Effect Of Scaling And Root Planning In Reducing The Risk Of Preterm Birth Among Pregnant Women - A Systematic Review And Meta-Analysis

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Abstract

Background: *Preterm birth is a major public health issue in India, one of the top five contributors to the 13.4 million global cases in 2020. Maternal periodontal disease is linked to increased risk of preterm birth and low birth weight. However, the impact of treating periodontal disease during pregnancy remains unclear. This systematic review and meta-analysis aimed to assess the effect of scaling and root planning (SRP) in reducing the risk of preterm birth among pregnant women.*

Methods: *A systematic review with meta-analysis was conducted following PRISMA guidelines. PROSPERO registration was done (ID: CRD42024518915). A comprehensive search strategy was employed across electronic databases, including PubMed/Medline, Embase, Scopus, and Web of Science. The systematic review was conducted using CADIMA software, with critical appraisal of included studies performed using the JBI tool. The certainty of evidence for the outcomes was evaluated using the GRADE approach by the GRADEpro GDT tool. Meta-analysis was performed in RevMan, calculating pooled risk ratios (RRs) with 95% confidence intervals (CIs) using a random-effects model.*

Results: *Out of 109 initially identified reports, 7 RCTs met the inclusion criteria. Out of the included studies, 5 RCTs involving 1,458 pregnant women were analyzed to evaluate the effect of scaling and root planning (SRP) during pregnancy on the risk of preterm birth (PTB). Meta-analysis using a random-effects model showed that SRP was associated with a lower risk of PTB (pooled estimate [OR] = 0.59, 95% CI: 0.34–1.02). However, the result did not reach statistical significance (P = 0.06). Moderate heterogeneity was observed across studies (I^2 = 68%).*

Conclusion: *SRP during pregnancy was associated with a lower risk of preterm birth, though the effect did not reach statistical significance. The included RCTs were limited by moderate heterogeneity and variation in study design. Larger, well-conducted trials are needed to confirm these findings and inform clinical practice.*

Keywords: *Scaling and root planning, Preterm birth, Pregnant women, Systematic review, Meta-analysis.*

INTRODUCTION

Good health is essential for overall well-being, shaping physical, mental, and emotional aspects of life. As a vital part of general health, oral health supports fundamental functions such as chewing, speaking, and social interaction while also enhancing self-esteem and quality of life. It remains vital at every stage, from childhood to old age, enabling individuals to reach their full potential. However, despite its importance,

oral health is often overlooked, with issues like dental caries and periodontal disease continuing to pose significant public health challenges.[1]

Periodontal disease which comprises gingivitis and periodontitis is a common oral infection that affects the tissues (gingiva, periodontal ligament, cementum and alveolar bone) that surround and support the teeth. The condition often presents as gingivitis which is characterized by bleeding, swollen gums, pain, and if left untreated, it progresses to periodontitis which involves the loss of periodontal attachment and supporting bone.[2] Severe periodontal diseases are estimated to affect around 19% of the global adult population, representing more than 1 billion cases worldwide. Tobacco use and poor oral hygiene are the primary risk factors for periodontal disease.[3]

In recent decades, considerable focus has been placed on the potential association between periodontal disease and various systemic conditions, including cardiovascular disease, diabetes mellitus, hypertension, respiratory disorders, preterm birth, and low birth weight.[4] Among these conditions, preterm birth is widespread in developing countries like India, Bangladesh, and Pakistan.[5]

Preterm birth refers to babies born alive before 37 weeks of pregnancy are completed. An estimated 13.4 million infants were delivered prematurely in 2020. Complications arising from preterm birth are the leading cause of mortality among children under five years old, accounting for approximately 900,000 deaths in 2019. Notably, three-quarters of these deaths could be prevented through existing, cost-effective interventions. In 2020, the prevalence of preterm births varied from 4% to 16% worldwide.[6]

Numerous studies have identified link between untreated periodontal disease and adverse pregnancy outcomes. It is suggested that the release of inflammatory mediators and bacteria into the bloodstream due to periodontal disease may impair fetal development, thereby increasing the risk of adverse pregnancy outcomes such as preterm birth (PTB), low birth weight (LBW), preeclampsia, stillbirth, miscarriage, and intrauterine growth restriction.[7-11]

Preterm birth is influenced by three primary risk factors: (1) social stress and racial disparities, (2) infection and inflammation (both systemic and localized), and (3) genetic factors. Among these, intrauterine infection is widely recognized as a major contributor, particularly in cases occurring before 30 to 32 weeks of gestation.[12] Preterm infants are at a higher risk of respiratory distress, hypoglycemia, seizures, infections, subsequent hospitalizations, and even mortality. Over time, they may also be more prone to cerebral palsy, intellectual disabilities, and cognitive impairments.[5]

It was first reported by Offenbacher et al in 1996 that periodontal disease was a potential risk factor for preterm birth.[13] Since then, the relationship between periodontal infections and preterm birth has become a key focus in dental research. As a result, there is increasing recognition of the importance of managing oral health during pregnancy. Periodontal therapy, therefore, is not only essential for maintaining oral hygiene but may also contribute to reducing the risk of adverse pregnancy outcomes. Periodontal therapy plays a crucial role in treating the disease and promoting good oral health. It is generally categorized into non-surgical and surgical periodontal therapy, based on the severity of the condition. Non-surgical treatments are often the initial approach for managing periodontal disease, particularly in its early stages. These include scaling and root planning, antimicrobial therapy, and laser therapy. However, if non-surgical methods do not achieve the desired results, surgical procedures may be required to restore the gingival and bone health. Surgical options include flap surgery, bone grafting, and guided tissue regeneration.[14]

Among the available treatments, professional scaling and root planning are the most conventional methods for treating periodontal disease in its early stages. This approach limits bacterial growth in the oral cavity by physically removing plaque and calculus, potentially decreasing the risk of adverse pregnancy outcomes, including preterm birth.[15] Therefore, a simple yet effective conventional method, such as scaling and root planning, could help lower the risk of preterm birth.

Several observational studies have shown that periodontal disease during pregnancy can increase the risk of preterm birth.[16,17] The results of these observational studies prompted the initiation of several randomized controlled trials (RCTs) to investigate whether scaling and root planning could help reduce the incidence of preterm birth.[15,18]

Previous literature assessed various oral hygiene measures, including mouthwashes,[19] but evidence on Scaling and Root Planning (SRP) as a standalone treatment remains limited. Therefore, this review fills

the gap by analyzing RCTs where SRP was the sole intervention, offering clearer evidence to support dental-obstetric care integration during pregnancy.

This review aims to assess the effect of scaling and root planning in reducing the risk of preterm birth among pregnant women.

MATERIALS AND METHODS

Review Question

This review protocol was registered on March 11, 2024, at PROSPERO (CRD42024518915), an international database of prospectively registered systematic reviews. It was done to ensure no duplication or overlapping reviews on this topic. This systematic review and meta-analysis was conducted in accordance with the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA) guidelines.[20]

The review question was formulated based on PICO format.

(P) Population: Women in their second trimester of pregnancy

(I) Intervention: Scaling and Root Planning

(C) Comparison: Control group (without intervention or only polishing done)

(O) Outcomes: Preterm birth, Periodontal probing depth

The review question was, "Does Scaling and Root Planning have an effect in reducing the risk of preterm birth among pregnant women?".

Eligibility criteria

[A] Inclusion criteria

Population: Studies with healthy female in their second trimester of pregnancy.

Intervention: Studies with only scaling and root planning as intervention.

Comparison: Studies in which the control group received no intervention or only superficial polishing was done.

Outcome: Studies with primary outcome as preterm birth and secondary outcome as periodontal probing depth.

[B] Exclusion criteria

- Observational studies, Review reports, case series, in vitro and animal studies.
- Studies providing only abstract and not full text.
- Studies in other language except English.

Type of Study

This review included randomized controlled trials involving pregnant women in their second trimester who presented with a periodontal probing depth greater than 5 mm. The intervention group underwent scaling and root planning, while the control group received no treatment or only superficial polishing.

Search Strategy

Two independent researchers systematically searched major databases like Medline/PubMed, Web of Science, Scopus, and Embase for randomized controlled trials published in English over the past 25 years, up to December 2024 (Table 1).

Table 1: Search strategy for databases

DATABASE	SEARCH STRATEGY
PubMed	(((((((dental scaling[MeSH Terms]) OR (root scaling[MeSH Terms])) OR (root scalings[MeSH Terms])) OR (scaling, dental[MeSH Terms])) OR (scaling, root[MeSH Terms])) OR (root planing[MeSH Terms])) OR (root planings[MeSH Terms])) AND (((((birth, preterm[MeSH Terms]) OR (births, preterm[MeSH Terms])) OR (labor, preterm[MeSH Terms])) OR (preterm birth[MeSH Terms])) OR (preterm births[MeSH Terms]))
Embase	('dental scaling':ti,ab OR 'root scaling':ti,ab OR 'root scalings':ti,ab OR 'scaling, dental':ti,ab OR 'scaling, root':ti,ab OR 'root planing':ti,ab OR 'root

	planings':ti,ab) AND ('birth, preterm':ti,ab OR 'births, preterm':ti,ab OR 'labor, preterm':ti,ab OR 'preterm birth':ti,ab OR 'preterm births':ti,ab)
Scopus	((((((((TITLE-ABS ("dental scaling")) OR (TITLE-ABS ("root scaling"))) OR (TITLE-ABS ("root scalings"))) OR (TITLE-ABS ("scaling, dental"))) OR (TITLE-ABS ("scaling, root"))) OR (TITLE-ABS ("root planing"))) OR (TITLE-ABS ("root planings"))) AND (((((TITLE-ABS ("birth, preterm")) OR (TITLE-ABS ("births, preterm"))) OR (TITLE-ABS ("labor, preterm"))) OR (TITLE-ABS ("preterm birth"))) OR (TITLE-ABS ("preterm births")))
Web of science	((((((((TI="dental scaling" OR AB="dental scaling")) OR ((TI="root scaling" OR AB="root scaling"))) OR ((TI="root scalings" OR AB="root scalings"))) OR ((TI="scaling, dental" OR AB="scaling, dental"))) OR ((TI="scaling, root" OR AB="scaling, root"))) OR ((TI="root planing" OR AB="root planing"))) OR ((TI="root planings" OR AB="root planings"))) AND ((((((TI="birth, preterm" OR AB="birth, preterm")) OR ((TI="births, preterm" OR AB="births, preterm"))) OR ((TI="labor, preterm" OR AB="labor, preterm"))) OR ((TI="preterm birth" OR AB="preterm birth"))) OR ((TI="preterm births" OR AB="preterm births")))

Screening of Articles

Screening of articles was done using CADIMA software. Upon merging the articles from various databases, duplicates due to repetition of the same article across different indexing sources were identified and removed. Studies that failed to satisfy the specified PICO criteria were excluded. Titles and abstracts were independently screened by two primary reviewers, with any disagreements regarding article selection resolved by a third author. Following this, the full texts of all eligible articles were independently reviewed by the two primary reviewers.

Data Extraction

For all studies that fulfilled the eligibility criteria, data extraction was performed by two authors which included: (a) Author and year of publication, (b) Study location, (c) Study design, (d) Population, (e) Mean age, (f) Sample size, (g) Study duration, (h) Intervention, (i) Comparison, and (j) Outcomes measured.

Risk of Bias

Risk of bias among the selected randomized controlled trials was evaluated using the Joanna Briggs Institute (JBI) critical appraisal tool for RCT(2023).[21] This comprehensive tool consists of four distinct domains of assessment, providing the overall risk of bias associated with each study. Each domain is structured with a set of targeted questions designed to elicit information regarding specific methodological aspects of the studies in question. Responses to each item are grouped into one of four categories: "yes," "no," "unclear," or "not applicable. This systematic categorization facilitates a clear understanding of the quality of the evidence presented in each study, reflecting its overall compliance with established quality criteria and fulfillment of necessary methodological requirements.

Assessment of Evidence Quality

The certainty of evidence for the outcomes reported in this systematic review was evaluated using the GRADE approach, facilitated by the GRADEpro GDT tool. GRADE, which stands for Grading of Recommendations, Assessment, Development, and Evaluations, offers a clear and structured method for assessing the certainty of evidence based on key domains: risk of bias, inconsistency, indirectness, imprecision, and publication bias. Each outcome was assessed independently by two reviewers using GRADEpro GDT, and any disagreements were resolved by mutual consensus.

Statistical Analysis

Data from the included studies were subjected to both qualitative and quantitative analyses. For quantitative synthesis, a meta-analysis was conducted using the Review Manager (RevMan) software version 5.3.5. To estimate pooled effect sizes across studies, Odds Ratios (ORs) with 95% Confidence

Intervals (CIs) were calculated. In addition, to account for variability between studies in terms of methodology, patient populations, and outcome measures, a random-effects model was employed. This model assumes that the true effect size could vary across studies and helps to provide a more generalizable estimate of the overall pooled effect. Heterogeneity among the studies was quantified using the I^2 statistic, where values above 50% indicate considerable heterogeneity, suggesting that the variation in results may not be entirely due to sampling error. A high I^2 value suggests that the results should be interpreted with caution, as the studies may not be sufficiently similar to warrant direct comparison. Statistical significance was defined as a p-value ≤ 0.05, indicating that the observed effect was unlikely to have occurred by random chance. To visually present both individual study results and the overall pooled estimates, forest plots were generated. These plots allow for a clear comparison of effect sizes across the studies, making it easier to understand the overall trends and variability. Meta-analysis was conducted for the primary outcome to assess the difference in preterm birth between intervention and control groups.

RESULTS
Study Selection and Inclusion
Initially, 109 studies were found, from which 57 were selected after removing 52 duplicates. The titles and abstracts of these 57 studies were screened, resulting in the selection of 22 studies for further review. The full texts of these 22 studies were accessed, and 15 studies were excluded as they were duplicates and had different outcome parameters; and 7 studies were included in this review (Figure 1).

Figure 1: PRISMA flowchart showing the inclusion process of the study

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Included

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┌──────────────────────────┐
│ Studies included in review│
│          (n=7)            │
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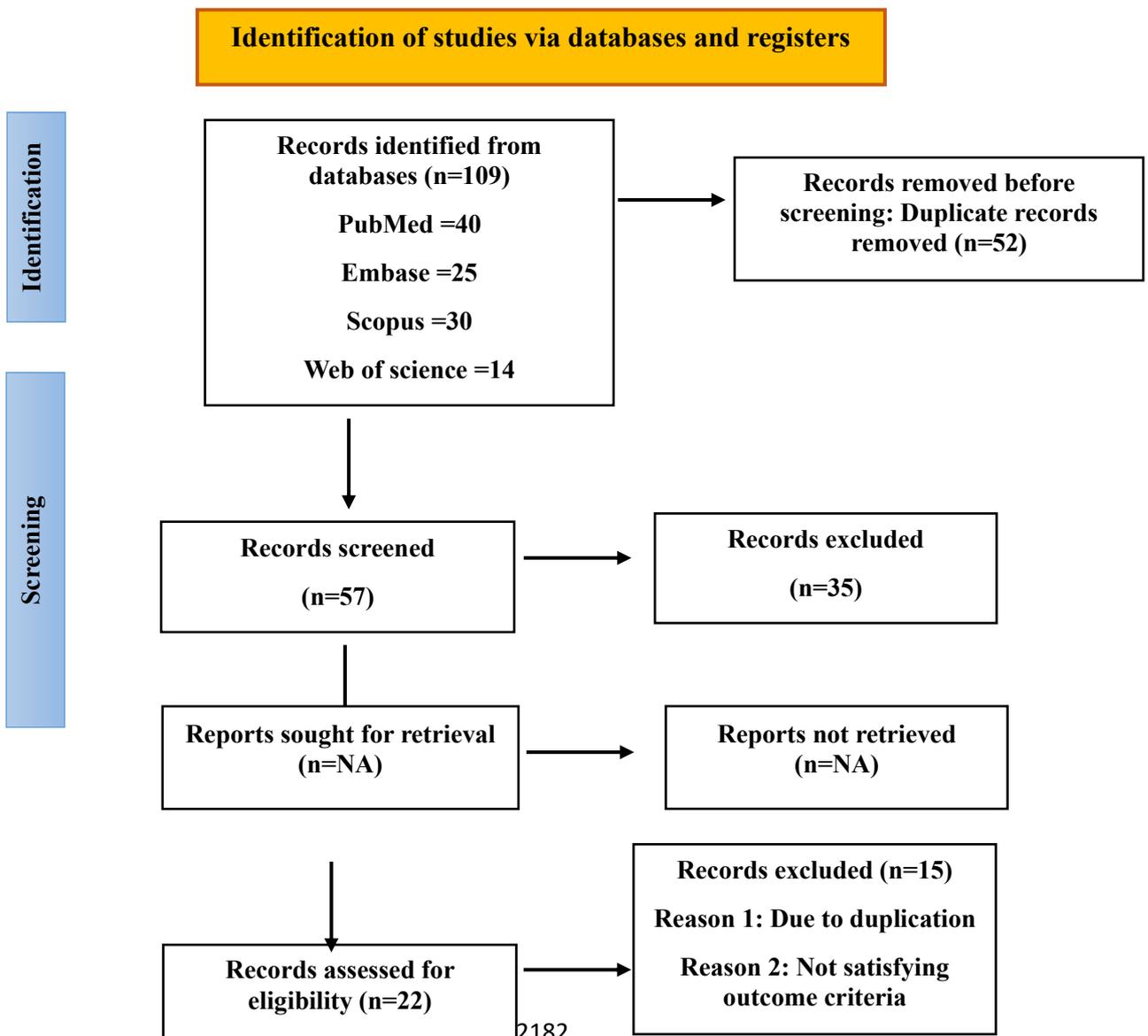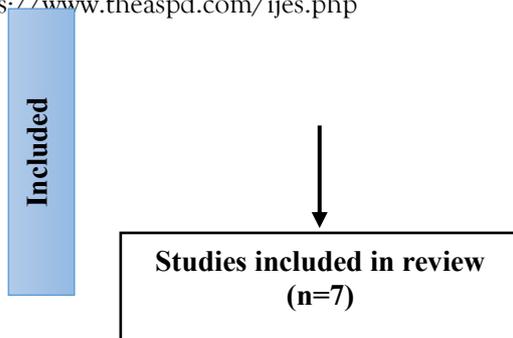
General Study Characteristics

This review included 7 randomized controlled trials (RCTs) that evaluated the effect of scaling and root planning (SRP) on preterm birth among pregnant women in their second trimester. These studies were conducted in various countries, including the USA, United Kingdom, Iran, India, and Hungary. Participants in all studies were pregnant women with gestational ages ranging from less than 13 weeks to up to 32 weeks. The sample sizes varied from 30 to 856 participants, and the mean age of the participants ranged from 23 to 29 years. The duration of follow-up for each study lasted between 2 to 5 months. In each study, the intervention group received scaling and root planning, while the control groups were given either no treatment, superficial cleaning, or polishing. The primary outcome was preterm birth, defined as delivery before 37 weeks of gestation, and several studies also assessed periodontal parameters such as periodontal probing depth. Overall, the seven studies illustrates the clinical diversity in study settings, methodologies, and outcome measures among the trials (Table 2).

Table 2: General characteristics of the included studies

Author & Year	country	Study design	Population	Mean age	Sample size	Study duration	Intervention	Comparison	Outcomes measured
Arthur F. Hefti et al, 2006	USA	randomized, single blinded design	Pregnant women, gestational age of <22 weeks	More than 18 years	109	3 months	scaling and root planning	Polishing	Preterm birth, periodontal probing depth
Bryan S. Michalowicz et al,2006	United kingdom	Randomized, blinded, controlled trial	Pregnant women, Gestational age of 15.0±1.3 weeks	25.9± 5.5 years	823	5 months	scaling and root planning	Control group	Preterm birth, periodontal probing depth
Sadatmansouri S et al, 2006	Iran	randomized clinical trial	Pregnant women, gestational age of less	28.4 ±4.1 years	30	2 months	scaling and root planning	Control group	Preterm birth, periodontal probing depth

			than 28 weeks						
Fouzia Tarannum et al, 2007	India	randomized, controlled clinical trial	Pregnant women, gestational age of 33.8 ±2.8 weeks	23.3± 3.3 years	200	4 months	scaling and root planning	Control group	Preterm birth
M. Radnai et al, 2009	Hungary	randomized, double blinded	Pregnant women, gestational age of 32 weeks	29.0± 5.8 years	83	4 months	scaling and root planning	Control group	Preterm birth, periodontal probing depth
George A. Macones et al, 2010	USA	multicenter, randomized, controlled clinical trial	Pregnant women, gestational age of 16 weeks	24.1± 5.2 years	856	5 months	scaling and root planning	Superficial cleaning	Preterm birth
M Jeffcoat et al, 2010	USA	blinded, randomized clinical study	Pregnant women, gestational age of less than 20 weeks	23.7 years	322	4 months	scaling and root planning	Control group	Preterm birth

Primary Outcome

The primary outcome, Preterm birth, was assessed in all 7 studies by evaluating the delivery of infants before 37 weeks of gestation. The studies by Arthur F. Hefti et al. (2006)[22], Fouzia Tarannum et al. (2007)[25], and M. Radnai et al. (2009)[26] reported a statistically significant reduction in preterm birth following intervention, with p-value of < 0.05, < 0.001, and 0.013, respectively. However, studies conducted by Bryan S. Michalowicz et al. (2006)[23], Sadatmansouri S et al. (2006)[24], George A. Macones et al. (2010)[27], and M. Jeffcoat et al. (2010)[28] found no statistically significant reduction in preterm birth among pregnant women following scaling and root planning (Table 3).

Table 3: Primary outcome characteristics of the included studies

Author & Year	Intervention group	Comparison group	P value	Significance

Arthur F. Hefti et al, 2006	Preterm birth decreased	Preterm birth not decreased	<0.05*	**Statistically significant***
Bryan S. Michalowicz et al, 2006	44 (10.9%) pretrem birth	38 (9.7%) preterm birth	0.64	Not statistically significant
Sadatmansouri S et al, 2006	0 % preterm birth	20% preterm birth	< 0.11	Not statistically significant
Fouzia Tarannum et al, 2007	53.5% preterm birth	74.4% preterm birth	<0.001*	**Statistically significant***
M. Radnai et al, 2009	10 (24.3%) preterm birth	22 (52.4%) preterm birth	0.013*	**Statistically significant***
George A. Macones et al, 2010	no difference in preterm birth	no difference in preterm birth	0.69	Not statistically significant
M Jeffcoat et al, 2010	45.6% preterm birth	52.4% preterm birth	<0.13	Not statistically significant

Secondary Outcome

The secondary outcome, change in periodontal probing depth, was assessed in four out of seven studies, while the remaining three studies focused solely on preterm birth. The studies by Arthur F. Hefti et al. (2006)[22] and Bryan S. Michalowicz et al. (2006)[23] reported a significant reduction in periodontal probing depth following scaling and root planning (p < 0.05 and p < 0.001, respectively). In contrast, the studies conducted by Sadatmansouri S et al. (2006)[24] and M. Radnai et al. (2009)[26] found no statistically significant reduction in probing depth after treatment (p = 0.6 and p = 0.316, respectively). Overall, the findings suggest insufficient evidence to confirm a consistent decrease in periodontal probing depth following scaling and root planning (Table 4).

Table 4: Secondary outcome characteristics of the included studies

Author & Year	Intervention group	Comparison group	P value	significance
Arthur F. Hefti et al, 2006	Decreased	Periodontal probing depth ≥5mm	<0.05*	**Statistically significant***
Bryan S. Michalowicz et al, 2006	Decreased	Periodontal probing depth >4mm	<0.001*	**Statistically significant***
Sadatmansouri S et al, 2006	Remains same	Periodontal probing depth ≥ 4mm	0.6	Not statistically significant
M. Radnai et al, 2009	Remains same	Periodontal probing depth ≥4mm	0.316	Not statistically significant

Risk of Bias

The methodological quality of the included studies was evaluated using the Joanna Briggs Institute (JBI) tool (2023) for Randomized Controlled Trials (RCTs)[21]. The studies conducted by M. Radnai et al. (2009)[26] and George A. Macones et al. (2010)[27] demonstrated the highest methodological rigor, receiving a "Yes" rating in 11 out of the 13 JBI appraisal domains. Similarly, the study by Bryan et al. (2006)[23] earned 10 out of 13 "Yes" responses, also indicating a low risk of bias. Across the included trials, most studies consistently performed well in crucial areas, such as randomization and outcome measurement, suggesting strong internal validity, especially in assessing intervention effects and outcomes. However, some domains, particularly those related to blinding (Q3, Q4), allocation concealment, and participant

retention (Q12), were not reported in six out of seven studies (Table 5). Nonetheless, these limitations posed only a minor threat to overall validity. Despite some risk of performance and detection bias, the general methodological strength of the included studies provides reasonable confidence in the reliability of the review findings. This also highlights the need for greater transparency and completeness in future trial reporting.

Table 5: Results following critical appraisal using the revised JBI critical appraisal tool for Randomized Controlled Trials

DOMAIN/ QUESTIONS	STUDY ID						
Bias related to selection and allocation	Arthur et al, 2006	Bryan et al, 2006	Sadatmansouri et al, 2006	Fouzia et al, 2007	M. Radnai et al, 2009	George A. Macones et al, 2010	M Jeffcoat et al, 2010
Was true randomization used for assignment of participants to treatment groups?	Y	Y	Y	Y	Y	Y	Y
Was allocation to treatment groups concealed?	Y	N	Y	Y	Y	Y	Y
Were treatment groups similar at the baseline?	N	Y	Y	Y	Y	Y	Y
Bias related to administration of intervention/exposure							
Were participants blind to treatment assignment?	N	N	N	N	Y	N	N
Were those delivering the treatment blind to treatment assignment?	Y	Y	Y	N	Y	N	Y
Were treatment groups treated identically other than the intervention of interest?	Y	Y	N	Y	Y	Y	Y
Bias related to assessment, detection and measurement of the outcome							
Were outcome assessors blind to treatment assignment?	N	N	N	N	N	Y	N
Were outcomes measured in the same way for treatment groups?	Y	Y	N	N	Y	Y	Y
Were outcomes measured in a reliable way?	Y	Y	N	N	Y	Y	Y
Bias related to participant retention							
Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed?	Y	Y	N	N	Y	Y	N
Statistical conclusion validity							

Were participants analyzed in the groups to which they were randomized?	N	Y	N	Y	N	Y	N
Was appropriate statistical analysis used?	N	Y	Y	Y	Y	Y	Y
Was the trial design appropriate and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?	Y	Y	Y	Y	Y	Y	Y

*** Y: Yes, N: No, U:Unclear, N/A: Not Applicable***

GRADE Assessment of Evidence Quality
The certainty of evidence for the outcomes reported in this systematic review was evaluated using the GRADE approach, facilitated by the GRADEpro GDT tool. Table 6 summarizes the GRADE evaluations for two outcomes, preterm birth and periodontal probing depth, both derived from randomized controlled trials (RCTs). For preterm birth, seven RCTs were included in the analysis. The certainty of evidence was rated as low due to serious risks of bias, such as inadequate allocation concealment, lack of blinding, and selective reporting, as well as serious imprecision stemming from small sample sizes and wide confidence intervals. Although the overall direction of effect was consistent, only three of the studies demonstrated statistically significant reductions. The varying results suggest a potential benefit of periodontal therapy for preterm birth, but uncertainty remains. Regarding periodontal probing depth, four RCTs were reviewed. The certainty of evidence for this outcome was also rated as low, primarily due to serious risks of bias, including unclear definitions and lack of blinding, along with serious imprecision due to the small number of studies and variable results. Nevertheless, all studies indicated a positive effect of the intervention, with two reporting statistically significant improvements. This suggests that periodontal therapy may enhance periodontal health; however, further high-quality research is necessary to confirm these findings.

Table 6: GRADE Assessment of Evidence Quality

Outcome	Studies	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Certainty of Evidence (GRADE)	Effect Summary
Preterm Birth	7RCTs	Serious	Not serious	Not serious	Serious	Undetected	●●○○ Low	Mixed results: 3 studies statistically significant, 4 not. Some show large differences favoring intervention.

Periodontal probing depth	4RCTs	Serious	Not serious	Not serious	Serious	Undetected	●●○○ Low	Periodontal depth improved in intervention groups; 2/4 studies statistically significant

Meta analysis

Out of seven randomized controlled trials, only five were eligible for meta-analysis; two studies (Arthur F Hefti et al., 2006, and George A. Macones et al., 2010) lacked specific preterm birth outcome data. The pooled analysis yielded an odds ratio of 0.59 (95% CI: 0.34 to 1.02), indicating a 41% reduction in preterm birth risk among women who received SRP, though this was not statistically significant (Z = 1.87, P = 0.06). Fouzia et al. (2007) and Radnai et al. (2009) reported significant reductions, with ORs of 0.41 and 0.29, respectively. The other studies showed no significant effect as their confidence intervals crossed 1. Moderate heterogeneity was present (I^2 = 68%, P = 0.01), likely due to differences in study populations, protocols, or disease definitions. The forest plot (Figure 2) illustrates this variability, with most confidence intervals crossing the line of no effect. While SRP appears potentially beneficial, the evidence remains inconclusive, highlighting the need for more rigorous and standardized trials.

Figure 2: Forest plot of the effect of scaling and root planning (SRP) on preterm birth
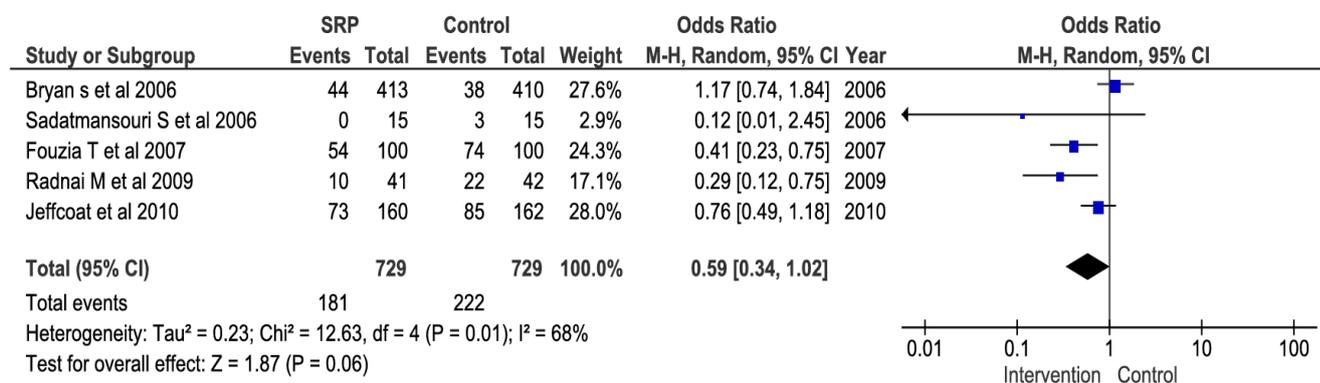
DISCUSSION

The present systematic review and meta-analysis aimed to evaluate the effect of Scaling and Root Planning in reducing the risk of preterm birth among pregnant women. Preterm birth is a significant public health concern, as it is a leading cause of neonatal mortality and is linked to various long-term health complications.[6] In recent decades, significant attention has been directed toward the possible connection between periodontal disease and preterm birth. Numerous studies have indicated that while various treatment options exist for managing periodontal disease, professional scaling and root planning remain the most conventional and effective methods for treating the condition in its early stages and reducing the risk of preterm birth.[8]

This review included a total of seven studies, all designed as randomized controlled trials, with study durations ranging from two to five months. The primary outcome assessed in the review was preterm birth, and the secondary outcome was periodontal probing depth.

In the present review, although a reduction in preterm birth was noted in the intervention group that received scaling and root planning (SRP), the effect was not statistically significant. This finding is consistent with the study by Weidlich et al. (2013)[29], which also reported no significant difference in preterm birth rates between the SRP and control groups. In contrast, the study by Adriana Sant'Ana et

al. (2011)[30] demonstrated a statistically significant reduction in preterm birth among women who received scaling and root planning.

The discrepancy in these outcomes may be attributed to the timing of the intervention. scaling and root planning performed in the early second trimester may more effectively reduce the overall bacterial load, thereby lowering systemic levels of pro-inflammatory mediators and improving periodontal health. Conversely, when SRP is administered later in the second trimester, a period during which maternal systemic circulation becomes increasingly sensitive, there may be an elevated risk of inflammatory cytokines such as IL-1β, IL-6, and PGE2 entering the bloodstream, potentially exerting negative effects on pregnancy outcomes.

In addition, Tonetti et al. (2007)[31], demonstrated that scaling and root planning alone did not lead to a significant reduction in serum levels of inflammatory mediators within one to six months following treatment.

In meta-analysis, the forest plot demonstrates a trend toward reduced risk of preterm birth in the group that received scaling and root planning (SRP) compared to the control group. While some individual studies showed a favorable effect of the intervention, the overall pooled effect did not reach statistical significance. This variability may be due to heterogeneity among the studies, including differences in sample size, diagnostic criteria for periodontal disease, and timing of the intervention during pregnancy. Notably, studies with more pronounced effects often performed SRP earlier in pregnancy. Despite the lack of statistical significance, the review supports a potential benefit of scaling and root planning in reducing adverse pregnancy outcomes, warranting further research with standardized protocols.

The periodontal probing depth was evaluated in four of the seven included studies. Arthur F. Hefti et al. (2006)[22] and Bryan S. Michalowicz et al. (2006)[23] reported a significant reduction in probing depth in the intervention group that received scaling and root planning, compared to the control group with no treatment. In contrast, studies by Sadatmansouri S et al. (2006)[24] and M. Radnai et al. (2009)[26] found no significant improvement in probing depth following the intervention. The variation in findings may be attributed to inconsistent diagnostic criteria for periodontal disease, with some studies defining it as probing depth >4 mm and others >5 mm. Additionally, reductions in periodontal probing depth require adequate time for tissue healing and resolution of inflammation. As the improvement in probing depth is a progressive outcome that reflects the resolution of inflammatory processes and reattachment of periodontal tissues, evaluations conducted shortly after treatment may not accurately reflect the full therapeutic effect of scaling and root planning. Insufficient follow-up duration may therefore lead to an underestimation of clinical improvements.

Future research should focus on the methodological limitations highlighted in this review, including the lack of blinding, inadequate allocation concealment, small sample size, inconsistent diagnostic criteria for periodontal disease, and the intervention provided in the late second trimester. Overcoming these issues will be crucial for producing more robust and conclusive evidence.

Clinical Implications

Although study results vary and certain methodological limitations exist, the overall trend towards improved birth outcomes highlights the relevance of incorporating periodontal health into prenatal care. From a clinical perspective, incorporating oral screening for periodontal disease and timely intervention, preferably earlier in pregnancy, may offer a proactive, non-invasive strategy to support maternal and child health. Given the safety and accessibility of scaling and root planning as a treatment modality, integrating it into antenatal protocols could serve as a preventive adjunct, especially for high-risk populations. Therefore, a multidisciplinary approach involving both dental and obstetric care providers is essential to promote maternal oral health through routine periodontal screening and early intervention as part of comprehensive prenatal care.

CONCLUSION

Scaling and root planning were associated with a reduction in preterm birth, suggesting a potential protective effect. However, the effect was not statistically significant, indicating that the evidence is insufficient to definitively establish a causal relationship between SRP and a reduced risk of preterm delivery. Therefore, while the trend is promising, further well-designed, large-scale randomized controlled

trials are necessary to validate this potential benefit and clarify whether periodontal therapy during pregnancy can be reliably recommended as a preventive strategy against preterm birth.

ABBREVIATIONS

PTB – Preterm Birth

LBW – Low birth weight

SRP – Scaling and root planning

RCT – Randomized controlled trial

PRISMA - Preferred Reporting Items for Systematic Reviews and Meta-Analyses

CADIMA - Central Access Database for Impact Assessment of Crop Genetic Resources

OR – Odds ratio

CI – Confidence interval

REVMAN – Review manager

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