Evaluation of risk of bias assessment of trials in systematic reviews of oral health interventions, 1991-2014

A methodology study

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Systematic reviews and meta-analyses of randomized controlled clinical trials are considered to be a criterion standard form of evidence to indicate the efficacy and effectiveness of therapeutic interventions in health sciences.[1] The authors of systematic reviews use a comprehensive search strategy to identify all potentially relevant trials, predefine eligibility criteria to minimize the impact of bias in study selection, and use reproducible methods to assess the risk of bias found in individual trials and to consider that risk when synthesizing their results.[2] As with any research design, the value of a systematic review depends on how well its authors conduct and report the results. The endorsement by journal editors, reviewers, and authors of reporting guidelines such as the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement[3] has resulted in increases in both the reporting and the methodological quality of published reviews.[4]

Supplemental material is available online.

In the area of oral health, approximately 50 dentistry-related trials are published per month, and this number increases every year.[5] Similarly, the number of systematic reviews published in oral health and within dental

ABSTRACT

Background. The authors aimed to describe how often and by what means investigators assessed the risk of bias of clinical trials in systematic reviews of oral health interventions and to identify factors associated with risk of bias assessments.

Methods. The authors selected therapeutic oral health systematic reviews published from 1991 through 2014. They extracted data related to the tools used for risk of bias assessment of primary studies and data related to other review characteristics. They descriptively analyzed the data and used multivariate logistic regression.

Results. The authors identified 1,114 oral health systematic reviews (130 Cochrane reviews and 984 non-Cochrane reviews). The investigators of the primary studies assessed risk of bias in 61.4% of the reviews, and the risk of bias assessments occurred more often in Cochrane reviews than in non-Cochrane reviews (100% versus 56.3%; $P < .001$) and in reviews published after the dissemination of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement (odds ratio [OR], 1.55; 95% confidence interval [CI], 1.17-2.06). Compared with the investigators of reviews of public oral health interventions, investigators of reviews of oral surgery were less likely to assess risk of bias (OR, 0.41; 95% CI, 0.25-0.67). Furthermore, the investigators of systematic reviews published in dental journals were less likely to assess risk of bias of individual trials (OR, 0.28; 95% CI, 0.19-0.41) compared with the investigators of reviews published in nondental journals.

Conclusions. The investigators of primary studies did not undertake risk of bias assessment in a considerable portion of non-Cochrane oral health systematic reviews. The investigators of reviews published in dental journals were less likely to assess risk of bias than the investigators of reviews published in nondental journals. The results of this study provide evidence of the need for improving the conduct and reporting of oral health systematic reviews with respect to risk of bias assessment.

Practical Implications. Clinicians should determine to what extent the findings of a systematic review are valid on the basis of whether the investigators assessed and considered risk of bias during the interpretation of findings.

Key Words. Dentistry; systematic review; meta-analysis; randomized controlled trial; study quality; bias.

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specialties has grown steadily over the last 2 decades.[6] Evidence from the results of methodological studies has shown that the reporting of methodological aspects of systematic reviews in oral health was below an acceptable level and that an area of particular weakness was the risk of bias assessment for the primary studies.[7-9]

The extent to which clinicians can interpret and use findings from a systematic review relies heavily on the scope and internal validity of the included studies; the latter is determined largely by the extent to which the investigators who designed, conducted, and analyzed the included trials followed the highest possible standards to minimize multiple biases and thus ensured that the findings could be attributed to the intervention.[2,10] For this reason, it is essential to critically appraise the risk of bias—a critical component to overall methodological quality—of trials included in systematic reviews that focus on therapeutic interventions.[11] Numerous tools exist to assess the risk of bias of randomized clinical trials; however, few investigators have conducted extensive testing of these tools to determine their reliability or validity.[12,13] Because investigators have not assessed the measurement properties of these instruments, it is unknown whether or to what extent the instruments can tap the construct of risk of bias in ways that can discriminate between trials that have biased and unbiased results.

The investigators of a 2014 report[14] examined the risk of bias approaches used in periodontal systematic reviews that included meta-analysis (n = 159) and found that risk of bias assessments varied greatly among the reviews. Because the investigators performed that study in 1 dental specialty only and restricted it to reviews with meta-analysis, clinicians cannot generalize the findings to reviews in other dental specialties. Consequently, whether the authors of systematic reviews of therapeutic oral health interventions more frequently assess the risk of bias of trials and which factors of systematic reviews are associated with risk of bias are still largely unknown. Thus, our objectives for this study were to describe the approaches used by systematic reviewers of oral health interventions for assessing the risk of bias of trials and to identify potential factors associated with performing risk of bias assessment as they relate to dental specialty and publication source.

METHODS

We conducted comprehensive searches of the literature in 6 electronic databases (PubMed, MEDLINE, Embase, Web of Science, Cochrane Database of Systematic Reviews [Evidence-Based Medicine Reviews], and Ovid HealthSTAR) from databases' inceptions to May 2014. We planned the search strategy with the assistance of a health sciences librarian and included a combination of index terms and key words relating to systematic reviews and oral health. The search strategy for MEDLINE can be found in the eTable (available online at the end of this article); we adapted the search using controlled vocabulary for each database. In addition, we searched the American Dental Association (ADA) Evidence-based Dentistry database (http://ebd.ada.org/en/evidence/systematic-reviews/) and hand searched the reference lists of potentially relevant studies that focused on the quality of systematic reviews in oral health that we identified in the main search. We did not limit the searches to articles written in the English language nor did we restrict the search with other limitations.

We included systematic reviews that examined a therapeutic intervention related to dental, oral, or craniofacial diseases as defined by the ADA scope of practice.[15] We considered a report to be a systematic review if the authors summarized the evidence from individual studies and reported methods to search, identify, and evaluate the evidence.[16]

Two reviewers (either H.S. and T.K. or H.S. and S.A.) independently screened the titles and abstracts retrieved from the search strategy. We retrieved for full screening the full text of relevant systematic reviews and articles with insufficient information in the abstract. Two independent reviewers (either H.S. and T.K. or H.S. and S.A.) determined the final eligibility of full texts, with disagreements resolved through consensus. We created a flow diagram of study selection according to the PRISMA statement (Figure 1).[3]

Two reviewers (H.S., S.A.) classified relevant systematic reviews into the following dental specialties by adapting the ADA definitions[15]: dental public health, oral and maxillofacial radiology, endodontics, oral medicine and pathology, orthodontics and dentofacial orthopedics, oral and maxillofacial surgery, periodontics, pediatric dentistry, restorative dentistry, and prosthodontics. We adapted the ADA definition[15] by adding oral medicine topics to "oral and maxillofacial pathology" and restorative dentistry topics to "prosthodontics."

We extracted the following data elements from the systematic reviews: publication year, type of review (Cochrane versus non-Cochrane), journal of publication (dental versus nondental; we classified Cochrane reviews as being in dental publications), journal impact factor, and which methodological quality tool, risk of bias assessment tool, or both, were used. We tested double data extraction on a random sample of 20% of the reviews to assess the completeness and accuracy of the data extraction; we resolved any discrepancies by consensus.

To describe the pool of systematic reviews included, we conducted descriptive analyses (that is, proportions and percentages for categorical data such as risk of bias assessment, and mean and standard deviations [SD] or

ABBREVIATION KEY. **ADA:** American Dental Association. **GRADE:** Grading of Recommendations Assessment, Development and Evaluation. **PRISMA:** Preferred Reporting Items for Systematic Reviews and Meta-analyses.