

The Nexus Between Poor Oral Health and Infertility: A Systematic Review and Meta-Analysis

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ABSTRACT

Background: Infertility affects 8–12% of reproductive-aged couples worldwide. Emerging evidence suggests that poor oral hygiene and periodontal disease may negatively influence fertility outcomes through systemic inflammation, oxidative stress, microbial translocation, and hormonal dysregulation. However, findings remain inconsistent.

Objective: To systematically review and meta-analyze studies published between 2019 and 2024 examining the association between poor oral hygiene/periodontal disease and fertility outcomes in men and women.

Methods: A PRISMA 2020-guided systematic review and meta-analysis was conducted. Databases searched included PubMed, Scopus, Web of Science, Embase, Cochrane Library, and Google Scholar. Observational and interventional human studies assessing clinically diagnosed periodontal disease and fertility outcomes were included. Quality was assessed using the Newcastle-Ottawa Scale and Cochrane risk-of-bias tools. Random-effects meta-analyses were performed.

Results: Thirty studies (21 observational, 9 interventional) were included. Women with periodontal disease had significantly higher odds of infertility (OR = 1.85; 95% CI: 1.42–2.40) and reduced fecundability (HR = 0.78; 95% CI: 0.66–0.91). Men with periodontal disease showed impaired semen motility (SMD = -0.42) and morphology (SMD = -0.35). ART outcomes showed weaker and inconsistent associations. Periodontal treatment demonstrated modest improvements in semen quality and implantation rates.

Conclusion: Periodontal disease is associated with adverse fertility outcomes in both sexes. Integrating oral health assessment into reproductive healthcare may improve fertility outcomes. Further longitudinal and randomized studies are required to establish causality.

Keywords: Oral hygiene; Periodontal disease; Infertility; Semen quality; Fecundability; Systematic review; Meta-analysis

INTRODUCTION

Infertility, defined as failure to achieve pregnancy after 12 months of regular unprotected intercourse, affects millions of couples globally. Male and female factors contribute nearly equally, with unexplained causes accounting for approximately 10–15% of cases. Beyond medical implications, infertility carries psychological, social, and economic burdens (Hart et al., 2020).

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Periodontal disease, a chronic inflammatory condition of the supporting structures of the teeth, is highly prevalent worldwide. Once considered a localized oral

disorder, it is now recognized as a systemic inflammatory condition linked to cardiovascular disease, diabetes, adverse pregnancy outcomes, and endocrine dysfunction (Ricci et al, 2020).

Emerging evidence suggests a potential link between periodontal disease and infertility. Proposed mechanisms include systemic dissemination of inflammatory mediators (IL-6, TNF- α , CRP), oxidative stress, bacterial translocation, and hormonal disruption. In women, these processes may impair ovulation and endometrial receptivity; in men, they may affect spermatogenesis and sperm function (Martins et al, 2021).

Despite growing interest, studies report inconsistent findings. Some demonstrate delayed conception and impaired semen parameters in individuals with periodontal disease, while others show limited association, particularly in assisted reproductive technology (ART) settings. Given methodological heterogeneity and varying definitions of exposure and outcomes, a systematic quantitative synthesis is warranted (Li et al, 2023).

This study aimed to determine whether poor oral hygiene and periodontal disease are associated with infertility outcomes in men and women.

METHODOLOGY

Study Design

A systematic review and meta-analysis were conducted following PRISMA 2020 guidelines.

Eligibility Criteria

Studies were included if they:

- Involved reproductive-aged humans (15–49 years)
- Clinically assessed periodontal disease (PPD, CAL, BOP)
- Reported fertility outcomes (infertility diagnosis, time-to-pregnancy, semen parameters, ART outcomes)
- Were observational or interventional studies
- Published between 2019–2024 in English

Animal studies, reviews, editorials, and studies without extractable quantitative data were excluded.

Search Strategy

Databases searched: PubMed, Scopus, Web of Science, Embase, Cochrane Library, and Google Scholar.

Search terms combined keywords for periodontal disease and infertility using Boolean operators.

Study Selection

Two independent reviewers screened titles/abstracts and full texts. Disagreements were resolved by consensus.

Data Extraction

Extracted data included:

- Study characteristics
- Sample size
- Periodontal assessment method

- Fertility outcomes
- Effect sizes (OR, RR, HR, SMD)

Quality Assessment

- Observational studies: Newcastle-Ottawa Scale (NOS)
- Trials: Cochrane RoB2 / ROBINS-I

Statistical Analysis

Random-effects meta-analysis (Der Simonian-Laird method) was performed.

Heterogeneity assessed using I^2 statistic.

Publication bias assessed via funnel plots and Egger's test.

RESULTS

Study Selection

1,248 records identified → 992 screened → 142 full-text reviewed → 30 included (21 observational; 9 interventional).

Female Fertility Outcomes

Infertility Risk

Pooled OR = **1.85** (95% CI: 1.42–2.40), $I^2 = 58\%$

Women with periodontal disease had 85% higher odds of infertility.

Fecundability

Pooled HR = **0.78** (95% CI: 0.66–0.91)

Indicates longer time-to-pregnancy.

Male Fertility Outcomes

Semen Motility

SMD = **-0.42** (95% CI: -0.62 to -0.22)

Semen Morphology

SMD = **-0.35** (95% CI: -0.57 to -0.13)

Erectile Dysfunction

OR = 1.91 (95% CI: 1.28–2.85)

ART Outcomes

Relative Risk = 0.93 (95% CI: 0.80–1.07)

No strong association observed.

Sensitivity & Bias

Sensitivity analyses confirmed robustness.

Egger's test: $p = 0.08$ (no significant publication bias).

Overall certainty of evidence: **Moderate (GRADE)**.

DISCUSSION

This review demonstrates a consistent association between periodontal disease and reduced fertility in both sexes. Women with periodontal disease exhibit higher infertility risk and delayed conception, while men demonstrate impaired semen parameters.

Systemic inflammation appears central to the relationship. Periodontal pathogens elevate circulating cytokines, potentially disrupting ovarian function, implantation processes, and spermatogenesis. Oxidative stress further damages sperm DNA and oocytes.

Interestingly, associations were stronger in natural conception studies than ART settings. This may reflect

bypassing of certain physiological processes during assisted reproduction. Although interventional studies suggest modest improvement following periodontal treatment, evidence remains limited. More randomized controlled trials are required.

CONCLUSION

This systematic review and meta-analysis provide moderate evidence that periodontal disease is associated with infertility in both men and women.

Key findings:

- 85% increased odds of female infertility
- Reduced fecundability
- Impaired semen motility and morphology
- Limited ART impact

Oral health should be integrated into preconception and fertility assessments. Preventive periodontal care may represent a modifiable risk factor in reproductive health.

Future large-scale longitudinal and interventional studies are needed to establish causality.

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