No consistent association found between dental caries and body mass index in children

Abstracted from

Chen D, Zhi Q, Zhou Y, Tao Y, Wu L, Lin H.

Association between dental caries and BMI in children: A Systematic Review and Meta-Analysis. *Caries Res* 2018; **52:** 230-245.

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Question: What is the association between dental caries and the full range of body mass index (BMI) classes among children?

Data sources PubMed, Embase, the Cochrane Library and reference lists of identified studies.

Study selection Observational studies comparing dental caries and body mass index (BMI) where BMI was clearly defined were considered.

Data extraction and synthesis Two reviewers independently abstracted data using standard forms with study quality being assessed using a modified version of the Agency for Healthcare Research and Quality (AHRQ) methodology checklist for cross-sectional studies. The weighted mean differences and corresponding 95% confidence intervals for dental caries between children with abnormal weight and those with normal weight were analysed.

Results Fourteen cross-sectional studies including 43,860 children (boys: 23,299; girls: 20,561) were included. Only two studies were considered to be of high quality, eight of medium quality and four of low quality. Four main patterns of associations between dental caries and BMI were found: five studies showed no association, five studies found a positive association, three an inverse association and one found a U-shaped pattern, which meant that the deft score was significantly higher in underweight children and there was a higher DMFT score in overweight and obese children.

Conclusions This meta-analysis showed no differences in dental caries between underweight and normal weight children. Further studies are recommended using suitable sample sizes, to unify the criteria for BMI categorisation and the dental caries index, and investigate the confounding factors that might influence dental caries and BMI.

Commentary

The shared risk factor of 'diet' can provide what seems a straightforward link between dental caries and body weight.[1] A positive association between dental caries experience and obesity has been described within at least two previous systematic reviews.[2,3] This association, together with the contrasting relationship between low body weight and dental caries, was also found in the Hooley *et al*. 2012 systematic review.[4] The number of individual studies which assess this relationship has increased over past the five years. This systematic review provides both an updated synthesis of the available literature and a meta-analysis which compares dental caries experience between 'normal weight' and 'abnormal weight' children.

The systematic review includes reviews of non-randomised studies therefore this summary has been informed by the recently updated AMSTAR critical appraisal tool.[5]

Inclusion criteria for systematic reviews of interventional studies such as those described within the Cochrane Handbook are often described using the PICO criteria (population, intervention, comparator and outcome).[6] The PICO equivalent for reviews of aetiology or associated risk can be to consider PICo: population (P), interest or phenomena of interest (I), and context (Co).[7] Although not explicitly stated in the PICo format, the research question of the study is 'to investigate the association of dental caries with the full range of BMI classes in children by comparing the dental caries index between normal weight and abnormal weight'. The authors state that only observational studies were included in the review if they met a number of predefined criteria. They also advise a written protocol that included objectives, a search strategy, inclusion/exclusion criteria and a risk of bias assessment was prepared prior to starting the review.

A comprehensive literature search strategy was used and two relevant databases were searched (PubMed and Embase), as well as the Cochrane Library of Systematic Reviews. The inclusion of a search within Cochrane is interesting as systematic reviews found here tend to focus on intervention studies rather than non-randomised observational studies. The key words included within the search are listed as Medical Subject Headings (MeSH terms) and include synonyms for overweight, underweight and dental caries. The authors also searched the reference lists of included studies. If articles which described the same study population were found the most recent study was included. This can occasionally happen between epidemiological studies when researchers use the same population dataset to answer a number of research questions.

The authors provide justification for excluding 135 of the retrieved articles, although a list of the excluded studies is not provided. As suggested within the AMSTAR 2 appraisal tool,5 both study selection and data extraction were performed in duplicate. All of the studies identified were cross-sectional in nature therefore looked at the data from a population, or representative subset, at a specific point in time.

Fourteen cross-sectional studies are included in this systematic review and meta-analysis. This includes at least ten studies which have not been included in previous systematic reviews on this

topic.[2-4] The reviewers found included studies to generally be of low quality. Results from the individual studies varied with five showing no association, five showing a positive association and three showing a negative association between caries and BMI. The remaining study suggested a positive association between caries experience and those in the extremes of underweight and obese.

The authors pooled studies for separate meta-analyses according to dentition type (primary or permanent) and World Bank Group income economies (low and middle income countries or high income countries). This subgroup evaluation suggested that overweight and obese children in high income countries were more likely have an increased caries experience when compared to 'normal-weight' children. The reviewers acknowledge the potential risk of bias across the studies and suggest these results should be interpreted with caution.

In relation to overall confidence in the results of this review, Shea *et al*. 'strongly recommend that individual item ratings are not combined to create an overall score' from the AMSTAR checklist. However, assessment of the critical domains would indicate that this review has no critical flaws and 'may provide an accurate summary of the results of the available studies that were included in the review.[5]

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