prevalence of hypomineralised second primary molars (HSPM): A systematic review and meta-analysis. *Int J Paediatr Dent*. 2021;00:1–16. https://doi.org/10.1111/ipd.12892