

Evidence-Based Orthodontics

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The modern era in medicine and dentistry is based upon the evidence-based understanding of etiopathogenesis, diagnostic protocols, management, and predictive models. The evidence in any field comes from the existing primary studies through the various evidence-based approaches. One of the most popular and important modalities is the systematic reviews with or without meta-analysis. A systematic review is a method to evaluate the evidence for any focused research question through a pre-decided strategy of systematic literature search, data extraction and analysis, quality analysis, and clear presentation of findings. It is usually done by a team of reviewers with at least one of them being the subject expert. It differs from the narrative reviews which are usually opinionated, lack the focused questions, and don't have an a priori protocol.

Orthodontics is one of the first branches of dentistry that endorsed the EBD and even has two major textbooks titled the same. It must however be understood that the evidence in different domains of clinical orthodontics and its subdomains are not uniform. Some of the more researched areas such as accelerated orthodontics and biomechanical aspects have the availability of high-quality systematic reviews which are often based upon high-quality study designs such as randomized controlled trials. On the contrary, fields such as epidemiology and etiopathogenesis, and cleft orthodontics have heterogeneity in methods and designs, resulting in variability in the outcomes, and have a detrimental effect on the quality of evidence. There are also certain areas such as digital orthodontics and machine learning which are emerging and lack the adequate number of primary studies to perform systematic reviews.

When starting a systematic review, the first step is always the formulation of a research question that is based on a relevant knowledge gap. It is recommended that these questions clearly define the Population (P), Intervention/Exposure (I/E), Comparator (C), and outcome (O) elements. Additionally, it is important

for a researcher to be aware of the works that have been done or are in progress in the intended area of a discipline. Hence, evidence-based dentistry often becomes the starting point of several types of original research studies too. Usually, a scoping search using limited "trial" keywords is performed on PubMed and the retrieved records are analyzed in terms of the type of studies and their aims. If the research group finds the study designs higher than case reports or series, it is usually recommended to perform a systematic review to answer the desired research question. The next step is to formulate a research group with at least one subject expert, that discusses the various aspects of a protocol and registers it in registries such as PROSPERO: An International Register of Systematic Review Protocols, Joanna Briggs Institute (JBI), Open Sciences Framework, or Cochrane database. This document serves as the reference strategy for the entire research project and later for the peer reviewers and readers to assess the published paper. The protocol contains the details of the search strategy, databases to be searched, selection criteria, data extraction, the variables to be extracted, outcomes, risk of bias, data analysis, and data presentation. All protocols must also provide strategies for quality assurance by minimizing the bias at each step such as avoiding any limitation of language or year of publication during the search, and ensuring that two authors independently perform each of the above-mentioned steps with their inter-reviewer agreement measured by using Cohen's Kappa analysis. The considerations for resolving the disagreements that arise at any step should also be mentioned. Finally, after collecting the data, the recommendations of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement are followed to report it in the form of a manuscript. Meta-analysis and systematic reviews are used interchangeably. However, a fundamental difference between the two is that the meta-analysis is always preceded by a systematic review and cannot be done independently. The lack of variability in the inclusion and outcome assessment

during a systematic review can support the case for performing a meta-analysis.

There has been an increase in the number of systematic reviews being published in different specialties of dentistry including orthodontics. This gives a false sense of completeness of evidence to the readers who have inadequate knowledge about the critical appraisal of systematic reviews. For example, in one of our works related to evidence mapping of quality analysis of systematic reviews in dental traumatology, we observed that a lot of papers could be categorized in the domains of therapeutics and the prognostic domain while the domains of prevention, research methods, and oral biology were largely ignored. When a similar work was performed in the field of cleft lip and palate, a total of 144 systematic reviews could be identified but a majority of them were rated as low or critically low quality as per AMSTAR-2 and high risk of bias as per ROBIS. These futuristic methods such as evidence mapping, overview of systematic reviews, and meta-synthesis are the most recent advancements in evidence-based medicine. They are aimed to summate the evidence of systematic review works and address any existing ambiguity in their conclusions. The field of orthodontics is still largely untouched by these paradigms and can be an area of interest for researchers.

In our experience, there are three main phases of gaining experience in this rewarding field. The first is acquiring adequate training either through workshops

or courses. A lot of information is available online as well for self-learning. Since the details are different from the usual research methodology, it usually takes some time and revision to assimilate it. The next step is to develop a team that can assist you in the different steps of a systematic review as mentioned above. This may include researchers experienced in drafting a search strategy, subject experts, and someone who understands the statistical aspects of meta-analysis. In the post-COVID-19 era, the world has come closer and you can contact and collaborate with any research group globally. Often, doing the first few works with an experienced mentor also helps in overcoming the roadblocks and gaining confidence. The third and most important phase is the practical application of this knowledge. The simplest way is to critically analyze the published works as a personal exercise or as part of an academic journal club program. In the past 3 years, we have had a fair amount of success in publishing systematic reviews in high-impact international journals, which have resulted in the start of several well-designed original research studies at CDER AIIMS, New Delhi, and other centers in the world, yet we believe that our works are still evolving. As you start a journey of working on a systematic review project, you shall get better and more confident with every problem, roadblock, struggle, rejection, reviewer's comments, and publication. It is definitely worth a ride and the countless hours spent on such an enriching paradigm are bound to enhance your research acumen as well.