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INPLASY

ADVANCED NANOPARTICLE-BASED ANTIBACTERIAL DELIVERY FOR ENDODONTIC DISINFECTION: A SYSTEMATIC REVIEW AND META-ANALYSIS

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ADMINISTRATIVE INFORMATION

Support - King Khalid University.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202550021

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 10 May 2025 and was last updated on 10 May 2025.

INTRODUCTION

Review question / Objective Evaluate the antibacterial efficacy and clinical applicability of nanoparticle-based delivery systems compared to conventional treatments for endodontic disinfection.

Rationale Conventional irrigants fail to eliminate biofilms in complex root canal systems whereas nanoparticles offer superior penetration and biofilm disruption.

Condition being studied Endodontic infections caused by biofilms in root canals leading to treatment failure and persistent apical periodontitis.

METHODS

Search strategy Databases (PubMed, Embase, Scopus, Web of Science, Cochrane Library, Google Scholar) searched using keywords: "endodontic," "nanoparticle," "antimicrobial,".

Participant or population In vitro models, animal models, and human patients undergoing root canal treatment.

Intervention Nanoparticle-based irrigants, medicaments, or coatings for disinfection.

Comparator Conventional treatments like NaOCl, EDTA, etc.

Study designs to be included In vitro, ex vivo, animal studies, clinical trials.

Eligibility criteria English studies evaluating NPs for disinfection with antibacterial outcomes; excluded reviews or non-biological studies.

Information sources Databases, trial registries like ClinicalTrials.gov, conference proceedings, and reference lists.

Main outcome(s) Bacterial elimination, biofilm disruption, smear layer removal, dentinal penetration.

Additional outcome(s) Safety, clinical outcomes, physicochemical properties.

Data management Dual-reviewer extraction using standardized Excel templates; PRISMA 2020 guidelines.

Quality assessment / Risk of bias analysis Cochrane RoB 2, SYRCLE, and qualitative assessment.

Strategy of data synthesis Qualitative synthesis by NP type; meta-analysis (random-effects model) for OR and mean differences.

Subgroup analysis By NP type, comparator, and study model; limited by heterogeneity.

Sensitivity analysis Excluding high-risk studies and testing alternative statistical models.

Language restriction Only studies published in English included.

Country(ies) involved Saudi Arabia, India.

Other relevant information None.

Keywords Nanoparticles, Endodontic Disinfection, Root Canal, Antimicrobial, Systematic Review, Meta-analysis.

Dissemination plans To be published in Peer-reviewed publication, and academic networks to inform guidelines.

Contributions of each author

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