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Comparative effectiveness of herbal and conventional oral care interventions for plaque-induced gingivitis: a systematic review and network meta-analysis protocol

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ADMINISTRATIVE INFORMATION

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

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 5 October 2026 and was last updated on 5 October 2026.

INTRODUCTION

Review question / Objective To evaluate and compare the effectiveness of herbal and conventional oral-care interventions for plaque-induced gingivitis using systematic review and network meta-analysis. The primary outcome is gingival inflammation, while plaque accumulation and gingival bleeding are secondary outcomes. The review compares eligible interventions including chlorhexidine, Aloe vera, chamomile, Nigella sativa/thymoquinone and other oral-care agents through direct and indirect evidence from randomized controlled trials.

Rationale Previous systematic reviews and network meta-analyses have evaluated chemical and natural oral-care agents, but uncertainty remains regarding the relative effectiveness of individual formulations and the validity and applicability of indirect comparisons. Network meta-analysis allows integration of direct and indirect evidence across multiple interventions through common comparators, provided that

assumptions of transitivity and consistency are adequately considered. This review therefore evaluates comparative effects while interpreting treatment rankings alongside effect estimates, uncertainty and clinical differences among trials.

Condition being studied Human participants with plaque-induced gingivitis without active periodontitis. Studies including participants with active periodontitis were excluded unless an eligible gingivitis subgroup was separately randomized.

METHODS

Search strategy ("Gingivitis" OR gingivitis OR "gingival inflammation" OR "gingival bleeding") AND ("Thymoquinone" OR "thymoquinone" OR "Nigella sativa" OR "black seed" OR "Chamomile" OR "Matricaria chamomilla" OR "German chamomile" OR "Aloe vera" OR "Aloe barbadensis" OR "aloe vera").

Participant or population Human participants with plaque-induced gingivitis without active periodontitis. Studies including participants with active periodontitis were excluded unless an eligible gingivitis subgroup was separately randomized.

Intervention Eligible interventions included oral-care formulations containing chlorhexidine, Aloe vera, chamomile/Matrica, Triphala, green tea, Nigella sativa or thymoquinone, Ocimum sanctum, tea tree oil, pomegranate, probiotics, povidone-iodine, chlorine dioxide or fluoride. Eligible delivery forms included mouthwashes, toothpastes and other relevant topical oral-care formulations.

Comparator Another eligible intervention, standard care or placebo. Professional cleaning and oral-hygiene instruction were required to be comparable across study arms.

Study designs to be included Randomized controlled trials. Nonrandomized studies were excluded.

Eligibility criteria Randomized controlled trials (RCTs) involving human participants with plaque-induced gingivitis were eligible for inclusion. Participants could have mild, moderate, severe, or generalized gingivitis. Studies involving participants with active periodontitis were excluded unless data from a separately randomized gingivitis subgroup could be extracted.

Eligible studies evaluated oral-care interventions administered as mouthwashes, toothpastes, or other topical formulations, including herbal or conventional agents, and compared them with another eligible intervention, placebo/vehicle, standard care, or control. Professional cleaning and oral-hygiene instructions were required to be comparable between treatment groups.

Studies were required to report at least one validated clinical outcome related to gingival inflammation, dental plaque, or gingival bleeding, with sufficient extractable data for quantitative analysis, including sample size and measures of central tendency and variability.

Non-randomized studies, studies involving non-plaque-induced gingival inflammation, studies of active periodontitis without a separately extractable eligible subgroup, studies with unequal co-interventions between groups, and studies without extractable clinical outcome data were excluded.

Information sources PubMed, Scopus and Web of Science were searched from database inception to October 2025. No search restrictions were reported.

Main outcome(s) Gingival inflammation, primarily assessed using the Löe–Silness Gingival Index.² Plaque accumulation, primarily assessed using the Silness–Löe Plaque Index, and gingival bleeding, including percentage of sites bleeding on probing where reported.

Quality assessment / Risk of bias analysis Two reviewers independently assessed risk of bias using the Cochrane Risk of Bias 2 (RoB 2) tool, covering the randomization process, deviations from intended interventions, missing outcome data, outcome measurement and selection of the reported result. Judgments were categorized as low risk, some concerns or high risk, with disagreements resolved by discussion.

Strategy of data synthesis A frequentist random-effects network meta-analysis was performed using R version 4.4.2 and the netmeta package. Direct and indirect evidence was combined with placebo as the reference treatment. Mean differences (MDs) with 95% confidence intervals were calculated for continuous outcomes. Network diagrams and forest plots were used to summarize network structure and treatment effects. Treatment rankings were summarized using SUCRA values and P-scores. Heterogeneity and between-design inconsistency were evaluated using variance and Q statistics, and node-splitting assessments were also considered. The gingival-index synthesis targeted approximately four weeks, while the plaque-index synthesis used a 21–35-day window.

Subgroup analysis No subgroup analysis was performed.

Sensitivity analysis No sensitivity analysis was performed.

Country(ies) involved Saudi Arabia.

Keywords gingivitis; network meta-analysis; chlorhexidine; Aloe vera; thymoquinone; Nigella sativa; chamomile; plaque index.

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