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**SUPPLEMENTAL DATA**

# Early childhood caries and type 1 diabetes mellitus – Evidence on primary teeth and oral health: A systematic review

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**Full article is available at the following link:** Early childhood caries and type 1 diabetes mellitus – Evidence on primary teeth and oral health: A systematic review

**Table S1. Search strategies and results for each database**

| Database / Source | Search strategy (example) | Limits | Date searched | Records identified |
|---|---|---|---|---|
| PubMed (NCBI) | ("Diabetes Mellitus, Type 1"[MeSH] OR "type 1 diabetes" OR T1DM OR "insulin-dependent diabetes") AND ("Child"[MeSH] OR "Infant"[MeSH] OR children OR preschool* OR "early childhood") AND ("Dental Caries"[MeSH] OR "Early Childhood Caries" OR ECC OR dmft OR "primary teeth") | English | April–May 2025 (last search: 21 May 2025) | 95 |
| Scopus | TITLE-ABS-KEY("type 1 diabetes" OR T1DM OR "insulin-dependent diabetes") AND TITLE-ABS-KEY(children OR preschool OR "early childhood") AND TITLE-ABS-KEY("dental caries" OR "early childhood caries" OR ECC OR dmft) | English | April–May 2025 (last search: 21 May 2025) | 69 |
| Web of Science | TS=("type 1 diabetes" OR T1DM OR "insulin-dependent diabetes") AND TS=(children OR preschool OR "early childhood") AND TS=("dental caries" OR "early childhood caries" OR ECC OR dmft) | English | April–May 2025 (last search: 21 May 2025) | 64 |
| Embase | ('type 1 diabetes mellitus'/exp OR 'type 1 diabetes' OR T1DM OR 'insulin dependent diabetes') AND ('child'/exp OR children OR preschool OR 'early childhood') AND ('dental caries'/exp OR 'early childhood caries' OR ECC OR dmft) | English | April–May 2025 (last search: 21 May 2025) | 47 |
| Cochrane Library | (MeSH descriptor: [Diabetes Mellitus, Type 1] explode all trees OR "type 1 diabetes" OR T1DM OR "insulin-dependent diabetes") AND (MeSH descriptor: [Child] explode all trees OR children OR preschool OR "early childhood") AND (MeSH descriptor: [Dental Caries] explode all trees OR "dental caries" OR "early childhood caries" OR ECC OR dmft) | English | April–May 2025 (last search: 21 May 2025) | 93 |
| Other methods (Google Scholar, reference lists) | Keyword-based search using the same free-text terms; "type 1 diabetes" OR T1DM OR "insulin dependent diabetes") AND (child OR children OR preschool OR "early childhood") AND ("dental caries" OR "early childhood caries" OR ECC OR dmft" | First 200 results | April–May 2025 (last search: 21 May 2025) | 200 from 691* |

The numbers refer to records identified during the identification phase of the PRISMA 2020 flow diagram (Figure 1). All records from databases and Google Scholar were merged and deduplicated before the screening process. *The initial 200 results ranked by Google Scholar's default relevance algorithm were systematically screened. **Abbreviations**: NCBI: National Center for Biotechnology Information;

MeSH: Medical Subject Headings; T1DM: Type 1 diabetes mellitus; ECC: Early childhood caries; dmft: Decayed, missing, and filled primary teeth.

**Table S2. PRISMA 2020 checklist**

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| **TITLE** | | | |
| Title | 1 | Identify the report as a systematic review.<br>**Early Childhood Caries and Type 1 Diabetes Mellitus: A Systematic Review**<br>The title identifies the report as a systematic review and narrative synthesis, specifying population (children with T1D), condition (ECC), and method (systematic review + narrative synthesis). | Title page, p.1, lines 1–3. |
| **ABSTRACT** | | | |
| Abstract | 2 | See the PRISMA 2020 for Abstracts checklist.<br>Abstract structured per PRISMA 2020: background, objectives, eligibility criteria, databases, PROSPERO ID, number of studies, narrative analysis, conclusions. | Abstract, p.2, lines 27–49. |
| **INTRODUCTION** | | | |
| Rationale | 3 | Describe the rationale for the review in the context of existing knowledge.<br>Introduction outlines current evidence and uncertainties: fragmented findings on ECC in T1D children; explains importance of synthesis for clinical and public health practice. | Introduction (rationale), p.2, lines 51–57; p.3, lines 58–71. |
| Objectives | 4 | Provide an explicit statement of the objective(s) or question(s) the review addresses.<br>Objectives stated: to compare prevalence and severity of ECC in T1D vs. controls; to assess associations with glycemic control, salivary changes, and preventive care. | Objectives, p.3, lines 72–84. |
| **METHODS** | | | |
| Eligibility criteria | 5 | Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.<br>Included: children ≤6 years with T1D, ECC/primary dentition outcomes, observational studies. Excluded: permanent dentition, other diabetes types, case reports, non-English studies. Synthesis grouped by outcomes (caries, salivary, glycemic, preventive) | Methods – Eligibility Criteria, p.4, lines 94–104. |
| Information sources | 6 | Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.<br>Databases searched: PubMed, Scopus, Cochrane, Embase, Web of Science, Google Scholar (April–May 2025, no date restriction, English only). Reference lists screened; search updated until review completion. | Methods – Information Sources, p.4, lines 106–116; p.5, lines 117–119. |

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| | | | |
| Search strategy | 7 | Present the full search strategies for all databases, registers and websites, including any filters and limits used.<br>Database-specific strategies combining MeSH/Emtree and free-text terms for population, exposure, and outcomes. Boolean operators used. Full strategies in Supplementary S1. Example PubMed string included. Language restriction: English. | Methods – Search Strategy, p.5, lines 121–133; Supplementary Table S1, p.23, line 560. |
| Selection process | 8 | Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.<br>Two reviewers independently screened titles/abstracts and full texts; disagreements resolved by consensus or third reviewer. PRISMA diagram shown. | Methods – Study Selection, p.5, lines 135–147; Results – Study Selection & Figure 1, p.7, lines 212–216. |
| Data collection process | 9 | Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.<br>Standardized extraction form; two reviewers extracted design, sample, outcomes; discrepancies resolved by discussion; authors contacted for missing data. | Methods – Data Collection Process, p.6, lines 149–157. |
| Data items | 10a | List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.<br>Outcomes: ECC prevalence/severity (dmft/deft/ICDAS), salivary flow, buffering capacity, pH, HbA1c, periodontal indices, preventive care. | Methods – Data Items, p.6, lines 161–167 (caries/saliva/periodontal/HbA1c/behaviors). |
| | 10b | List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.<br>Other variables: age, gender, country, study design, oral hygiene, fluoride use, socioeconomic indicators. No assumptions were made about missing or unclear information; all data were extracted exactly as reported in the original studies. | Methods – Data Items, p.6, lines 159–166 (study characteristics and other variables). |
| Study risk of bias assessment | 11 | Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.<br>JBI items listed in Table 2; study-level RoB assessments presented in Table 3. | Methods – Risk of Bias in Individual Studies, p.6, lines 169–178; Results – Risk of Bias Within Studies, p.8, lines 229–242; Table 3, p.22, line 557. |

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| | | | |
| Effect measures | 12 | Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.<br>No meta-analysis was performed. For ECC prevalence and dmft/dmfs outcomes, effect measures reported by the original studies (e.g., prevalence proportions and mean values) were extracted and summarized narratively. | Narrative presentation only (no pooled effect measures): Methods – Synthesis of Results/Software, p.7, lines 182–201. |
| Synthesis methods | 13a | Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).<br>Studies grouped by outcome domain (caries, saliva, HbA1c, periodontal, preventive) | Outcome-domain grouping for synthesis: Methods – Synthesis of Results, p.7, lines 190–192. |
| | 13b | Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.<br>No data conversions or imputations were performed. All outcome data (ECC prevalence and dmft/dmfs scores) were extracted as reported in the original studies, and missing summary statistics were not estimated. Data were organized in standardized tables to enable consistent narrative comparison. | Methods – Synthesis of Results, line 193 |
| | 13c | Describe any methods used to tabulate or visually display results of individual studies and syntheses.<br>Results from individual studies were organized into structured summary tables presenting key study characteristics and outcomes. No statistical plots were generated, and findings were displayed descriptively without graphical synthesis. | Tabulation: Results text references Table 1, p.8, lines 225–228; Table 1 itself, p.19, line 553. |
| | 13d | Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.<br>Synthesis narrative | Narrative synthesis rationale: Methods – Synthesis of Results, p.7, lines 182–192. |
| | 13e | Describe any methods used to explore possible causes of heterogeneity explored qualitatively among study results (e.g. subgroup analysis, meta-regression).<br>Subgroup analyses by age, HbA1c, region, study design. | Heterogeneity explored qualitatively (age ranges/definitions/measurement differences): Methods, p.7, lines 183–190; Results, p.9, lines 243–246 and 263–265. |
| | 13f | Describe any sensitivity analyses conducted to assess robustness of the synthesized results. | No sensitivity analyses (no meta-analysis): Methods – Software, p.7, lines 198–201. |

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| | | No statistical plots were generated, and findings were displayed descriptively without graphical synthesis. No sensitivity analyses could be conducted because no meta-analysis was performed. | |
| Reporting bias assessment | 14 | Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).<br>Due to the small number of included studies, formal methods to assess reporting bias (e.g., funnel plots or Egger's test) were not applicable. The risk of bias arising from missing results was evaluated qualitatively by comparing reported outcomes with the methods described in the original studies and by checking for consistency and completeness of outcome data. | Methods ,Risk of Bias, line 181 |
| Certainty assessment | 15 | Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.<br>Certainty of evidence was not formally assessed (e.g., GRADE) due to heterogeneity and narrative synthesis. | Methods , Line 185 |
| **RESULTS** | | | |
| Study selection | 16a | Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.<br>1,059 records identified; after screening and eligibility assessment, 12 studies included in qualitative synthesis. PRISMA 2020 flow diagram presented in Figure 1. | Results – Study Selection, p.7, lines 213–216; Figure 1, p.7, line 212. |
| | 16b | Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.<br>Several full-text articles appeared relevant but were excluded: some did not report ECC outcomes separately for T1D children, others focused on adolescents or mixed diabetes populations, and a few lacked sufficient outcome data. Reasons for exclusion are described in Results. | Results, section Study selection, figure 1 |
| Study characteristics | 17 | Cite each included study and present its characteristics.<br>Characteristics of the 12 included studies are summarized in Table 1. Studies were published between 2000–2024, conducted across Europe, Asia, and the Middle East. Most were cross-sectional; one was case-control. Sample sizes ranged from <50 to >200 children, aged up to 6 years, with type 1 diabetes compared to healthy controls. Outcomes included caries indices (dmft/deft, ICDAS), salivary parameters (flow rate, buffering capacity, pH), periodontal status, HbA1c levels, and preventive behaviors. Additional details such as study | Results – Study Characteristics, p.8, lines 217–228; Table 1, p.19, line 553. |

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| | | setting, recruitment methods, and main findings are presented in Table 1. | |
| Risk of bias in studies | 18 | Present assessments of risk of bias for each included study.<br>JBI items listed in Table 2; study-level RoB assessments presented in Table 3. | Results – Risk of Bias Within Studies, p.8, lines 229–242; Table 3, p.22, line 557. |
| Results of individual studies | 19 | For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.<br>Results of each study are reported in section results. For caries outcomes, individual dmft values and standard deviations are provided for both T1D and control groups. Salivary analyses included mean flow rate, buffering capacity, and pH by group. Where available, HbA1c levels and oral hygiene behaviors were presented. Effect sizes with confidence intervals are summarized in text and tables. | Results – Individual Study Results (narrative by domains), p.9–10, lines 243–298. |
| Results of syntheses | 20a | For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.<br>Syntheses were grouped by outcome domain (caries indices, salivary parameters, periodontal indices, HbA1c associations, preventive practices). Risk of bias of included studies was considered when interpreting findings. | Results – characteristics and RoB context for syntheses, p.8, lines 217–242. |
| | 20b | Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.<br>No meta-analysis was conducted due to the small number of eligible studies and the heterogeneity in outcome definitions and reporting. Therefore, no pooled effect estimates, confidence intervals, or heterogeneity statistics were generated. Instead, results were synthesized narratively, describing the direction and magnitude of differences in ECC and dmft between children with type 1 diabetes and healthy controls. | No statistical syntheses (narrative only): Methods, p.7, lines 182–192; Results, p.9, lines 247–265. |
| | 20c | Present results of all investigations of possible causes of heterogeneity explored qualitatively.<br>Subgroup analyses by age, glycemic control, geographic region, and study design did not materially alter the direction of results. | Heterogeneity described narratively, p.9, lines 243–246; 263–265. |
| | 20d | Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.<br>No formal sensitivity analyses were performed because no meta-analysis was conducted. The robustness of findings was instead considered qualitatively by examining variations in study design, age ranges, diagnostic criteria, and outcome reporting across the included studies. | No sensitivity analyses performed, p.7, lines 198–201. |

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| Reporting biases | 21 | Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.<br>No concerns indicating substantial reporting bias were identified. Because no meta-analysis was conducted and the number of included studies was small, formal statistical assessments of reporting bias were not applicable. Potential missing results were evaluated qualitatively by comparing reported outcomes with the methods described in each study, and no inconsistencies suggesting selective reporting were detected. | Results , line 181, section Risk of Bias in Individual Studies |
| Certainty of evidence | 22 | Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.<br>Certainty of evidence was not formally assessed; therefore, no certainty ratings are presented. | Results, line 250. Section Risk of Bias Within Studies |
| **DISCUSSION** | | | |
| Discussion | 23a | Provide a general interpretation of the results in the context of other evidence.<br>The discussion interprets the findings in the context of existing literature. It highlights that children with T1D may have slightly higher caries experience, but differences were not statistically significant, consistent with some previous studies (e.g., Rapone et al. 2020). Secondary outcomes such as salivary changes and preventive care behaviors are discussed in relation to prior research. | Discussion (overall interpretation), p.11–14, lines 304–416. |
| | 23b | Discuss any limitations of the evidence included in the review.<br>Limitations of the included studies are addressed: small sample sizes, cross-sectional predominance, geographic variability, and lack of standardized outcome reporting reduce the strength of conclusions. Few studies controlled for important confounders such as diet or oral hygiene. | Discussion – Strengths and Limitations, p.14, lines 394–400. |
| | 23c | Discuss any limitations of the review processes used.<br>The review process may be limited by the possibility of missed studies despite a comprehensive search strategy, as well as by the restriction to published, English-language literature. In addition, data extraction and risk-of-bias assessment were conducted by two reviewers, but unavoidable subjectivity in interpretation may still be present. | Review-process limitations noted (English-only + manual steps), p.4, lines 103–104 and p.4–5, lines 111–113. |
| | 23d | Discuss implications of the results for practice, policy, and future research.<br>Practical implications include the need for interdisciplinary care integrating dentistry into diabetes management. Policy recommendations emphasize preventive strategies for high-risk children. Future research should prioritize longitudinal and intervention studies with standardized caries indices and better adjustment for | Discussion – implications for practice and research, p.14, lines 401–416. |

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| | | confounders. | |
| **OTHER INFORMATION** | | | |
| Registration and protocol | 24a | Provide registration information for the review, including register name and registration number, or state that the review was not registered.<br>Registered in PROSPERO: CRD42024602599 | Methods – Protocol and Registration (PROSPERO), p.4, lines 87–90. |
| | 24b | Indicate where the review protocol can be accessed, or state that a protocol was not prepared.<br>Protocol publicly accessible (URL provided). | Methods – Protocol access link, p.4, lines 92–93. |
| | 24c | Describe and explain any amendments to information provided at registration or in the protocol.<br>No amendments reported. | line 93 |
| Support | 25 | Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.<br>No funding received. | Funding statement, p.15, line 443. |
| Competing interests | 26 | Declare any competing interests of review authors.<br>Authors declare no conflict of interest. | Competing interests statement, p.15, line 442. |
| Availability of data, code and other materials | 27 | Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.<br>Search strategies (S1), extracted data, and analytic code/software noted (Jamovi, Excel, Zotero). Available upon request. | Data availability statement, p.15, lines 444–446; Search strategies provided in Supplementary Table S1, p.23, line 560; Software described, p.7, lines 194–201. |

*From:* Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. This work is licensed under CC BY 4.0. To view a copy of this license, visit https://creativecommons.org/licenses/by/4.0/ . **Abbreviations**: PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses; PROSPERO: International Prospective Register of Systematic Reviews; T1D: Type 1 diabetes; ECC: Early childhood caries;

dmft: Decayed, missing, and filled teeth; dmfs: Decayed, missing, and filled surfaces; deft: Decayed, extracted, and filled teeth; ICDAS: International Caries Detection and Assessment System; JBI: Joanna Briggs Institute; RoB: Risk of bias; HbA1c: Glycated hemoglobin; GI: Gingival Index; PI: Plaque Index; BOP: Bleeding on probing; GRADE: Grading of Recommendations Assessment, Development and Evaluation.