



## Editorial

# The scientific steps required in performing meta-analyses

Mohan Kumar P<sup>1</sup>\*

<sup>1</sup>Dept. of Periodontics, Vishnu Dental College, Bhimavaram, Andhra Pradesh, India



## ARTICLE INFO

### Article history:

Received 05-03-2024

Accepted 20-03-2024

Available online 28-03-2024

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](#), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: [reprint@ipinnovative.com](mailto:reprint@ipinnovative.com)

The increasing growth of medical and dental data makes it nearly challenging for professionals in the medical field for studying and assessing all essential information in order to come up with informed decisions. By means of meta-analyses, investigators can impartially and quantitatively combine findings from many investigations to enhance the statistical potency and accuracy in effect estimation.

In order to produce insightful results, writing a meta-analysis in the medical and dental sciences necessitates using a methodical approach to gathering and evaluating previous research data. By outlining the scientific steps involved in performing meta-analyses, this editorial page provides physicians and researchers with some basic knowledge guidelines for meta-analyses.<sup>1</sup>

## 1. Formulate the Research Question

Clearly state the hypothesis or research question that your meta-analysis seeks to answer. Make sure it is answered based on the body of existing literature, particular, and relevant.

## 2. Protocol Development

Create a comprehensive protocol that describes the steps involved in carrying out the meta-analysis. This should contain the search strategy, data extraction techniques,

statistical analysis methodology, and inclusion/exclusion criteria for the study.

## 3. Literature Search

To find pertinent research, conduct a thorough literature search across several databases (such as PubMed, Scopus, and Web of Science). Use relevant search terms and filters to make sure the results are thorough.

## 4. Study Selection

Screen the found studies by using predetermined inclusion and exclusion criteria. Based on factors like study design, population characteristics, intervention/exposure, outcome measures, and publication status, determine if each study is eligible.

## 5. Data Extraction

Create a standardized data extraction form to gather pertinent data from all included studies in a methodical manner. This could contain information about the study's design, participant demographics, exposure and intervention specifics, outcome measurements, and effective sizes.

## 6. Quality Assessment

Assess the standard of the method used and risk of bias in the research being reviewed using the appropriate

\*Corresponding author.

E-mail address: [mosups@gmail.com](mailto:mosups@gmail.com) (Mohan Kumar P).

instruments or checklists (for example, the Newcastle-Ottawa Scale as well as the Cochrane Risk of Bias Tool). Take into account elements like sample size, blinding, randomization, study design, and confounding variable control.

## 7. Data Synthesis

Compile the findings of several research using statistical techniques to determine the total effect magnitude. Depending on the degree of study heterogeneity, select between fixed-effects and random-effects models. Utilising statistical methods like the  $I^2$  statistic and Cochran's Q test, evaluate heterogeneity.<sup>2,3</sup>

## 8. Subgroup Analysis

Subgroup analyses should be carried out to investigate possible causes of heterogeneity depending on study features, such as study design, population demographics, and type of exposure or intervention. This can clarify heterogeneity and help find subgroup effects.

## 9. Sensitivity Analysis

Analyse subsets of research based on specific criteria or examine the impact of eliminating studies one at a time to determine the robustness of the results using sensitivity analysis.

## 10. Publication Bias Assessment

Assess the probability of biased reporting using methods such as Egger's regression test, Begg's rank correlation test, or funnel plot analysis. Investigations with favourable outcomes have a greater probability to be published compared to those with unfavourable or null outcomes, which is known as publication bias.

## 11. Interpretation of Results

Examine the meta-analysis's conclusions in light of the research query and the studies that were used. Talk about the potential sources of bias, limits, and clinical or practical

repercussions. Emphasize topics requiring additional study.

## 12. Manuscript Writing

Write your document with an abstract, introduction, methodology, findings, discussion, and conclusion, following the format of a conventional scientific paper. Respect the meta-analysis reporting criteria (such as the PRISMA statement) to guarantee accuracy and comprehensiveness.

## 13. Peer Review and Revision


Consult with colleagues or subject matter experts for comments, then make necessary revisions to your manuscript. Send in your meta-analysis for publication to a peer-reviewed journal.

These criteria can be followed to perform a thorough and insightful meta-analysis within the fields of healthcare and dental disciplines, where scientific proof is regarded as decisive due to the fact that it is at the highest level of the hierarchy of evidence.

## References

1. Wang XM, Zhang XR, Li ZH, Zhong WF, PYang, Mao C, et al. A brief introduction of meta-analyses in clinical practice and research. *J Gene Med*. 2021;23(5):e3312. doi:10.1002/jgm.3312.
2. 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. *Int J Surg*. 2021;88:105906. doi:10.1016/j.ijsu.2021.105906.
3. Tawfik GM, Dila KA, Mohamed MY, Tam DN, Kien ND, Ahmed AM, et al. A step by step guide for conducting a systematic review and meta-analysis with simulation data. *Trop Med Health*. 2019;47:1–9.

## Author biography

**Mohan Kumar P**, Associate Professor  <https://orcid.org/0000-0001-7797-1890>

**Cite this article:** Mohan Kumar P. The scientific steps required in performing meta-analyses. *International Dental Journal of Student's Research* 2024;12(1):1-2.