

Periodontal Therapy as a Preventative Measure Against Preterm Birth:

A Systematic Review

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INTRODUCTION

- Preterm birth (PTB) is the leading cause of neonatal mortality and morbidity globally.
- PTB is linked to future risk for poor physical and mental health outcomes for both mother and baby.
- Although no predictive biomarkers have been found yet, PB is being investigated as a preventable phenomenon.
- PTB is linked to states of inflammation and infection during pregnancy, suggesting that periodontal disease may be a risk factor. Proposed mechanisms include both indirect and direct pathways.
- Clinical parameters of periodontal disease progression, periodontal probing depth (PD) and clinical attachment level or loss (CAL), are exacerbated during pregnancy.
- Numerous clinical studies have investigated the relationship between periodontitis and PTB, but whether periodontitis is a causative factor of TB remains inconclusive.
- Clinical trials studying the effectiveness of periodontal treatment as a potential preventative measure against PTB also report conflicting results.

Objectives

Recent literature reviews have already analyzed the effects of periodontitis and periodontal therapy during pregnancy. However, this is with the view of TB as one part of the aggregate of adverse birth outcomes, not as an independent entity. As a result, this literature review aims to evaluate:

1. the most frequent oral health interventions used as preventative or therapeutic measures against TB;
2. gaps in literature and clinical practice in addressing PT and perinatal oral conditions.

METHODS & MATERIALS

Database searches were carried out in PubMed, Embase, and Cochrane.

Topics:

- Therapeutic interventions for pregnancy-related periodontitis
- Effects on birth term outcomes

Search strategy:

- Medical Subject Headings (MeSH) and non-MeSH vocabulary
 - Dental care, Gingivitis, Oral Health, Oral Hygiene, Periodontitis, Pregnancy, Premature birth

Inclusion criteria:

- Participants: pregnant women
- Intervention: preventative or therapeutic periodontal treatment
 - Scaling and root planing (SRP), antimicrobials, oral hygiene instruction (OHI)
- Comparisons: between pregnant women who did and did not receive oral health care, or between oral health states in a pregnant woman before and after receiving care
- Outcomes: perinatal oral status changes, possible associations between oral therapy and PB
- Types of studies: randomized controlled trials, non-randomized controlled trials, case control trials
- Statistical data: p-values, frequencies, odds ratios, or confidence intervals

Exclusion criteria:

- Animal studies, cohort studies, cross-sectional studies, literature reviews, and patient self-reporting

RESULTS

- The database searches identified 1865 results.
- After duplicate removal, full texts of remaining potentially eligible articles were imported into an electronic library for further review.
- After title screening, abstract screening, and full text review, 10 studies were chosen for this review according to relevance to the review topic, inclusion criteria, and exclusion criteria.
- Included studies: 5 randomized controlled trials (RCT), 2 non-randomized controlled trials, 2 case control trials, and 1 pseudo-random controlled trial.
- Selected studies demonstrate varying conclusions about the relationship between dental interventions and preterm birth.
- 6 publications reported statistically significant relationships where periodontal therapy reduced TB frequency^{1, 2, 3, 5, 9, 10}.
- 9 trials compared the effects of SRP plus OHI against OH alone.
- 1 trial tested the effects of antimicrobial cetylpyridinium chloride mouth rinse in place of SRP³.

DISCUSSION

- Improvements in PD and CAL indicate reduction of periodontal inflammation after therapy.
 - PTB rates also decreased, but cytokine levels remained high, suggesting that true effects of SRP may be masked by other systemic sources of inflammation^{5, 8}.
- Diagnostic criteria for periodontal disease varied between studies, and the severity of periodontitis in each trial's participant base was heterogeneous.
 - Consequently, PTB frequency outcomes from different studies should be compared in terms of grade and stage.
- Lack of randomization may incur allocation bias.
 - Assigning participants to intervention or control groups based on consent for receiving prenatal periodontal therapy may reflect healthcare-seeking behavior, which may affect the risk of PTB¹⁰.
- Smoking is a high-risk behavior associated with PTB, but appears to have no effect on an individual's response to periodontal treatment^{1, 2, 4}.
- Mechanical therapy currently yields inconclusive results for PTB prevention.
 - Non-mechanical therapies such as antimicrobial mouth rinses are less commonly studied, but appear to have promising results for PTB reduction³.
- Intervention timing may affect trial results.
 - Individuals treated late in pregnancy may not experience optimal effects of periodontal treatment, since multiple sessions may be needed^{5, 6, 7, 9, 10}.
- Post-treatment outcomes are rarely reported.
 - True effects of periodontal therapy may be difficult to assess if participants are not known to have attained a state of periodontal health after treatment^{3, 5, 9}.
- Pre-existing external and internal factors may influence the effectiveness of periodontal therapy for PTB prevention
 - PTB reduction following periodontal therapy appears more commonly with high-risk populations^{1, 2, 5, 6, 10}.

CONCLUSIONS

The preventative effect of periodontal therapy against PTB is still debated. This may be due to the complex nature of PTB, which arises from a combination of external and internal factors. Nevertheless, clinical and observational trials suggest there is no detrimental effect to receiving periodontal therapy prenatally.

Future directions

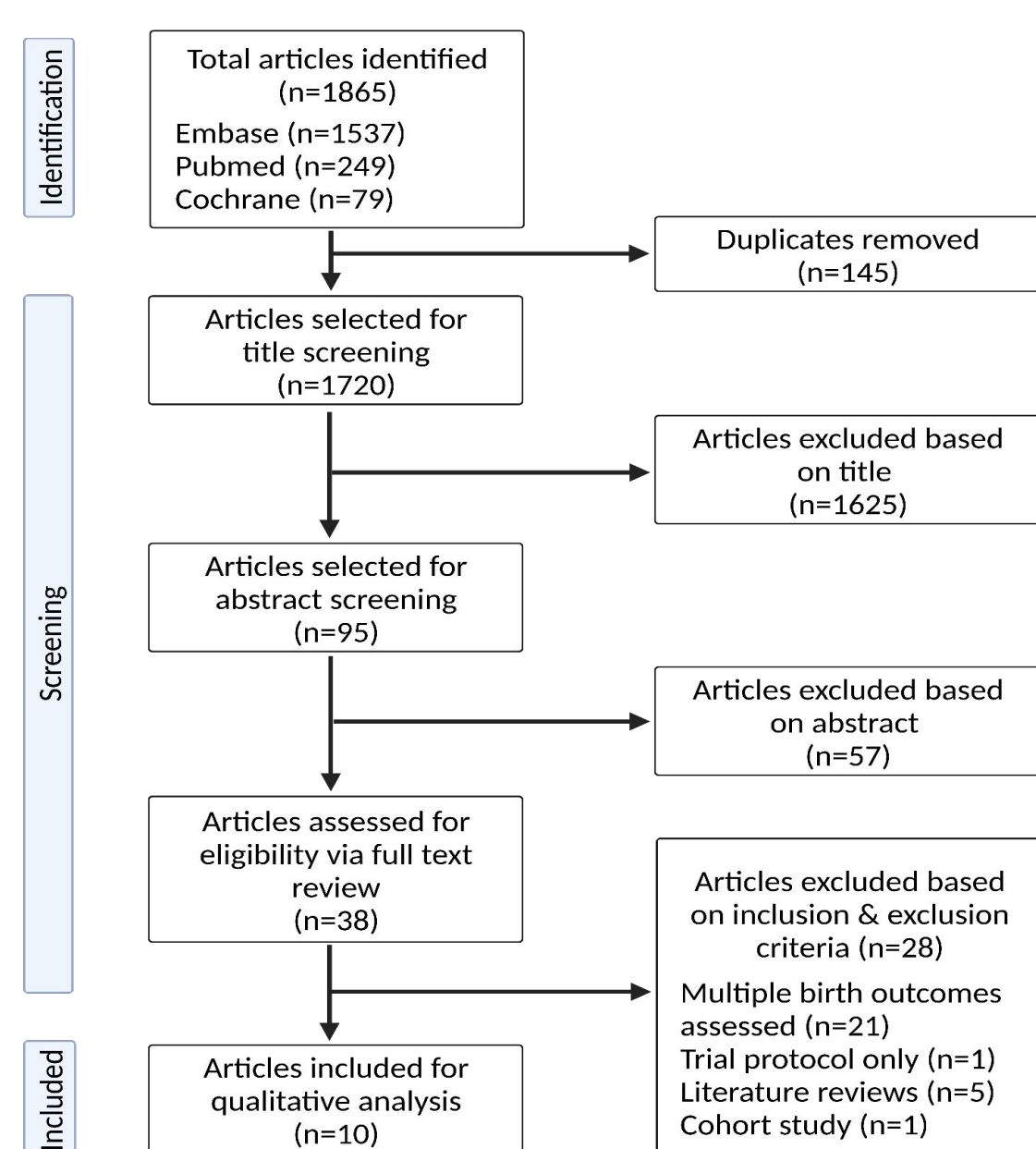
- Need for defined, observable, and measurable predictors for PTB. Identifying genetic loci related to PT predisposition and periodontal therapy response can help in developing targeted preventative treatments.
- Combinations of mechanical and non-mechanical therapy may be warranted to treat PTB, which is a multifactorial birth outcome.
- Possible objectives for future RCTs: comparisons of periodontal therapy at different stages of pregnancy, periodontal therapy as a prophylactic measure, effects of recall and maintenance visits.

ACKNOWLEDGEMENTS

- Supported by CDM Summer Research Fellowship
- Thanks to Dr Catherine Monk and the Perinatal Pathways Lab for their guidance and support

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First author, year	Study design	Test treatment	Control Treatment		Diagnostic inclusion criteria	
			Prenatal	Postpartum	PD	CAL
Offenbacher (2006) ⁶	RCT	SRP, OHI, polishing, sonic toothbrush	Supragingival debridement, manual toothbrush	SRP, OHI, polishing, sonic toothbrush	≥ 5 mm at ≥ 2 sites	1 – 2 mm at ≥ 2 sites
Offenbacher (2009) ⁵	RCT	SRP, OHI, polishing	SRP, OHI, polishing	SRP, OHI, polishing	≥ 3 mm at ≥ 3 sites	≥ 3 mm at ≥ 3 sites
Jeffcoat (2011) ³	RCT	SRP, OHI, home care supplies	OHI, home care supplies		≥ 4 mm at ≥ 3 sites	
Ryu (2010) ⁹	Case control	SRP			≥ 3.5 mm on ≥ 2 teeth	
Sant'Ana (2010) ¹⁰	Non-randomized CT	SRP, prophylaxis, OHI	OHI, prophylaxis	SRP, caries control		
Jeffcoat (2011) ²	Pseudo-random CT	Cetylpyridinium chloride rinse, OHI, home care supplies	OHI, home care supplies, rinsing with water	SRP, caries control	≥ 4 mm at ≥ 3 sites	
Oliveira (2011) ⁷	RCT	Periodontal status exam, SRP, prophylaxis, OHI, home care supplies	Periodontal status exam, home care supplies	SRP	≥ 4 mm at ≥ 1 site on ≥ 4 teeth	≥ 3 mm at ≥ 1 site on ≥ 4 teeth
Pirie (2013) ⁸	RCT	SRP, OHI, polishing	Supragingival debridement, OHI	SRP	≥ 4 mm at ≥ 4 sites	≥ 2 mm at ≥ 4 sites
Jeffcoat (2014) ¹	Case control	SRP, OHI, home care supplies	OHI, home care supplies		≥ 4 mm at ≥ 3 sites	
Kaur (2014) ⁴	Non-randomized CT	SRP, OHI, home care supplies			≥ 3 mm at ≥ 3 sites	

Fig. 1. Screening and selection process documented using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Table 1. Selected design features of published clinical trials.

First author, year	Racial / ethnic distribution (%)		Additional risk factors	GA at intervention	Post-intervention clinical effects								
	Treatment Group	Control Group			GA < 37 weeks (%)			PD			CAL		
					Treatment Group	Control Group	p-value	Treatment Group	Control Group	p-value	Treatment Group	Control Group	p-value
Offenbacher (2006) ⁶	60.0% African American 25.0% White	61.8% African American 26.5% White	Prior PTB, low SES	< 22 weeks	34.6	43.8	0.026	1.46 mm average	2.39 mm average	< 0.0001	0.45 mm average	0.58 mm average	0.01
Offenbacher (2009) ⁵	38.2% African American 60.8% White	36.9% African American 61.3% White	Low SES	< 23 w/ weeks	11.0	9.2	0.212						
Jeffcoat (2011) ³	86.9% African American	57.4% African American	Never seen dentist, never had dental cleaning	< 13 weeks	45.6	52.4	0.13						
Ryu (2010) ⁹				< 12 months before pregnancy			0.039						0.318
Sant'Ana (2010) ¹⁰			Low SES, low educational status	< 28 weeks	6.25	35.3	Significant	2.28 mm average	2.53 mm average	< 0.01	0.56 mm average	0.75 mm average	< 0.01
Jeffcoat (2011) ²	85% African American	84% African American	Low SES, single parent	< 20 weeks	5.6	21.9	< 0.01	0.14 mm decrease	0.25 mm increase	< 0.001			
Oliveira (2011) ⁷	32.74% Black 33.63% White	33.04% Black 33.04% White		< 20 weeks	21.2	23.2	0.722	1.19 sites with PD ≥ 4 mm	6.36 sites with PD ≥ 4 mm	< 0.0001	5.72 sites with CAL ≥ 3 mm	6.58 sites with CAL ≥ 3 mm	0.0069
Pirie (2013) ⁸				< 24 weeks	8.16	2.00	Not significant						
Jeffcoat (2014) ¹	91.4% African American		Prior PTB, never seen dentist, never had dental cleaning, smoking, alcohol use	< 20 weeks	1.0 if treatment successful	52.1 if treatment not successful	< 0.0032				2.39 mm average if treatment successful	3.83 mm average if treatment not successful	< 0.0001
Kaur (2014) ⁴	83.3% African American across all participants		Low SES, single parent, smoking	< 24 weeks	6.7		0.113	0.34 mm decrease		< 0.0001	0.21 mm increase		0.0008

Table 2. Selected population characteristics and outcomes of published clinical trials.