

Summary Review / Paediatric Dentistry/Caries/Diabetes

Title/Question

Children with Type I Diabetes and caries - are they linked?

Authors

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A Commentary on

Wang Y, Xing L, Yu H, Zhao L. Prevalence of dental caries in children and adolescents with type 1 diabetes: a systematic review and meta-analysis. *BMC Oral Health*. 2019 Sep 14;19(1):213. doi: 10.1186/s12903-019-0903-5. PubMed PMID: 31521152.

Data sources

PubMed, EMBASE and China National Knowledge Infrastructure. Manual review of reference list of included studies

Study selection

Cross-sectional studies or the first evaluation of longitudinal studies that were conducted on patients (<18 years old) with a known diagnosis of Type I Diabetes Mellitus (DM). The primary outcome was prevalence of dental caries.

Data extraction and synthesis

Selection of studies, data extraction and risk of bias assessment was performed, independently, by two members of the review team. Inter-rater reliability ($\kappa = 0.68$) was provided. Disagreements were resolved by consensus. The modified Newcastle-Ottawa scale, modified specifically to this review, was used to assess study quality and bias. Where appropriate, data was pooled, and analysed using a random-effects model. Subgroup analyses were carried out where possible.

Results

488 potential articles were screened. 83 full-text articles were reviewed with 10, involving a total of 538 patients, included in the meta-analysis. Seven studies were adjudged to be of high quality and three low quality using the modified Newcastle-Ottawa scale used.

Overall pooled prevalence of dental caries, among children and adolescents with Type I DM, was 67% (95%CI: 0.56-0.77%; $I^2 = 83\%$; $p < 0.01$). Subgroup analyses (geographic location and diabetic control) highlighted pooled prevalence was highest at 84% (95%CI: 0.67-0.94%; $I^2 = 49\%$; $p = 0.16$) in South America and 66% (95%CI: 0.43-0.83%; $I^2 = 87\%$; $p < 0.01$) in those with bad diabetic control.

Conclusions

Caries prevalence is high among children and adolescents with Type I DM. Diabetic children and adolescents need to be regularly screened for dental disease. Consistent preventive measures are required, from all healthcare professionals involved in the care of these patients, to ensure a balance in struck between optimum oral health and diabetic control for these patients.

GRADE Rating: Medium

Commentary

Type I diabetes mellitus (DM) is an autoimmune condition that prevents the body from producing enough insulin to regulate blood glucose levels. It is approximated that 32,400 children under the age of 19 have Type 1 DM in the UK and if not managed can have detrimental consequences¹.

The relationship between dental caries and diabetes is complex with no causal links identified². It is more common to think of Type II DM children being at higher risk of developing dental caries, due to the intake of carbohydrate-rich foods, when compared to those with Type I DM. However, Type I DM patients are still likely to be exposed to these dietary conditions but have the addition of diminished salivary flow and buffering capacity, associated with Type I DM, which significantly increases their caries risk².

This meta-analysis appears to be the first to attempt to highlight overall dental caries prevalence for patients with Type 1 DM in children and adolescents. The search strategy is very clear, using appropriate MeSH terms, however the authors have narrowed their search to only Medline/EMBASE, a national Chinese database and conference abstracts. Additional databases, Cochrane registers and other forms of grey literature could have been explored.

Eligibility criteria for potential studies is clearly presented however more information on what the authors would accept as a validated diagnosis of Type I DM would have been beneficial as this is likely to differ between studies and countries. The authors have explained why they have excluded case reports and case-control studies and as this review is estimating prevalence of caries in a Type I diabetic cohort, this seems appropriate. To their credit, conference abstracts have been included however, as a reader you have to assume only prospective cohort studies were included from these abstracts.

Data extraction was performed independently by two reviewers, with disagreements being resolved by consensus. Inter-rater reliability score of 0.68 was provided, which is good, however I do wonder why a third reviewer wasn't used when disagreements were noted. Quality assessment was undertaken using a modified Newcastle-Ottawa scale (NOS). Modifying the NOS scale, to be relevant to the research question, is accepted practice for the study designs included and their findings are clearly provided in appendix 4.

A PRISMA checklist and flow diagram are helpful to the reader with key characteristics of the included studies provided in table 1. Unfortunately, inconsistencies in the way the data is presented makes interpreting this table quite challenging. What is apparent is the relatively small sample sizes in each of the studies, and the authors do address this as a limitation to their review.

The overall pooled prevalence is 67% with the authors suggesting this is far greater than epidemiological data obtained for children of similar age in the US. However, 67% is obtained when all dental caries measurements (dmft, DMFT, dmft/DMFT, DFS and dfs/DFS) were used. Given the lack of studies that assessed dmft, I feel it would have been better to either exclude these or treat the primary and permanent dentition separately in their analysis. The pooled prevalence dropped to 62% when studies that only used DMFT were included. This is much closer to the reported figure of 58% in the

general US population (of note, the article reports the overall prevalence of adolescents in the US to be 58% in primary teeth however the referenced article³ confirms this prevalence figure is actually for the permanent dentition) and would therefore draw a different conclusion from this review.

Subgroup analyses were carried out where appropriate. The authors conclude that diabetic control and dental caries could be linked however this should be interpreted with caution as the levels of good and bad diabetic control differed between included studies as well as the sample sizes being significantly different between these two groups (bad control (n=170); good control (n=54)).

The authors try to unravel why caries prevalence is higher in Type 1 DM children and adolescents in the discussion section. They make some very valid points and suggestions, however, they do report that oral hygiene knowledge and habits of children with Type I DM are superior to that of healthy individuals. The references they refer to actually disagrees with this statement. A recent systematic review that included 27,894 people, of all ages, with diabetes showed quite clearly that people with diabetes have limited oral health knowledge and poor oral health behaviors compared to non-diabetic controls⁴. Therefore, I would suggest that readers of this article must ensure that the diabetic children and adolescents they encounter are managed as high risk patients, and are given consistent preventive messages to ensure optimum oral health is obtained.

Practice Points

- Children and adolescents with Type I Diabetes Mellitus should be screened for dental disease on a more regular basis due to their increased risk of dental caries
- Preventive messages should be consistent, provided by all healthcare professionals and be balanced towards good oral health and diabetic control

References

1. Diabetes UK: Facts & Figures 2019 [Available from: <https://www.diabetes.org.uk/Professionals/Position-statements-reports/Statistics> (Accessed 7th December 2019)]
2. Lamster IB, Lalla E, *et al.* The Relationship Between Oral Health and Diabetes Mellitus. *The Journal of the American Dental Association.* 2008;139:19S-24S.
3. Dye BA, Thornton-Evans G, *et al.* Dental caries and sealant prevalence in children and adolescents in the United States, 2011-2012. 2015.
4. Poudel P, Griffiths R, *et al.* Oral health knowledge, attitudes and care practices of people with diabetes: a systematic review. *BMC Public Health.* 2018;18(1):577.