International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Research Article

Consequence of periodontal therapy on unfavorable birth outcomes. A systematic review and meta-analysis

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Received: 05-08-2025
Accepted: 25-09-2025
Available online: 20-10-2025

ABSTRACT

Introduction: Unfavorable birth outcomes –Low Birth Weight (LBW), Preterm Birth (PTB) and Preterm Low Birth Weight (PTLBW) negatively impact health of mother and babies and also leads to developmental complications later in life. Among the etiological factors, infection and inflammation have gained important consideration. Purpose of present systematic review with meta-analysis is evaluation of impact that periodontal therapy exerts on unfavorable birth outcomes.

Material and methods: Electronic databases searched for the relevant articles- PubMed, Cochrane database and Google Scholar. Outcome variables considered – PTB, LBW and PTLBW. Meta-analysis was carried out with RevMan software. Risk ratio (RR) for each variable was utilized to present measures of effect.

Results: Ten researches were chosen for systematic review with meta-analysis. Results demonstrated no difference in risk of PTB(RR = 0.88; CI:0.69 to1.13; p =0.32), LBW(RR = 0.81;CI:0.56 to1.17; p = 0.002) and PTLBW (RR = 0.55;CI:0.22to1.36;p = 0.010) between treatment group and control group.

Conclusion: Present systematic review & meta-analysis demonstrated that non-surgical periodontal therapy does not decrease risk of unfavorable birth outcomes in pregnancy.

Keywords*: periodontal therapy, chronic periodontitis, preterm birth, non-surgical periodontal therapy, low birth weight, preterm low birth weight baby.*

INTRODUCTION

Unfavorable birth outcomes - Low Birth Weight (LBW), Preterm Birth(PTB) and Preterm Low Birth Weight(PTLBW) in addition to negatively impacting maternal and new born health also puts an additional economic burden on the families.[1,2] PTB - babies born before completion of 37 weeks of gestation, LBW-weight at birth of less than 2500 grams, PTLBW-babies born less than 37 weeks with < 2.5 kg weight.

PTB accounts for 28% of neonatal mortality[3] and development of neurological, behavioral problems, metabolic complications later in life.[4] Various etiological factors involved in development of PTB and LBW includes- maternal age, smoking, alcohol consumption, socioeconomic status, stress, nutritional deficiencies, hypertension, infection etc.[5-8] Infection and inflammation have received a considerable recognition in the recent years. Researches have shown relationship of periodontal disease with unfavorable birth outcomes. [9,10]

Proposed mechanism of periodontal disease causing unfavorable birth outcomes involves periodontal microorganisms, their by-products and inflammatory mediators.[11] Rise in female sex hormones in pregnancy increases permeability of blood vessels due to which pathogens of periodontal origin and their byproducts can transfer from infected periodontal tissue though blood into feto-placental unit. This can also activate inflammatory reactions in feto-placental unit leading to adverse pregnancy outcomes.[11] Therefore, researchers have explored result of periodontal therapy on birth outcomes. Present systematic review with meta-analysis aims to evaluate consequence of periodontal therapy on unfavorable birth outcomes.

MATERIALS AND METHODS

Focused question:

To develop focused question PICO (patient, intervention, comparison and outcomes) framework was used. "In pregnant patients with periodontitis what is consequence of periodontal therapy on unfavorable birth outcomes in terms of PTB, LBW and PTLBW." Present review was carried according to PRISMA guidelines- Preferred Reporting Items for Systematic Review and Meta-analysis. [12]

Eligibility criteria:

Inclusion criteria:

1) Randomized clinical trials.
2) Studies including non-surgical periodontal treatment.
3) Researches published in English language.
4) Studies including human trials.

Exclusion criteria:

1) Case series, case reports, non-randomized clinical trials.
2) Animal studies.
3) Researches including surgical periodontal treatment.
4) Studies not published in English language.

Outcome variables:

Outcome variables included are PTB, LBW and PTLBW. Reviewers independently extracted data – name of author, publication year, sample size, age, PTB, LBW, PTLBW and outcome.

Search strategy:

PubMed, Cochrane, Google scholar databases were searched till July 2025 for present review. References of selected studies were also explored.

PubMed:

"periodontal disease"[TITLE/ABSTRACT] OR "periodontal diseases"[MeSH] OR "chronic periodontitis"[MeSH] AND "periodontal treatment"[TITLE/ABSTRACT] OR "periodontal debridement"[MeSH] OR "Dental Scaling"[Mesh] OR "Root Planing"[Mesh] AND "infant, low birth weight"[MeSH] OR "premature birth"[MeSH]

Cochrane

"periodontal diseases"[MeSH] OR "chronic periodontitis"[MeSH] AND "periodontal treatment"[ti,ab,kw] OR "periodontal debridement"[MeSH] OR "Dental Scaling"[Mesh] OR "Root Planing"[Mesh] AND "infant, low birth weight"[MeSH] OR "premature birth"[MeSH] OR "low birth weight"[ti,ab,kw] OR "preterm birth"[ti,ab,kw]

Google scholar

"chronic periodontitis "AND "effect" AND "periodontal treatment" OR "non-surgical periodontal treatment" OR "periodontal therapy" AND "low birth weight" OR "preterm birth" OR "preterm low birth weight"

Screening and study selection:

Reviewers (AK & CY) evaluated titles and abstract of the selected studies. Full text of screened studies was assessed in accordance to eligibility criteria. Discussion was done to settle disagreement among the reviewers. Figure 1 shows PRISMA flowchart for study screening and selection.

Risk of bias:

Cochrane Collaboration's tool for assessment of risk of bias in randomised trials[13] was utilised for quality evaluation of selected studies, judging following domains-1)Sequence generation, 2)Allocation concealment, 3)Blinding of participants and personnels, 4)Blinding of outcome assessment, 5)Incomplete outcome data, 6)Selective outcome reporting, and 7)other sources of bias.

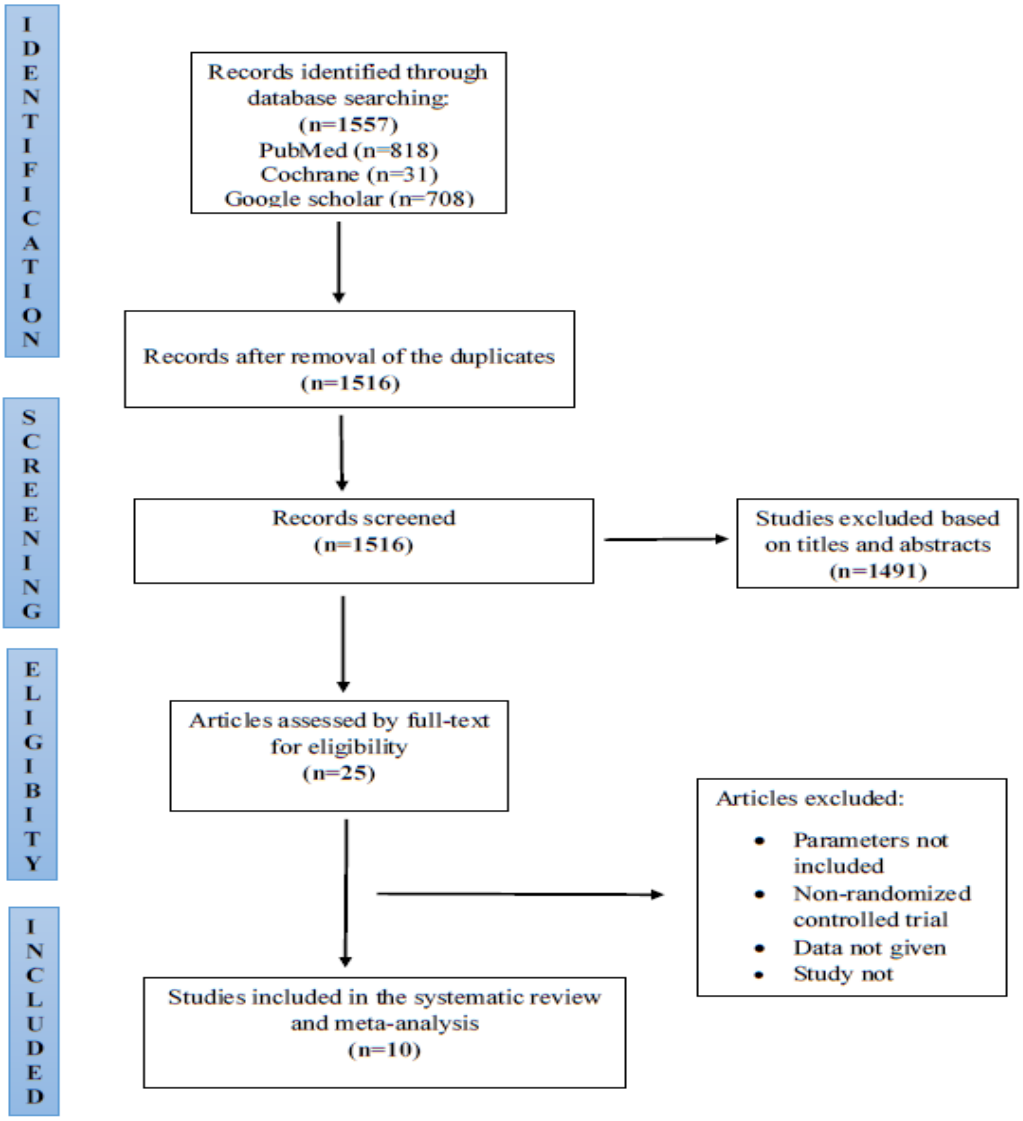

Figure 1. PRISMA flowchart for screening and study selection.

Statistical analysis:

Meta-analysis was carried out by RevMan software. Heterogenicity was calculated by I^2 value based on which fixed or random effect model was selected. Risk ratio (RR) for each outcome variable – PTB, LBW and PTLW at 95%Confidence interval(CI) was utilized to present measures of effect.

Electronic database search in PubMed, Cochrane database and Google Scholar provided 1557 articles. 1516 articles were left after removal of duplicates. Full text assessment of 25 articles was done after screening of titles and abstract. Finally, ten studies were chosen for systematic review & meta-analyses. Characteristics of selected studies are shown in Table 1.

Table 1. General characteristics of selected studies.

Author	Year of publication	Study groups	Mean age (years)	PTB	LBW	PTLBW	Outcome
Lopez et al.[14]	2002	Treatment group: 200 Control group: 200	Treatment group: 28±4.5 Control group: 27±4.3	Treatment group: 2 Control group: 12	Treatment group: 1 Control group: 7	Treatment group: 3 Control group: 19	Periodontal treatment showed significant reduction in PTLBW.
Michalowicz et al.[15]	2006	Treatment group: 413	Treatment group: 26.1±5.6	Treatment group: 49	Treatment group: 40	_____	Periodontal therapy failed to significantly

		Control group: 410	Control group: 25.9±5.5	Control group: 52	Control group: 43		alter rate of PTB and LBW.
Radnai et al.[16]	2007	Treatment group: 43 Control group: 46	Treatment group: 29.1±6.4 Control group: 28.9±5.4	Treatment group: 10 Control group: 22	Treatment group: 6 Control group: 18	Treatment group: 4 Control group: 14	Periodontal treatment lowered chance of PTB and LBW.
Tarannum et al.[17]	2007	Treatment group: 100 Control group: 100	Treatment group: 23±3.3 Control group: 22.9±3.6	Treatment group: 45 Control group: 68	Treatment group: 19 Control group: 48	_____	Risk of PTB and LBW reduced significantly with periodontal treatment.
Newnham et al.[18]	2009	Treatment group: 546 Control group: 541	Treatment group: 30.5±5.5 Control group: 30.5±5.5	Treatment group: 52 Control group: 50	_____	_____	No beneficial effect of periodontal therapy was reported.
Offenbacher et al.[19]	2009	Treatment group: 903 Control group: 903	Treatment group: 25.4±5.5 Control group: 25.3±5.5	Treatment group: 97 Control group: 81	Treatment group: 72 Control group: 71	_____	Periodontal therapy did not reduce PTB and LBW incidence.
Macones et al.[20]	2009	Treatment group: 376 Control group: 380	Treatment group: 24.1±5.2 Control group: 24.4±5.7	Treatment group: 58 Control group: 47	Treatment group: 48 Control group: 35	_____	Periodontal treatment failed to reduce PTB and LBW.
Oliveira et al.[21]	2010	Treatment group: 122 Control group: 124	Treatment group: 29.96±4.38 Control group: 26.58±3.96	Treatment group: 24 Control group: 26	Treatment group: 23 Control group: 31	Treatment group: 29 Control group: 31	Periodontal therapy did not significantly reduce PTB and LBW.
Weidlich et al.[22]	2012	Treatment group: 156 Control group: 147	_____	Treatment group: 17 Control group: 14	Treatment group: 8 Control group: 6	Treatment group: 6 Control group: 4	Periodontal treatment did not affect the PTB and LBW.
Queija et al.[23]	2019	Treatment group: 20 Control group: 20	Treatment group: 32±4.27 Control group: 32.25±4.21	Treatment group: 1 Control group: 3	Treatment group: 1 Control group: 3	_____	Periodontal treatment did not significantly reduced PTB and LBW.

PTB: preterm birth; LBW: low birth weight; PTLBW: preterm low birth weight

Risk of bias:

Cochrane risk of bias tool was utilized for evaluation of studies.[13] All studies showed moderate overall risk of bias. (Figure 2) All studies reported low risk of bias for random sequence generation except one.[21] In allocation concealment two studies reported low risk[22,23] while rest reported moderate risk. All studies reported moderate risk for performance bias except one with low risk.[18] For detection bias four studies[15,18,19,20] reported low risk while for rest moderate risk was reported. For attrition bias, reporting and other bias, all researches showed low risk. (Figure 3)

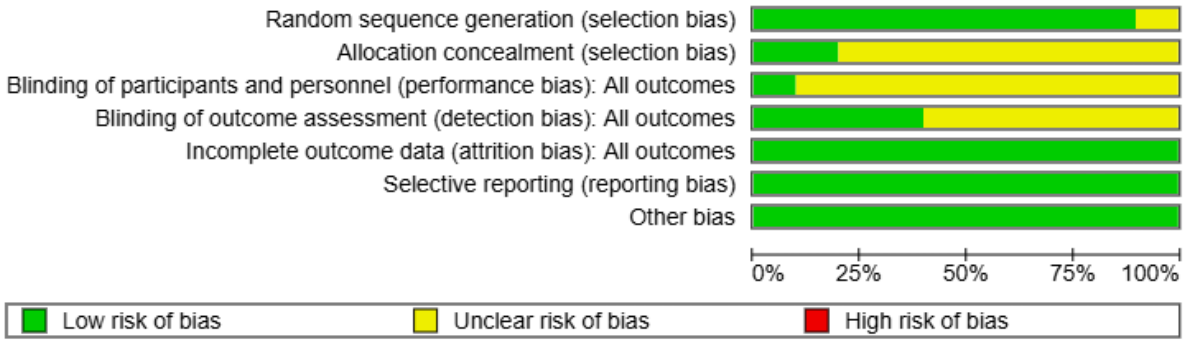

Figure 2. Risk of bias graph

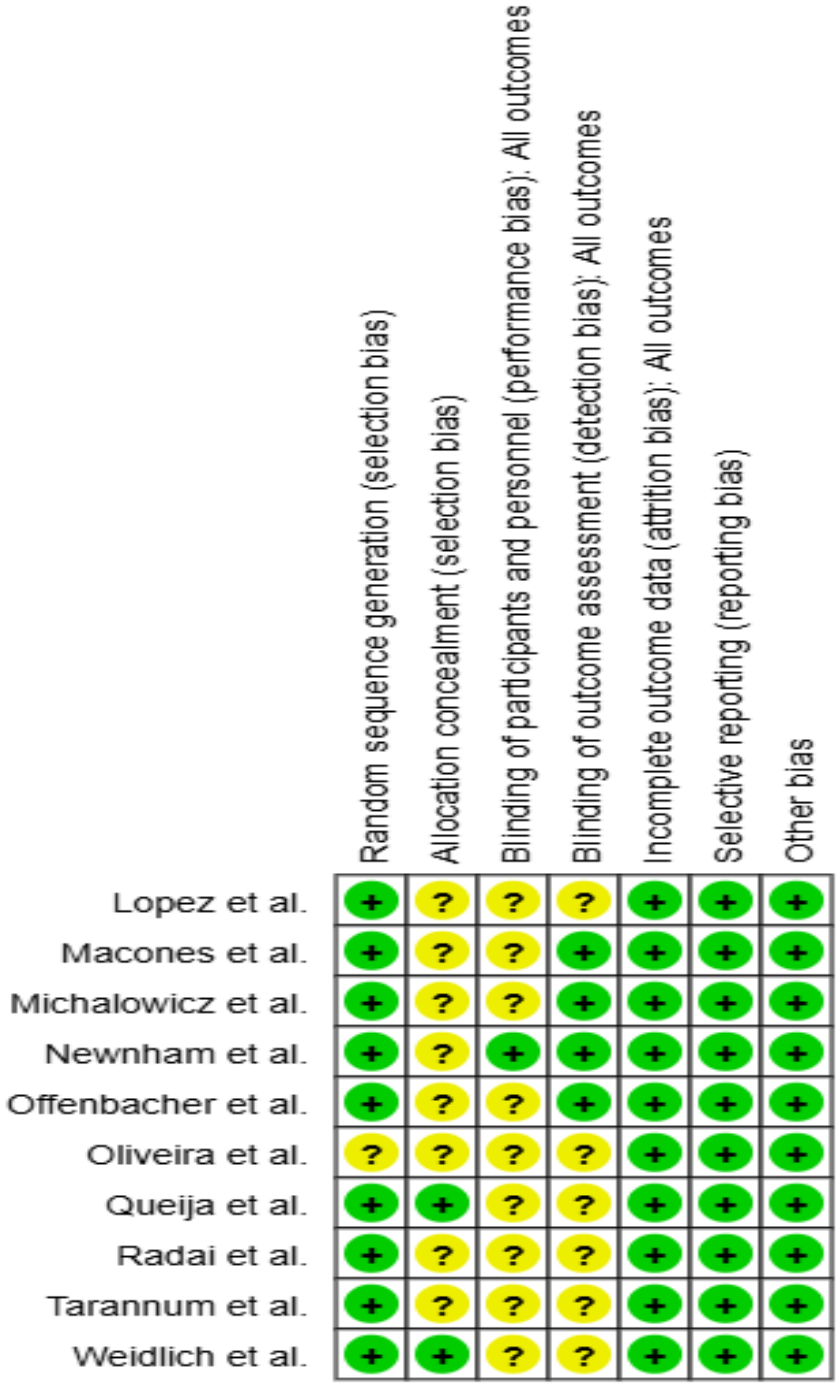

Figure 3. Risk of bias summary.

Outcome variables:
Preterm birth:

Random effect model was selected as heterogeneity was high (I^2=66%). Results show statistically non-significant difference in risk of PTB between patients of treatment group compared to control group (RR = 0.88; CI:0.69 to1.13;p =0.32) [Figure 4].

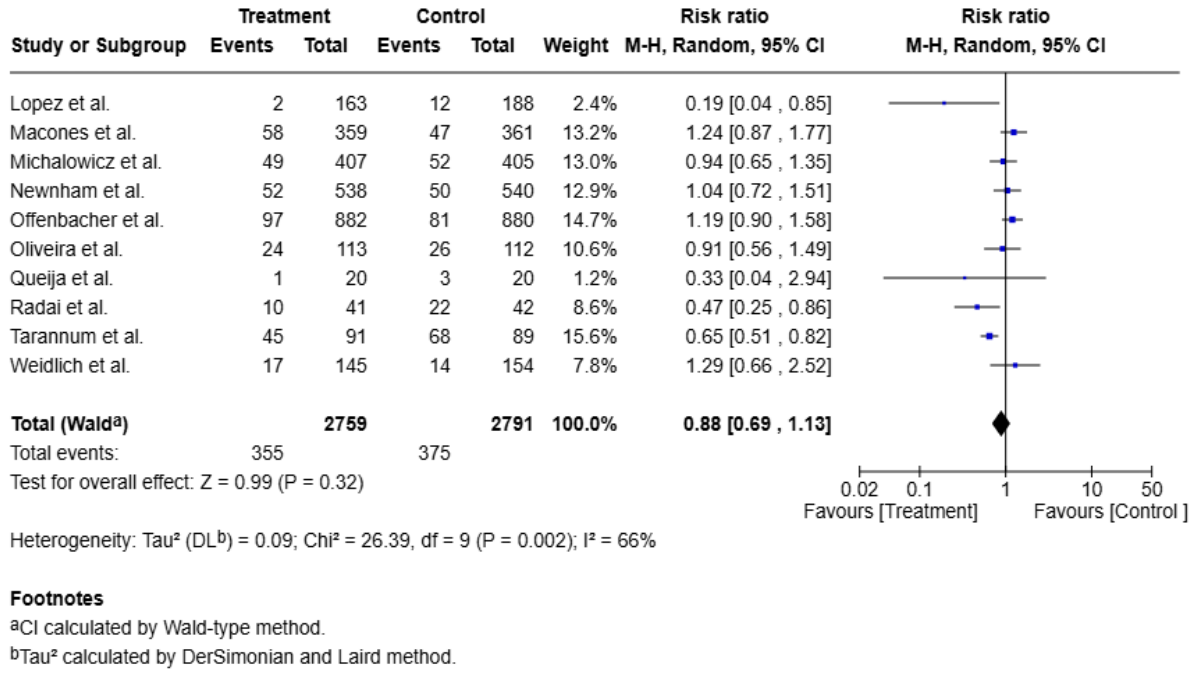

Figure 4. Forest plot of risk ratio for preterm birth in treatment group vs control group. M-H: Mantel-Haenszel.

Low birth weight:
As heterogeneity was high random effect model was used (I^2=70%). No statistically significant difference was reported in meta-analysis in risk of LBW in treatment group compared to control group (RR =0.81;CI:0.56 to1.17; p =0.002) [Figure 5].

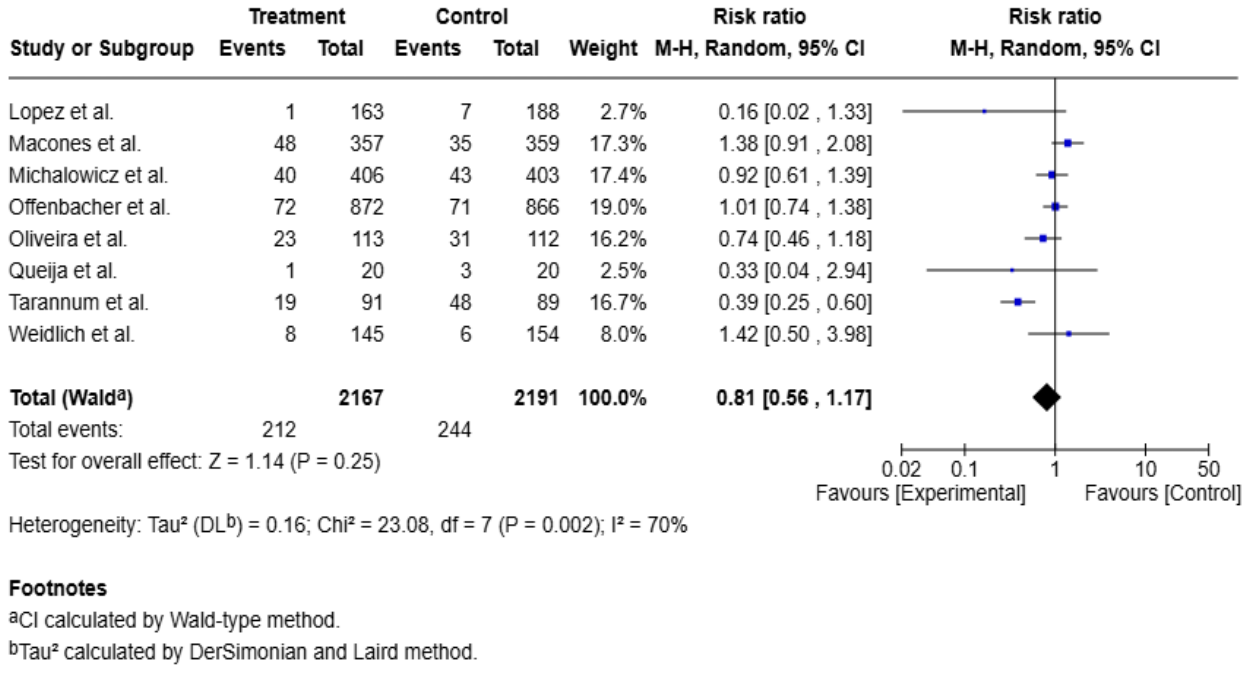

Figure 5. Forest plot of risk ratio for low birth weight in treatment group vs control group. M-H: Mantel-Haenszel.

Preterm low birth weight:
The heterogeneity was high (I^2=74%) due to which random effect model was selected. For risk of PTLBW meta-analysis demonstrated statistically non-significant difference between treatment group compared to control group (RR =0.55; CI:0.22 to1.36; p =0.010) [Figure 6].

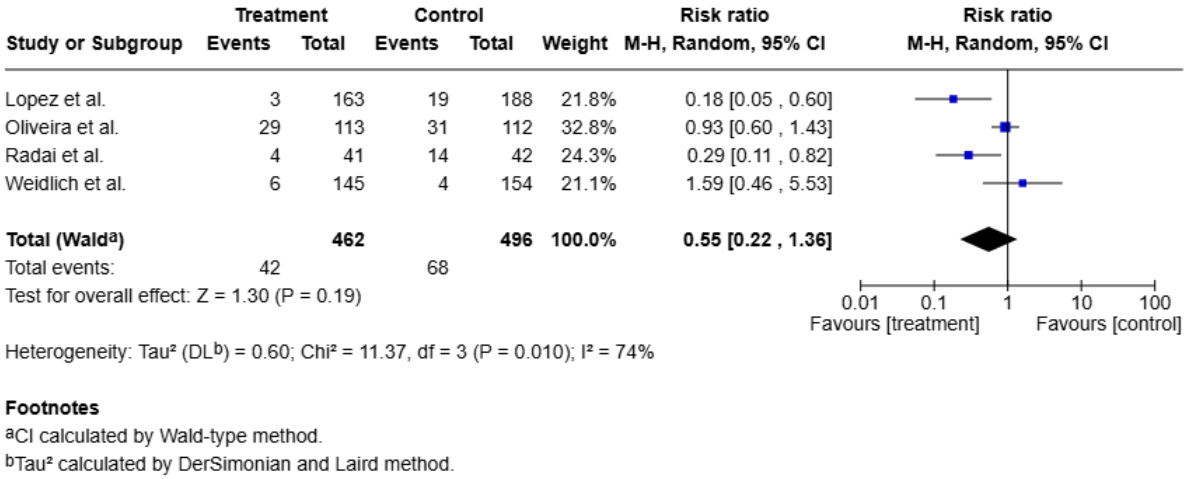

Figure 6. Forest plot of risk ratio for preterm low birth weight in treatment group vs control group. M-H: Mantel-Haenszel.

DISCUSSION

Present systematic review with meta-analysis evaluated consequence of periodontal therapy on unfavorable birth outcomes in terms of PTB, LBW and PTLBW. Results of meta-analysis demonstrated statistically non-significant difference in risk of PTB(RR = 0.88; CI:0.69 to1.13; p =0.32), LBW(RR = 0.81;CI :0.56 to1.17; p = 0.002) and PTLBW (RR = 0.55;CI :0.22 to1.36; p =0.010) between treatment group and control group.

Results of the present review corroborates with findings of some previous studies. Polyzos NP et al.,[24] demonstrated non-significant difference between treatment group compared to control group for PTB[odds ratio(OR)= 0.79, 95%CI :0.58 to1.06;P =0.12] and LBW (OR=0.85, 0.70 to1.04;P=0.11).Thus, concluded that periodontal therapy cannot be considered as an effective method of reducing PTB and LBW incidence. Uppal A et al.,[25] reported that periodontal therapy in pregnant patients don't cause reduction in PTB (OR=0.589, 95% CI: 396-0.875) and LBW (OR=0.717; 95% CI: 0.440-1.169). Rosa MI et al.,[26] demonstrated that periodontal disease treatment in pregnant patient showed no decrease the risk of PTB(RR = 0.90; 95%CI :0.68-1.19) & LBW(RR=0.92;95%CI:0.71-1.20). Fogacci MF et al.,[27] stated that periodontal treatment doesn't reduce incidence of PTB and LBW. Above findings can be a consequence of various reasons. Goldenberg et al.,[28] proposed that by the time periodontal therapy is undertaken it is already late to for any positive impact on the pregnancy outcomes. Another possible mechanism is lack of severity of periodontal disease, thus not exerting a negative impact on pregnancy. [29] Lack of any significant difference in cord serum cytokines level between treatment and control group might be another explanation.[29]

Some reviews however reported positive impact of periodontal therapy on birth outcomes. George A et al.,[30] reported reduction of PTB(OR = 0.65; 95%CI :0.45–0.93; P = 0.02) and LBW(OR = 0.53; 95%C I:0.31–0.92; P = 0.02) incidence. Bi WG et al.,[31] demonstrated that periodontal therapy decreases risk of PTB(RR = 0.78; 95%CI :0.62-0.98; p =0.03) and LBW. Kim AJ etal.,[32] reported significant decrease in risk of PTB with periodontal treatment.

Strength of present systematic review & meta-analysis includes comprehensive search for researches, assessment with Cochrane risk of bias tool and including only randomized clinical trials. Limitations of this review involves high heterogeneity among included studies and limiting to studies published in English language only.

CONCLUSION

Findings of present systematic review & meta-analysis demonstrated that periodontal therapy in pregnant women did not reduce unfavorable birth outcomes – PTB, LBW and PTLBW. More large scale studies are required to further explore impact of periodontal therapy on birth outcomes.

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