Effect of dental treatments on reduction of preterm birth: a systematic review and meta-analysis

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OBJECTIVE: Periodontal disease is associated with increased risk of preterm birth. Effective management during pregnancy may reduce preterm birth, though clinical trial evidence has been inconsistent. This study aimed to assess whether treating dental disease during pregnancy reduces preterm birth.

DATA SOURCES: A systematic search was performed of EMBASE, MEDLINE, PubMed, Cochrane Library, and trial registries up to December 2023 and re-run in January 2025.

STUDY ELIGIBILITY CRITERIA: Randomized controlled trials (RCTs) enrolling pregnant persons with any dental disease randomized to receive dental treatment vs no treatment were included. No language restriction was applied.

STUDY APPRAISAL AND SYNTHESIS METHODS: Data were independently extracted by two researchers and assessed for risk of bias using the Cochrane Risk of Bias tool, RoB 2. A random effect meta-analysis was performed with the Mantel—Haenszel variance estimate. Certainty of evidence (COE) was assessed using GRADE. The main outcome was preterm birth (<37 weeks' gestation). Data on low birth weight were also collected.

RESULTS: Fourteen RCTs (8316 participants) were included. Interventions included scaling and root planing (SRP) alone (8 RCTs), SRP with chlorhexidine mouthwash (4 RCTs), and cetylpyridinium chloride mouthwash (2 RCTs). Meta-analysis and GRADE assessment found moderate-certainty evidence suggesting that periodontal treatment results in a 15% relative risk reduction of preterm birth (risk ratio [RR] 0.85; 95% CI 0.71—1.02) compared to minimal periodontal treatment or no treatment (absolute difference 20 fewer preterm births per 1000 individuals; 95% CI from 39 fewer to 3 more). It is uncertain whether the addition of chlorhexidine mouthwash to SRP reduces preterm birth rates (RR 0.49, 95% CI 0.23—1.04, very low COE).

CONCLUSION: This meta-analysis, the largest and most up-to-date on this topic, suggests that treating periodontal disease during pregnancy may reduce the risk of preterm birth. However, limitations, such as the risk of bias and variations in populations and treatment, highlight the need for well-powered RCTs with low risk of bias to evaluate the most effective dental treatment strategies. Future studies should focus on established dental disease severity and explore different dental treatment strategies, including antimicrobial mouthwash.

El resumen está disponible en Español al final del artículo.

Key words: chlorhexidine mouthwash, dental disease, gingivitis, periodontitis, prematurity, preterm birth, scaling and root planing

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C.T. and S.A. contributed equally to this work and should be considered as co-first authors.

This study was registered with the International Platform of Registered Systematic Review and Meta-analysis Protocols (INPLASY) on December 30, 2023, with registration number: 2023120117, https://inplasy.com/inplasy-2023-12-0117/. The study was accepted as a poster presentation at the 2025 SMFM Pregnancy Meeting by the Society for Maternal-Fetal Medicine, Denver, Colorado, January 30 to February 1, 2025.

Tweetable Statement: Treating periodontal disease during pregnancy may reduce the risk of preterm birth, although more evidence is needed to evaluate the most effective types of treatment and the role of adjuvant therapies, including antimicrobial mouthwash.

Conflicts of Interest: Given their role as Editor-in-Chief, Vincenzo Berghella had no involvement in the peer-review of this article and has no access to information regarding its peer-review. Full responsibility for the editorial process for this article was delegated to another journal editor. All other authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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AJOG MFM at a Glance

Why was this study conducted?

Dental disease is associated with increased risk of preterm birth. Effective management during pregnancy may reduce preterm birth, though clinical trial evidence has been inconsistent.

Key findings

Results suggest that treating periodontal disease with scaling and root planing during pregnancy may reduce the risk of preterm birth. It is uncertain whether adding chlorhexidine mouthwash to scaling and root planing decreases the risk of preterm birth.

What does this add to what is known?

This is the largest and most up-to-date review on preterm birth and periodontal disease treatments, and the only one to comprehensively assess all dental conditions and treatments. A well-designed randomized controlled trial is needed to evaluate the most effective dental treatment strategies, including the role of antimicrobial mouthwash.

Introduction

Preterm birth, defined as delivery before 37 weeks of gestation, is a global health issue, affecting approximately 10% of all births worldwide[1] and contributing to neonatal mortality and morbidity.[2–4] Preterm birth is an obstetrical syndrome with multiple etiologies,[5] including infection and inflammatory mediators, which are established contributors to spontaneous preterm birth.[1,6,7] Despite extensive research, progress in reducing preterm births in the past decade has been limited.[8]

Primary prevention focuses on mitigating risk factors before complications arise, such as lifestyle changes, management of chronic conditions, and infection control. Emerging evidence suggests that oral infections, particularly periodontal disease, may significantly increase preterm birth risk.[9] Periodontal disease, including gingivitis and periodontitis,[10] is thought to contribute to preterm birth through two mechanisms: the translocation of periodontal pathogens to the intraamniotic cavity and systemic inflammatory responses mediated by cytokines like IL-1, IL-6, IL-8, TNF-α, and prostaglandin E2.[11–13]

Periodontal disease is common among individuals of reproductive age[14,15] and can worsen during pregnancy due to hormonal changes affecting the gingival mucosa.[15] Recent estimates suggest that up to 40% of pregnant individuals

EDITOR'S CHOICE

experience periodontitis.[14] Standard treatments for periodontitis outside of pregnancy include oral hygiene counselling and mechanical debridement (scaling and root planing, SRP), and if necessary, surgical interventions.[16] Antimicrobial mouthwashes such as chlorhexidine and cetylpyridinium chloride (CPC), and antibiotics may also be used adjunctively.[17,18] These treatments aim to target inflammation, potentially reducing preterm birth.[19–23]

Several clinical trials have examined the impact of dental treatment on preterm birth rates, with inconsistent results. A 2017 Cochrane review concluded that it is not clear if periodontal treatment during pregnancy has an impact on preterm birth (low quality evidence).[24] Importantly, two additional randomized controlled trials (RCTs) have been published since the 2017 Cochrane review.[25,26] A recent meta-analysis also suggests that chlorhexidine mouthwash may be a source of heterogeneity in the 2017 Cochrane review.[27] A subgroup meta-analysis by chlorhexidine use found no significant reduction in preterm birth rate from SRP alone, though some benefit was noted with adjunctive chlorhexidine mouthwash.[27]

Objective

This study aimed to systematically review and evaluate the impact of periodontal treatments during pregnancy on preterm birth rates, integrating the latest evidence, to provide clearer conclusions.

Methods

The study protocol was registered with INPLASY prior to data collection (2023120117) on December 30, 2023. It followed the PRISMA (Preferred Reporting Item for Systematic Reviews and Meta-analysis) reporting guideline.[28]

Eligibility criteria, information sources, and search strategy

We included RCTs that compared pregnant individuals with any dental condition undergoing dental treatments at any stage of pregnancy vs no treatment or minimal dental interventions. We excluded studies in which dental treatments were provided prior to conception,[29] as well as studies focusing solely on at-risk pregnant individuals with threatened preterm labor[30–32] or pre-eclampsia.[33]

The search strategy was reviewed according to the Peer-Reviewed Electronic Search Strategies (PRESS) 2015 guidelines[34] (Supplemental File 1) and performed in collaboration with a professional librarian. The following databases were searched from inception until December 2023: MEDLINE, EMBASE, PubMed, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Web of Science, Global Index Medicus, Google Scholar, International Prospective Register of Systematic Reviews (PROSPERO), ClinicalTrials, International Clinical Trials Registry Platform, and International Standard Randomized Controlled Trial Number Registry (ISRCTN). The search was re-run on January 8, 2025. The reference lists of all included studies were also screened for relevant studies. No language restrictions were applied.

Study selection

Two authors (SA, CT) independently screened titles and abstracts and reviewed independently and in duplicate selected full-text articles. Non-

English language publications were translated to English by medical experts fluent in the respective languages.

Data extraction

Two authors (SA, CT) collected data on study design, participant characteristics, dental indicators, and pregnancy-related outcomes on a comprehensive data extraction sheet. Disagreements were settled by discussion and consensus or through adjudication with additional authors (VB, SR). The main outcome was preterm birth (<37 weeks' gestation or as reported by study authors). As per the study protocol, additional outcome data were also collected on low birth weight (<2500 g), spontaneous abortions, stillbirths, neonatal deaths, and preeclampsia.

Assessment of risk of bias

Two authors (SA, CT) independently evaluated the risk of bias assessments for the studies, using the Cochrane Risk of Bias (RoB 2.0) tool,[35] seeking guidance from senior authors (VB, SR), in case of disagreement. Overall risk of bias was classified as "low" when all domains were graded as low risk, "some concerns" if at least one domain raised some concerns, but none were at high risk, and "high" if any domain was judged as high risk. We further subdivided "some concerns" judgments into "some concerns, probably high" and "some concerns, probably low." Studies were classified as having a high overall risk of bias if any domain was rated as high or probably high.

Data analysis

We analyzed outcomes using the intention-to-treat principle and pooled effect estimates with R version 4.3 (R Core Team 2021). Methodological, clinical, and statistical heterogeneity between the studies were considered, and we applied a random-effects model[36] for the meta-analysis of all outcomes. The Mantel −Haenszel method of weighting was employed to analyze and combine the data for the outcomes.[37] The risk ratio (RR) was chosen to report effect estimates, along with 95% confidence intervals for all outcomes, as all outcomes were dichotomous. When a study reported zero events in either the treatment or control arm, we assigned a value of 0.5 to that arm and calculated the RR accordingly. To address statistical heterogeneity, we performed a subgroup analysis to explore how study bias might influence the outcome, based on their risk classification from the RoB 2.0 tool (high vs low risk of bias studies).[35] Additionally, we conducted subgroup analysis of studies based on types of interventions and types of dental diseases. Publication bias was assessed through visual inspection of funnel plots[35] and Egger's regression test[38] for publication asymmetry when at least 10 studies were included in the outcome or its subgroups.

We assessed the certainty of evidence (COE) using the Grading of Recommendation, Assessment, Development, and Evaluation (GRADE) approach.[39] This approach provides a rigorous and reproducible assessment of the COE. Initially, evidence from the RCTs was rated as high certainty but this rating was adjusted based on confidence in key domains such as risk of bias, indirectness, inconsistency, imprecision, and publication bias.[39] Outcomes were then classified as having very low, low, moderate, or high certainty in line with GRADE protocols.[39] Heterogeneity (inconsistency) was evaluated by comparing point estimates, examining the overlap of confidence intervals, and using both the χ^2 test and the I^2 statistic. A minimally contextualized approach based on the null threshold for rating certainty was used.[40] The anticipated absolute effect was derived using the GRADEpro software, which integrates baseline risk estimates and relative effect measures rather than simple proportion calculations.[41] This approach ensures a more accurate estimation of the expected clinical impact. An absolute risk reduction of 1% was considered clinically meaningful for the main outcome of preterm birth.

All studies were assessed for adherence to the trustworthiness criteria outlined by the OBGYN Editors' Integrity Group.[42] This rigorous screening elevates the integrity and credibility of studies, to ensure that only methodologically sound, transparently reported, and ethically conducted trials—free from retraction or major concerns—contribute to the pooled estimates. Studies that did not meet absolute trustworthiness criteria were excluded from the analysis (Supplemental File 2).

Results

Study selection

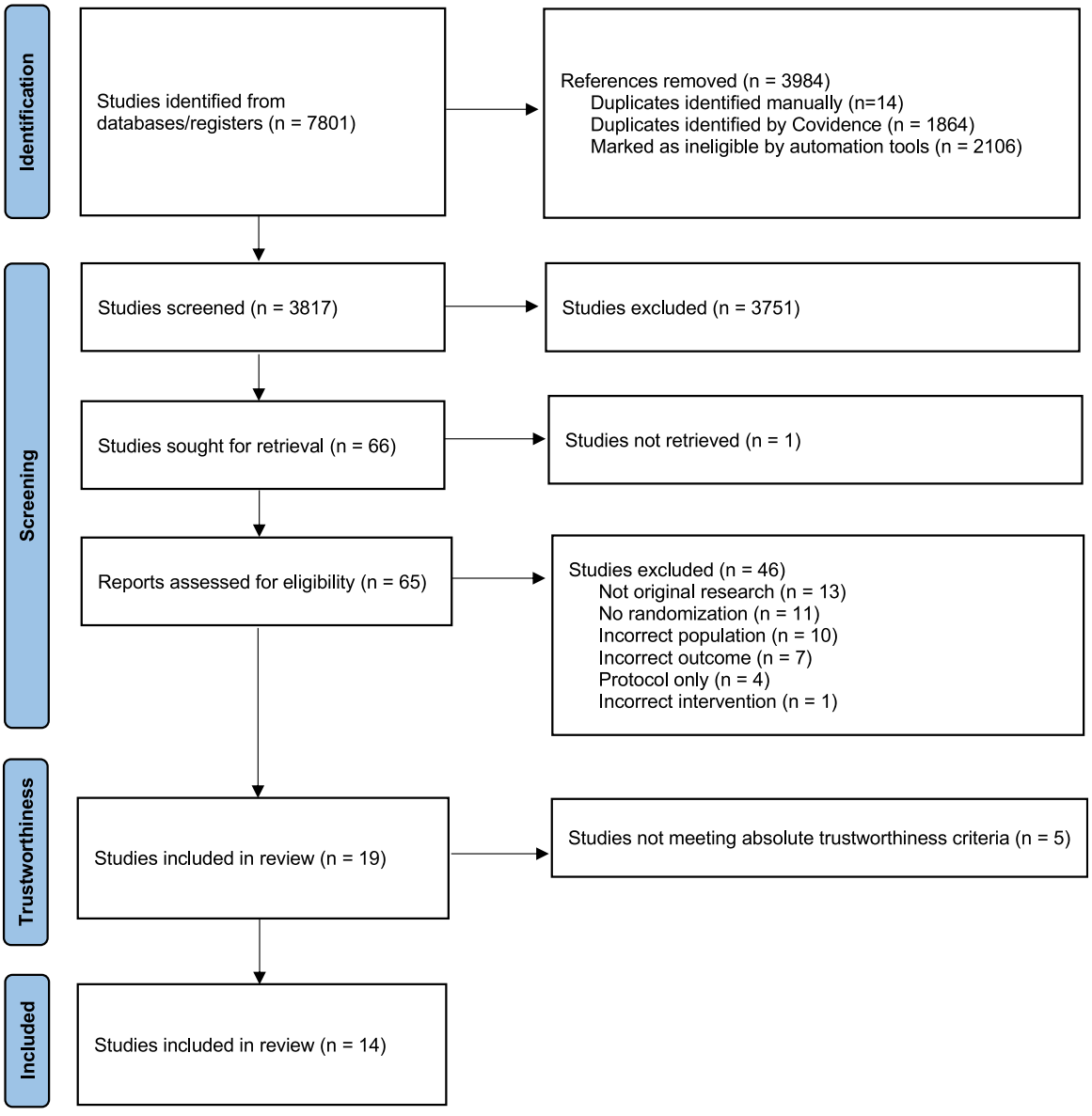
The search retrieved 7801 studies. Studies were screened independently by two authors (SA, CT) to remove duplicates, ineligible studies, and those not meeting inclusion criteria. Of note, six studies were excluded as they were secondary analyses or subgroup analyses of data from trials already included in the review: three[43−45] were secondary analyses of the Obstetrics and Periodontal Therapy (OPT) Study,[46] one[47] analysis of safety data from the OPT study, one[48] secondary analysis of the Maternal Oral Therapy to Reduce Obstetric Risk (MOTOR) Study,[49] and one study[50] was excluded because it was a subgroup analysis of the trial by Newnham et al[51] (Supplemental File 3, Supplemental Tables S1 and Table S2).

Following screening, 19 studies were assessed for trustworthiness, and five were excluded for not meeting absolute trustworthiness criteria (Supplemental File 2).[22,26,52−54] All studies included in the final analysis were appropriately registered in a clinical trials registry (registration date prior to enrollment of first participants), and none of the included studies had been retracted. In total, 14 RCTs were included in the systematic review, with a total of 8316 participants—4373 in the treatment arm and 3943 in the comparator arm (Figure 1).

Study characteristics

Table 1 summarizes the characteristics of the included studies. All RCTs were open-label except for one double-blinded study.[55] Control participants either received no treatment[20,21,23,25,46,49,51,56−58] or were minimally treated.[19,55,59,60] The total number of participants ranged from 99[60] to 1806.[49] Seven studies were conducted in the United States,[19,25,46,49,55,56,59] two in Chile,[20,21] and one in each Australia,[51] Brazil,[58] China,[57]

FIGURE 1
PRISMA flowchart for the systematic review



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India,[23] and Northern Ireland.[60] The studies were published between 2002[20] and 2023.[25] Four studies were multicenter trials,[25,46,49,59] and the others were single-center trials.

Our search strategy included all types of dental disease; however, the studies retrieved and ultimately included in our review targeted only those with periodontal disease. Definitions and severity of periodontal disease varied across studies (see Supplemental File 3, Supplemental Table S3). All studies provided data on baseline dental status, ranging from mild to severe. In three studies, participants in the treatment groups had significantly worse baseline dental health than those in the control groups.[19,57,58] Baseline dental status was not directly comparable amongst studies due to inconsistencies in definitions. Similarly, it was not possible to classify periodontitis severity according to the American Academy of Periodontology criteria,[10] due to inconsistent definitions (eg, combining severe and milder forms), which limited meaningful categorization.

Exclusion criteria included multifetal gestations[19,20,23,25,46,49,51,58,60]; systemic conditions or comorbidities[19,21,23,25,49,51,56–60]; recent antibiotic use[23,25,55,56,58,59]; conditions requiring antibiotic prophylaxis prior to dental treatment[20,46,49,51,58,60]; recent periodontal treatment[19,51,55,56,58,59]; and severe dental conditions requiring urgent treatment.[19,46,56,57,60]

Participant characteristics

Supplemental File 3, Supplemental Table S4, summarizes participant characteristics. All studies reported maternal age, which ranged from 22 to 30 years. Maternal age was balanced between treatment and control groups in all but one study, where participants in the treatment group were slightly older than controls (mean age 28 vs 27 years old, P=.04).[20] Five studies did not report maternal ethnicity.[20,21,23,57,60] Studies conducted in the United States of America (USA) included a majority of participants identifying as "Black," "African American," or "Hispanic," with balanced representation between treatment and control groups. The proportion of Black or African American participants ranged from 38%[49] to 88%,[55,56,59]while Hispanic participants ranged from 8%[59] to 50%.[49] In one study, 90% of all participants had never seen a dentist.[56]

Ten studies provided data on prior preterm birth history,[19−21,25,46,49,51,55,59,60] ranging from 3%[60] to 80%,[19] with the latter study initially enrolling participants based on history of a previous preterm or low birth weight delivery. One study had a significantly higher rate of prior preterm birth in the control group compared to the treatment group (7.47% vs 3.44%, P=.009).[19]

Intervention

The interventions assessed in the studies varied and are detailed in Table 1. Interventions included SRP alone in 8 out of 14 studies.[19,46,49,55,56,58−60] All but one[59] of these studies also incorporated oral hygiene instructions, OHI.[19,46,49,55,56,58,60] Four studies combined SRP with OHI and chlorhexidine mouthwash,[20,21,23,51] and two others used OHI and CPC mouthwash.[25,57] One study examined two treatment arms: SRP plus metronidazole capsule (250 mg thrice daily for 1 week) and SRP plus placebo capsule.[55] Another study provided a course of metronidazole and amoxicillin for participants in the treatment group with severe periodontitis.[20] Where specified, treatment was administered before 28 weeks' gestation,[20,21,23,46,49,51,56,58,60] and specifically before 20 weeks' gestation in three studies.[51,56,58] Among the 12 studies providing SRP, only three studies reported the number or frequency of SRP sessions: one study provided two 1-hour SRP sessions[60] and two studies provided up to four SRP sessions.[46,49] Six studies included maintenance therapy every few weeks until delivery,[20,21,23,46,51,58] and eight studies included local or topical anesthetic in SRP sessions.[23,27,46,49,51,58−60] The control arms varied, including oral examination only or no treatment (n=6),[20,21,46,49,51,58] OHI with superficial cleaning (n=4),[19,55,59,60] and OHI alone (n=4).[23,25,56,57] Eight studies reported that dental treatment for the control arm was provided postpartum.[19,23,46,49,51,56,58,60]

All studies reported on preterm birth before 37 weeks' gestation, except for one study[56] that only reported preterm births before 35 weeks' gestation. One study did not specify the gestational age used[51]; however, the study authors were contacted and confirmed that the standard obstetrical definition of birth before 37 weeks' gestation was used.

Risk of bias of included studies

Figure 2 provides a summary of the individual evaluation of each RCT included in the meta-analysis based on the RoB-2.0 assessment tool. Among these studies, nine studies were assessed to have a low risk of bias,[25,46,49,51,55−57,59,60] while the remaining five were categorized as having high risk of bias.[19−21,23,58] The identified bias arose primarily from issues related to bias arising from the randomization process and bias due to deviations from intended interventions. See Supplemental Table S5 for further details on risk of bias assessment.

Synthesis of results

For the main outcome, this meta-analysis of 14 studies, which included 8316 participants, suggests that there may be a 15% reduction in preterm birth for those who received dental treatment in pregnancy compared with those who received minimal dental treatment or no treatment (RR 0.85; 95% CI 0.71−1.02; I^2=59%, moderate COE, Figure 3, Table 2). The absolute difference is 20 fewer preterm births per 1000 individuals (95% CI from 39 fewer to 3 more, Table 2). The COE was downgraded by one due to imprecision, reflecting that the 95% confidence interval narrowly crosses 1. The findings did not change significantly when sensitivity analysis was performed, excluding one study[55] that reported only preterm birth under 35 weeks gestational age rather than under 37 weeks. An analysis of all studies, including those not meeting absolute trustworthiness criteria, was also performed (RR=0.78; 95% CI 0.63−0.95; I^2=58%, very low COE, Supplemental File 4, Supplemental Figure S1). The COE was downgraded by three, due to risk of bias, inconsistency, and lack of trustworthiness. This analysis was performed for sensitivity testing only, and all subsequent analyses were performed using only the 14 studies meeting trustworthiness criteria.

Risk of bias assessment found that approximately one third of the studies had high risk of bias (n=5). A subgroup analysis was performed stratifying studies into "low risk of bias" and "high risk of bias" groups and did not find any benefit of dental treatment on preterm birth outcomes when including only studies at low risk of bias (RR 0.98; 95% CI 0.85−1.14, I^2=7%, Supplemental File 4, Supplemental Figure S2).

Subgroup analyses by type of dental treatment and type of periodontal disease were conducted to examine these variables as potential sources of heterogeneity, as per our original protocol. No clear reduction in preterm births was observed in the subgroup analysis of SRP alone (RR 0.96; 95% CI 0.82−1.13, I^2=23%, moderate COE, Table 2, Supplemental File 4, Supplemental Figure S3) or CPC mouthwash (RR 0.90; 95% 0.39−2.09, I^2=52%, moderate COE, Table 2, Supplemental File 4, Supplemental Figure S3). It is uncertain if addition of chlorhexidine to SRP is associated with a reduction in preterm birth (RR 0.49; 95% CI 0.23−1.04, I^2=78%, very low COE, Table 2, Supplemental File 4, Supplemental Figure S3). No clear reduction in preterm birth was observed by type of periodontal disease (Supplemental File 4, Supplemental Figure S4).

Visual inspection of the funnel plot[35] and Egger's regression test (t=−0.44; P value=.6694)[38] did not suggest any evidence of publication bias (Supplemental File 4, Supplemental Figure S5).

TABLE 1
Description of included studies

Study, country	Sample size, *N* (treated vs controls)	Inclusion criteria and gestation at recruitment	Intervention, timing, and frequency	Comparator
Jeffcoat et al, USA[55]	366 (123+120 vs 123)	Periodontitis 21–25 wk of gestation	(1) OHI+SRP+placebo capsules q8h for 1 wk (2) OHI+SRP +metronidazole 250 mg q8h for 1 wk At randomization, with as much time and as many visits as needed	OHI+supragingival scaling and rubber cup polish
Jeffcoat et al, USA[56]	322 (160 vs162)	Periodontitis 6–20 wk of gestation	OHI+SRP Before 20 wk with FU 20 wk after	OHI (planned postpartum SRP)
Jiang et al, China[57]	466 (232 vs 234)	Periodontitis age: ≥18 y <20 wk of gestation	OHI+0.7% CPC 30 s twice daily	OHI
López et al, Chile[20]	400 (200 vs 200)	Periodontitis age: 18–35 y 9–21 wk of gestation	OHI+SRP+mouth rinse (chlorhexidine) once daily timing: before 28 wk of gestation +maintenance every 2–3 wk	No treatment
López et al, Chile[21]	870 (580 vs 290)	Gingivitis age:18–42 y <22 wk of gestation	OHI+SRP+0.12% chlorhexidine rinse once daily before 28 wk +maintenance every 2–3 wk	No treatment
Macones et al, USA[59]	756 (376 vs 380)	Periodontitis 6–20 wk of gestation	SRP+polishing 2 wk after screening (average 16.5 wk of gestation), once	Polishing
Michalowicz et al, USA[46]	823 (413 vs 410)	Periodontitis age: >16 y <17 wk of gestation	OHI+SRP before 21 wk of gestation, monthly tooth polishing repeated up to 4 SRP sessions	No treatment (planned postpartum SRP)
Newnham et al, Australia[51]	1087 (546 vs 541)	Periodontitis age: >16 y 12–20 wk of gestation	OIH+SRP+mouth rinse (chlorhexidine) once daily before 20 wk of gestation 3 × weekly SRP sessions; repeated in 4 wk if unsuccessful	No treatment (planned postpartum SRP)
Offenbacher et al, USA[19]	109 (56 vs 53)	Periodontitis age: ≥18 y <22 wk of gestation	OHI+SRP before 22 wk of gestation, once	Supragingival debridement (planned postpartum SRP)
Offenbacher et al, USA[49]	1806 (903 vs 903)	Periodontitis age: ≥18 y <24 wk of gestation	OHI+SRP before 24 wk of gestation up to 4 sessions	No treatment (planned postpartum SRP)
Oliveira et al, Brazil[58]	246 (122 vs124)	Periodontitis Age:18–35 y 12–20 wk	OHI+SRP between 12 and 20 wk of gestation+ maintenance visits every 3 wk	No treatment (planned postpartum SRP)
Parry et al, USA[25]	746 (373 vs 373)	Gingivitis 8–24 wk of gestation	OHI+advanced oral hygiene regime+mouth rinse (cetylpyridinium chloride)	OHI
Pirie et al, Ireland[60]	99 (49 vs 50)	Periodontitis age: >18 y <22 wk of gestation	OHI+SRP before 24 wk of gestation 1 h session repeated twice	OHI+supragingival cleaning (planned postpartum SRP)
Tarannum and Faizuddin, India[23]	220 (120 vs 100)[a]	Periodontitis age: 18–35 y 9–21 wk of gestation	OHI+SRP+mouth rinse (chlorhexidine) twice daily before 28 wk of gestation, 4–5 weekly sessions; maintenance therapy until delivery	OHI (planned postpartum SRP)

OHI, oral hygiene instructions; *SRP*, scaling and root planning.

[a] 120 participants were allocated to the treatment group; however, only 100 participants actually received the treatment. We used 120 as the number of participants in the treatment group for our analysis, in accordance with intention-to-treat analysis.

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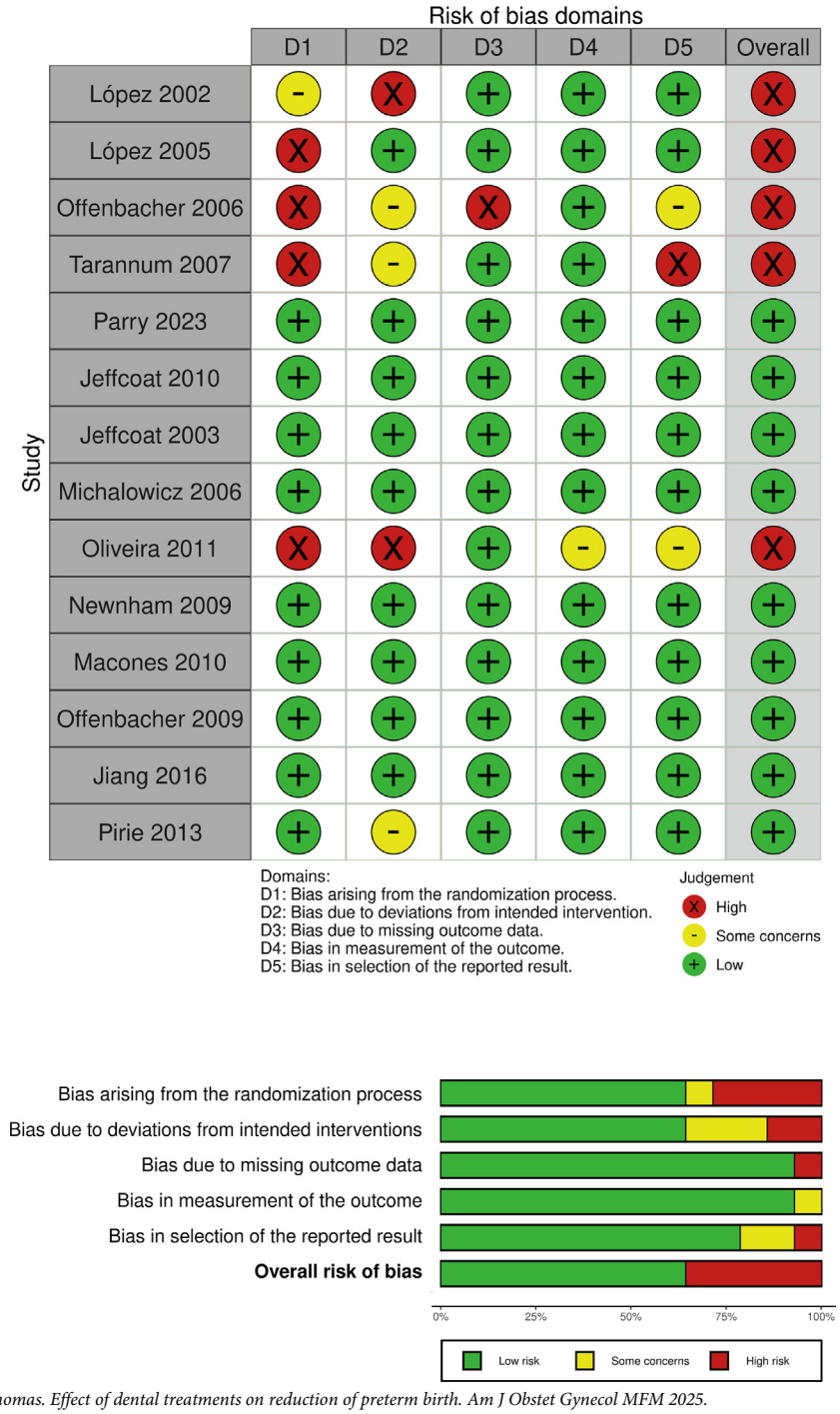
FIGURE 2
Risk of bias of included studies



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Analysis of low birth weight outcome data does not show clear benefit of reduction in low birth weight with dental treatment (RR 0.88, 95% CI 0.62−1.25, I^2=67%; very low COE, 5686 participants; 9 studies, Table 2, Supplemental File 4, Supplemental Figure S6).

Comment

Main findings

This meta-analysis of 14 RCTs, of moderate-certainty evidence, suggests that periodontal disease treatment during pregnancy may reduce the risk of preterm birth. However, when including only studies at low risk of bias, there is no clear benefit of effect. Neither subgroup analysis by type of intervention nor type of periodontal disease showed a clear benefit of effect, although very low certainty evidence suggests there may be a reduction of preterm births with addition of chlorhexidine to SRP. The primary limitation of the evidence includes risk of bias and inconsistency across studies.

Comparison with existing literature

The current study is the largest and most up-to-date review, and the only one to comprehensively assess all dental conditions and treatments. In addition, it is the only analysis which incorporates trustworthiness criteria.[42,61] Including all studies—including those not meeting trustworthiness criteria—provided a more precise effect estimate, with the confidence interval excluding the null hypothesis; however, the COE was very low. Restricting to trustworthy studies yielded a wider confidence interval that crosses the null; however, the COE of the effect estimate was increased to moderate.

A 2017 Cochrane review investigated the relationship between treating periodontal disease in pregnancy and preterm birth, and found no clear difference in preterm birth before 37 weeks' gestation (RR 0.87, 95% CI 0.70−1.10; 5671 participants; 11 studies), but indicating low-certainty evidence to suggest that periodontal treatment may reduce low birth weight <2500 g (9.7% with periodontal treatment vs 12.60% without treatment; RR 0.67, 95% CI 0.48−0.95; 3740 participants; 7 studies).[24] Findings from our analysis suggest there may be a reduction in preterm birth, but do not show clear benefit in reducing low birth weight. Compared with the Cochrane review, our analysis includes an additional 2645 participants and one new study that was published since the Cochrane review.[25] Additionally, our analysis examined other dental treatments such as advanced oral care[25] and CPC mouthwash.[57] These interventions were excluded from the 2017 Cochrane review, but recent evidence suggests they may have a role in preventing preterm birth, particularly in low-resource settings[57] or in those with health disparities.[25] The Cochrane review and other

FIGURE 3
Meta-analysis of pooled risk ratio of effect of dental treatments on preterm birth

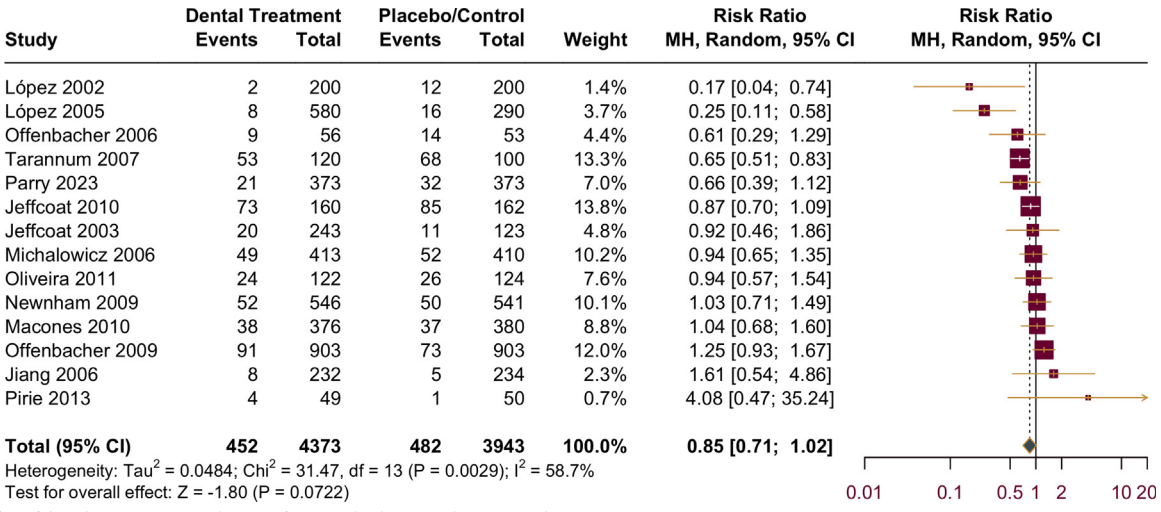

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TABLE 2
Summary of findings

Outcome (No. of studies, participants)	Relative risk (95% CI)	Anticipated absolute effects (95% CI)			Certainty	Interpretation
		Placebo	Intervention	Difference		
Preterm birth (14 RCTs, 8316)	RR 0.85 (0.71–1.02)	13.3%	11.3% (9.5–13.6)	2.0% fewer (3.9 fewer to 0.3 more)	⊕⊕⊕◯ Moderate[a]	Treatment of periodontal disease during pregnancy may result in an associated reduction in preterm birth
Preterm birth among those who receive SRP (8 RCTs, 4407)	RR 0.96 (0.82–1.13)	13.8%	13.2% (11.3–15.6)	0.6% fewer (2.5 fewer to 1.8 more)	⊕⊕⊕◯ Moderate[b]	Treatment of periodontal diseases during pregnancy likely results in little to no difference in preterm birth among those who receive SRP
Preterm birth in those who received CPC mouthwash (2 RCTs, 1212)	RR 0.90 (0.39–2.09)	6.1%	5.5% (2.4–12.7)	0.6% fewer (3.7 fewer to 6.6 more)	⊕⊕⊕◯ Moderate[b]	Treatment of periodontal diseases during pregnancy likely results in little to no difference in preterm birth among those who receive CPC mouthwash
Preterm birth in those who received SRP with chlorhexidine mouthwash (4 RCTs, 2577)	RR 0.49 (0.23–1.04)	16.4%	8.0% (3.8–17)	8.3% fewer (12.6 fewer to 0.7 more)	⊕◯◯◯ Very low[a,c,d]	The evidence is very uncertain about the effect of treatment of periodontal diseases on preterm birth among those who receive SRP with chlorhexidine mouthwash
Low birth weight (9 RCTs, 5686)	RR 0.88 (0.62–1.25)	9.0%	7.9% (5.6–11.2)	1.1% fewer (3.4 fewer to 2.2 more)	⊕◯◯◯ Very low[a,c,d]	The evidence is very uncertain about the effect of treatment of periodontal diseases on low birth weight of newborns

[a] We rated down one level because the confidence interval crosses the null threshold for the certainty of effect using the minimally contextualized approach; [b] We rated down one level because the point estimate reflects a minimum benefit toward the intervention, and the boundary of the CI almost equally includes the harm and important benefit of the intervention (threshold of interest: null effect); [c] We rated down two levels because all but one of the studies had a high risk of bias with serious concerns in the randomization domain; [d] We rated down one level for inconsistency because there was important heterogeneity among study results, which could not be credibly explained.

Thomas. Effect of dental treatments on reduction of preterm birth. Am J Obstet Gynecol MFM 2025.

meta-analysis included studies that focused solely on at-risk pregnancies, including pregnant individuals with threatened preterm labor[30–32] or pre-eclampsia[33]; these groups were excluded in our analysis.

A recent meta-analysis by Merchant et al[27] found that pregnant patients with periodontal disease receiving SRP plus chlorhexidine had a lower risk of preterm birth (RR 0.56, 95% CI 0.34–0.93), while SRP-only groups did not show this benefit (RR 1.03, 95% CI 0.82–1.29). Similarly, a meta-analysis by Le et al[62] showed that using chlorhexidine mouthwash in addition to SRP was associated with a reduced risk of preterm birth (RR 0.37, 95% CI 0.16–0.84, I^2=93.26%), albeit with significant heterogeneity. While mechanical debridement with SRP is effective in treating periodontal disease, it may also increase risk for transient bacteremia and systemic inflammatory mediators.[63] Other authors have suggested that this transient bacteremia may explain why SRP alone has not consistently shown a reduction in preterm birth.[25,59] Thus, it is hypothesized that the use of chlorhexidine mouthwash as an adjunct to SRP may help reduce bacterial load and inflammation, thereby reducing the risk of transient bacteremia and systemic inflammatory mediators and reducing the risk of preterm birth.[25,62,64] Findings from our study do not show a clear reduction in preterm birth with chlorhexidine mouthwash, although there may be a trend toward a protective effect. The COE in our subgroup analysis of SRP with chlorhexidine was downgraded to "very low" due to imprecision, inconsistency, and bias in study results, thus highlighting the importance of additional research in this area. Differences in our study findings compared with Merchant et al and Le et al may also be due to different exclusion criteria (Supplemental File 3, Supplemental Table S2).

A recent study in Malawi suggests that periconceptional xylitol chewing gum is associated with reduced preterm birth.[29] These findings, combined with our results suggesting a potential role for chlorhexidine mouthwash with SRP, indicate that additional research is needed into the role of adjuvant therapies.

Strengths and limitations

This systematic review was conducted with considerable methodologic rigor and included 11 databases with no language or time restrictions, adhering with PRISMA[28] and PRESS[34] guidelines. We excluded studies that focused exclusively on populations at high risk of preterm birth.[30–33] All included studies were RCTs, considered the gold standard for evaluating the intervention effectiveness, and only trustworthy, high-quality studies were included in the analysis.[42] The risk of bias was assessed using the ROB 2.0 tool[35] and the COE was assessed using the GRADE framework.[39]

Although the relative risk confidence interval narrowly includes the null value (RR 0.85; 95% CI 0.71–1.02), the absolute risk difference of 20 fewer preterm births per 1000 pregnancies (95% CI from 39 fewer to 3 more) was derived using the GRADE framework,[39] which integrates baseline risk with pooled relative estimates. The COE was downgraded due to imprecision, reflecting the borderline confidence interval. These findings suggest a possible reduction in preterm birth with dental treatment, though the effect remains uncertain, and further high-quality studies are needed.

Inconsistencies in criteria used to define periodontal disease prevented subgroup analysis by disease severity. Additionally, treatment protocols varied considerably in timing, frequency, and use of adjuncts like chlorhexidine or antibiotics, likely influencing treatment success. Control group approaches also varied; several studies included dental cleaning,[19,25,55,59,60] which may have minimized differences in treatment efficacy.

Most studies did not report final periodontal status, preventing an assessment of treatment success correlation with preterm birth rates. Furthermore, the use of antibiotics in some studies[20,55] may have resolved nonoral infections linked to preterm labor.[1,9]

Study populations showed significant variation in baseline dental status, preterm birth risk, socioeconomic status, and access to dental care. Subgroup analysis by human development indices and government provision of dental services did not find any meaningful trends (Supplemental File 4, Supplemental Figures S7-S10). However, caution is required when interpreting these results, given the small sample sizes and that the study population included in RCTs may not be representative of the general population.

Many studies targeted lower socioeconomic groups, a known risk factor for both dental disease and preterm birth, which may confound the results. All of the studies based in the USA included significantly more Black and African American participants than the reference population.[19,25,46,49,55,56,59] African Americans are at higher risk of preterm birth[65] and dental disease,[66] which may limit comparability of American studies with other studies in the review.

The overall preterm birth rate was over 20% in four studies,[19,23,56,58] including over 70%[23] in one study. These higher rates potentially indicate other factors contributing to preterm birth risk.

Finally, participants in the treatment groups of three studies had significantly worse baseline dental status than controls.[19,57,58] While other factors were balanced, this lack of equivalence may limit the validity of the findings.

Conclusions and implications

This systematic review and meta-analysis found moderate-certainty evidence to suggest that treatment of periodontal disease during pregnancy may reduce preterm birth rates, with an absolute difference of 20 fewer preterm births per 1000 individuals. Given the significant global burden of preterm birth, this intervention has the potential for meaningful impact. Subgroup analysis by type of intervention may suggest a benefit from adding chlorhexidine to SRP; however, we are very uncertain about the estimate.

This study is the largest and most up-to-date review on this topic, comprehensively encompassing periodontal disease and various dental treatments. It is the first meta-analysis on this topic to integrate a structured assessment of trial integrity and apply the GRADE approach. It was conducted by a multidisciplinary team, including both obstetricians and dental experts, and excluded studies exclusively targeting patients at high risk of preterm delivery.

Although the methodology was rigorous, the findings are limited by significant variations in inclusion criteria, study populations, and treatment approaches. Further well-powered RCTs at low risk of bias are necessary to strengthen confidence in our findings and further investigate the types of periodontal treatment that are most effective. Future studies should select participants based on well-established dental disease severity classifications and evaluate different dental treatment strategies, including adjunctive therapies, including antimicrobial mouthwash. Ensuring participants populations are representative of the general population will help improve generalizability of findings. ■

CRediT authorship contribution statement

Camille Thomas: Writing – original draft, Visualization, Conceptualization. **Shakil Ahmed:** Visualization, Methodology, Formal analysis. **Vincenzo Berghella:** Supervision, Conceptualization. **Romina Brignardello-Petersen:** Writing – review & editing, Methodology. **Mohamed El-Rabbany:** Conceptualization. **Catherine Devion:** Methodology, Investigation. **Stefania Ronzoni:** Writing – review & editing, Supervision, Conceptualization.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.ajogmf.2025.101884.

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Efecto de los tratamientos dentales en la reducción del parto pretérmino: una revisión sistemática y metaanálisis

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OBJETIVO
La enfermedad periodontal se asocia con un mayor riesgo de parto pretérmino. El manejo eficaz durante el embarazo puede reducir el parto pretérmino, aunque la evidencia derivada de ensayos clínicos ha sido inconsistente. Este estudio tuvo como objetivo evaluar si el tratamiento de la enfermedad dental durante el embarazo reduce el parto pretérmino.

FUENTES DE DATOS
Se realizó una búsqueda sistemática en EMBASE, MEDLINE, PubMed, Cochrane Library y registros de ensayos clínicos hasta diciembre de 2023, y se repitió en enero de 2025.

CRITERIOS DE ELEGIBILIDAD DE LOS ESTUDIOS
Se incluyeron ensayos clínicos aleatorizados (ECA) que incluyeron personas embarazadas con cualquier enfermedad dental, asignadas al azar a recibir tratamiento dental versus no recibir tratamiento. No se aplicaron restricciones de idioma.

MÉTODOS DE EVALUACIÓN Y SÍNTESIS
Dos investigadores extrajeron los datos de forma independiente y evaluaron el riesgo de sesgo mediante la herramienta de Riesgo de Sesgo de Cochrane, RoB 2. Se realizó un metaanálisis de efectos aleatorios con el estimador de varianza de Mantel–Haenszel. La certeza de la evidencia (CdE) se evaluó con GRADE. El desenlace principal fue el parto pretérmino (<37 semanas de gestación). También se recopilaron datos sobre bajo peso al nacer.

RESULTADOS
Se incluyeron 14 ECA (8316 participantes). Las intervenciones incluyeron raspado y alisado radicular (scaling and root planing, SRP) (8 ECA), SRP con enjuague bucal de clorhexidina (4 ECA) y enjuague bucal con cloruro de cetilpiridinio (2 ECA). El metanálisis y la evaluación GRADE encontraron evidencia de certeza moderada que sugiere que el tratamiento periodontal se asocia con una reducción relativa del 15% del riesgo de parto pretérmino (riesgo relativo [RR] 0.85; IC 95% 0.71–1.02) en comparación con tratamiento periodontal mínimo o ningún tratamiento (diferencia absoluta: 20 partos pretérmino menos por cada 1000 personas; IC 95% de 39 menos a 3 más). Es incierto si la incorporación de enjuague bucal de clorhexidina al SRP reduce las tasas de parto pretérmino (RR 0.49; IC 95% 0.23–1.04; CdE muy baja).

CONCLUSIÓN
Este metanálisis, el más grande y actualizado sobre el tema, sugiere que tratar la enfermedad periodontal durante el embarazo puede reducir el riesgo de parto pretérmino. Sin embargo, limitaciones como el riesgo de sesgo y las variaciones en las poblaciones y en el tratamiento resaltan la necesidad de ensayos clínicos aleatorizados con potencia adecuada y de bajo riesgo de sesgo para evaluar las estrategias de tratamiento dental más efectivas. Los estudios futuros deberían centrarse en una severidad establecida de la enfermedad dental y explorar diferentes estrategias de tratamiento, incluidos enjuagues bucales antimicrobianos.

Palabras clave
enjuague bucal de clorhexidina; enfermedad dental; gingivitis; periodontitis; prematurez; parto pretérmino; raspado y alisado radicular.