

PERIODONTAL HEALTH AND FEMALE FERTILITY: EXPLORING THE ORAL
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ABSTRACT

Aim: To critically synthesize the literature concerning periodontal health and female fertility, with particular attention to fecundability, infertility, assisted reproductive outcomes, employment-related factors, and proposed oral–reproductive mechanisms. **Materials and Methods:** Published literature addressing periodontal disease, female fertility, conception, infertility, assisted reproduction, employment, occupational stress, and oral–reproductive health was interpreted narratively. Emphasis was placed on study design, periodontal assessment, reproductive outcomes, potential confounding, biological plausibility, and clinical relevance. No systematic-review, meta-analytic, or formal evidence-synthesis methodology was applied. **Result(s):** Observational evidence suggests possible associations between periodontal disease and reduced fecundability or infertility in some populations, but findings are heterogeneous and largely observational. Studies of women undergoing assisted reproductive treatment have also produced inconsistent findings. Employment is not established as an independent biological cause of reduced fertility; age at pregnancy, socioeconomic circumstances, occupational stress, working patterns, and healthcare access may modify reproductive and oral-health outcomes. **Conclusion:** Periodontal inflammation is a biologically plausible component of the oral–reproductive health environment, but a direct causal relationship between periodontitis and impaired female conception has not been established. Prospective studies with standardized periodontal and reproductive measures and interventional studies are needed.

KEYWORDS: Periodontal diseases; Oral health; Female fertility; Fecundability; Infertility; Employment; Occupational stress; Reproductive health.

1. INTRODUCTION

Infertility is a disease of the male or female reproductive system characterised by failure to achieve pregnancy after 12 months or more of regular unprotected sexual intercourse. It may result from female factors, male factors, combined factors or unexplained causes. The World Health Organisation estimates that approximately one in six people of reproductive age experience infertility during their lifetime, highlighting the substantial public-health and psychosocial importance of reproductive health.^[1–3] Achievement of pregnancy is not determined by a single biological variable. Female age, ovulatory function, ovarian and tubal factors, uterine conditions, lifestyle, metabolic health and reproductive

behaviour all contribute to fecundability. Male reproductive characteristics and couple-level factors are also important. Consequently, factors associated with social circumstances and health behaviours may influence reproductive outcomes without necessarily having a direct biological effect on the reproductive organs.^[1,2]

Periodontitis is a chronic inflammatory disease characterised by dysbiotic microbial communities and a host inflammatory response resulting in progressive destruction of periodontal supporting tissues. The contemporary classification recognises periodontitis as a single disease entity characterised using staging and

grading based on severity, complexity, progression and risk characteristics.^[4,5] The concept of an oral-systemic connection has expanded considerably. Periodontal inflammation has been investigated in relation to cardiovascular, metabolic and pregnancy-related conditions, although the strength of evidence differs between outcomes. Potential mechanisms include systemic inflammatory signalling, microbial dissemination and immune-mediated responses.^[6-8] Interest has subsequently extended to the periodontium and female reproductive health. Several observational studies have reported an association between periodontal disease and infertility or reduced fecundability, while other studies have not identified meaningful differences in assisted reproductive outcomes.^[9-13]

Employment represents another potentially relevant dimension of women's reproductive health. Work can provide economic resources, independence and healthcare access, but occupational stress, long working hours, shift work and employment-related uncertainty may influence reproductive behaviour or health. Importantly, contemporary evidence indicates that employment should not be considered a uniform reproductive risk. A 2026 quantitative review of 94 studies found that the historically negative relationship between women's employment and fertility had become statistically insignificant in many contemporary settings and positive in several regions.^[14]

The intersection of these domains creates an important interdisciplinary question: could employment-related social and behavioural factors influence periodontal health, while periodontal inflammation represents one potential pathway within the broader relationship between oral and reproductive health? The present narrative review explores this question while distinguishing established evidence from biological plausibility and emerging hypotheses.

2. Female Fertility, Fecundability and Conception

2.1 Fertility and fecundability

Fertility generally refers to the capacity to reproduce, whereas fecundability describes the probability of achieving a clinically recognized pregnancy during a menstrual cycle among individuals exposed to the possibility of conception (Figure 1). These concepts should not be treated as interchangeable. This distinction is particularly important in research concerning periodontal disease. A study assessing infertility prevalence is addressing a different outcome from a prospective study measuring time to pregnancy or cycle-specific fecundability. Similarly, overall fertility or number of live births cannot automatically be interpreted as evidence of altered biological conception potential. Infertility is clinically defined by the WHO as failure to achieve pregnancy after at least 12 months of regular unprotected intercourse.^[1-3]

2.2 Determinants of conception

Natural conception requires coordinated reproductive function in both partners. In women, age, ovulation, ovarian reserve, tubal patency and uterine factors are important determinants. Lifestyle factors including smoking, obesity and excessive alcohol consumption may also affect fertility.^[1,2] Maternal age is particularly important when interpreting studies involving employed women. Employment and career development may coincide with postponement of pregnancy. Therefore, an observed difference in conception between working and non-working women may partly reflect differences in age at the beginning of pregnancy attempts rather than a direct occupational effect. Because fertility, fecundability, conception and infertility describe different reproductive concepts, their distinction is important when interpreting studies investigating periodontal health and reproductive outcomes (Table 1).^[1-5]

3. Periodontal Health in Women of Reproductive Age

Periodontal health exists within a dynamic relationship between the oral microbial community and host immune response. Periodontitis develops when dysbiotic microbial communities interact with a susceptible host, producing a chronic inflammatory response and progressive periodontal tissue destruction.^[4,5] The 2017 World Workshop classification introduced staging and grading of periodontitis. Staging reflects severity and complexity, whereas grading provides information regarding progression and risk. This framework is particularly useful when considering research into systemic outcomes because simply labelling a participant as having "periodontal disease" may conceal substantial variation in disease burden.^[4,5] For studies investigating reproductive health, accurate periodontal classification is therefore important. Studies based on self-reported periodontal disease may have greater misclassification than studies involving comprehensive periodontal examination. This is an important methodological issue in interpreting the current evidence.

4. Periodontal Inflammation and the Oral-Systemic Connection

The potential systemic consequences of periodontitis provide the biological foundation for investigating reproductive outcomes. Periodontal inflammation can involve substantial local production of inflammatory mediators, disruption of periodontal tissues and intermittent exposure to microorganisms or microbial products. Oral microorganisms and their components have been proposed as potential contributors to systemic inflammatory processes.^[6,8]

Three broad pathways are particularly relevant.

4.1 Inflammatory signalling

Persistent periodontal inflammation may contribute to systemic inflammatory burden through release of cytokines and other mediators. The precise clinical consequences of this systemic exposure remain

dependent on host susceptibility and the presence of other inflammatory or metabolic conditions.

4.2 Microbial dissemination

Transient bacteremia and systemic dissemination of oral microorganisms or microbial components provide another biologically plausible pathway. Experimental and clinical literature concerning pregnancy outcomes has proposed both microbial and inflammatory mechanisms.^[6,8]

4.3 Immune and oxidative pathways

Chronic inflammation may interact with oxidative stress, immune regulation and metabolic pathways. These mechanisms are relevant because infertility itself may coexist with inflammatory and metabolic conditions, including obesity, insulin resistance and polycystic ovary syndrome.

However, biological plausibility should not be confused with demonstrated causality. The existence of a plausible inflammatory pathway does not establish that periodontal disease independently causes infertility.

5. Periodontal Disease and Female Fertility

The direct evidence connecting periodontal disease with female conception remains relatively limited compared with the much larger literature concerning periodontal disease and pregnancy outcomes.^[23,25] A review by Ricci and colleagues identified only a small number of studies specifically addressing periodontal disease and spontaneous or medically induced conception and concluded that the available evidence was limited and heterogeneous.^[9]

5.1 Evidence from prospective pregnancy-planner research

One of the more informative studies was the prospective cohort study by Bond *et al.*, which included 2,764 female pregnancy planners from North America. Periodontitis was assessed using three self-reported measures, and the investigators reported that a history of periodontitis may be associated with reduced fecundability.^[10] This study is important because it examined women who were actively attempting pregnancy rather than simply comparing women with infertility diagnoses with fertile controls. Nevertheless, the reliance on self-reported periodontal status limits the precision with which periodontal disease can be characterised.

5.2 Evidence from spontaneous conception

Hart *et al.* examined periodontal disease in a large cohort of pregnant women and investigated time to conception among women with planned pregnancies. Women with periodontal disease had a longer mean reported time to conception than women without periodontal disease, although the relationship varied by ethnicity. Among non-Caucasian women, periodontal disease was associated with a higher likelihood of taking more than 12 months to conceive; this association was not observed

among Caucasian women.^[11] These findings are notable because they suggest that the association may be modified by population characteristics. They also demonstrate why periodontal disease, ethnicity, socioeconomic circumstances and other potential confounders must be considered simultaneously.

5.3 Evidence from women with unexplained infertility

Telatar *et al.* compared 50 fertile women with 50 women with unexplained infertility aged 21–39 years. Women with unexplained infertility demonstrated higher bleeding on probing, gingival index, probing depth and clinical attachment level. Periodontal inflammatory surface measures, including PISA and PESA, were also higher in the infertility group.^[12] Although these findings support an association between poorer periodontal status and unexplained infertility, the case-control design does not establish temporal direction. It cannot determine whether periodontal disease contributed to infertility, whether common underlying factors contributed to both conditions, or whether other mechanisms explain the association.

5.4 Evidence from infertility treatment

Lalasa *et al.* evaluated 180 women, including women receiving infertility treatment, women with infertility before treatment and women who had conceived naturally. The infertility-treatment group demonstrated greater gingival inflammation and bleeding, while both infertility groups had greater clinical attachment loss than the naturally conceived control group.^[13] However, hormonal treatment itself may alter periodontal tissues. Consequently, periodontal findings in women undergoing infertility treatment cannot necessarily be interpreted as evidence that periodontitis caused the infertility. Smadi's clinical observational study of 179 women undergoing IVF similarly found changes in gingival inflammation during IVF treatment, with gingival index increasing during treatment. Clinical attachment loss did not significantly differ across the examined periods.^[15] Studies investigating periodontal health and female reproductive outcomes have used heterogeneous populations, periodontal assessments and reproductive endpoints. Selected studies and their principal findings are summarized in Table 2.^[9–16] These findings highlight an important distinction between periodontal disease as a potential contributor to infertility and hormonal treatment as a factor capable of modifying gingival and periodontal parameters.

6. Periodontal Disease and Assisted Reproductive Outcomes

The relationship between periodontal health and IVF outcomes remains uncertain. A small pilot study involving women undergoing IVF found no significant association between periodontal inflammatory measures and IVF parameters or live-birth outcomes. Although plaque and bleeding scores were lower among women who achieved pregnancy, the differences were not statistically significant. The very small sample size

substantially limits interpretation.^[16] Conversely, other observational research has suggested that poor oral health may be associated with adverse fertility-treatment outcomes. Reviews of the literature have therefore proposed that periodontal disease deserves consideration in fertility care, but they consistently emphasize the need for larger prospective and interventional studies.^[9,17] A 2024 systematic review found that women with infertility had a higher prevalence of periodontal disease in the available literature, while emphasizing relationships with chronic inflammation, oxidative stress and metabolic comorbidities.^[18] More recently, a 2026 review of the periodontal–female reproductive axis concluded that the epidemiological evidence remains heterogeneous and largely observational. Its synthesis suggested a possible modest reduction in fecundability associated with periodontitis, but also highlighted wide uncertainty and frequent reliance on self-reported periodontal exposure.^[19] Taken together, these findings support continued investigation rather than a definitive causal conclusion.

7. Employment and Female Reproductive Health

Employment may influence reproductive health through several distinct pathways, and the effects are unlikely to be uniform.

7.1 Employment as a source of socioeconomic security

Employment can provide income, financial independence and greater access to healthcare. In some settings, stable employment may therefore facilitate rather than hinder family formation. Contemporary demographic evidence strongly challenges the traditional assumption that women's employment necessarily reduces fertility. Matysiak and Vignoli's 2026 quantitative review analysed 94 studies and 572 effect sizes and found that the historical negative association between women's employment and fertility had become statistically insignificant during the 2000s and 2010s in many populations. Positive associations were observed in several country groups.^[14]

7.2 Delayed childbearing

Employment and career development can significantly influence the timing of pregnancy, as women often choose to postpone having children to focus on completing their education, building their professional careers, or achieving financial stability. This can create an indirect relationship between employment and conception, where the sequence follows: increased employment leads to delayed attempts at pregnancy, which subsequently results in increased maternal age and lower age-related fecundability. It's important to note that this pathway does not suggest that employment itself has a biological effect on fertility.

7.3 Occupational stress

Work-related stress represents a separate potential pathway. A 2025 review of 16 studies reported significant associations between job stress and fertility in

five of eight studies examining fertility, all three studies examining fertility intention, and six of eight studies examining infertility-treatment processes. The authors nevertheless noted heterogeneity among the available evidence.^[20] Thus, occupational stress may be relevant to reproductive health, but it should not be equated with employment itself.

8. Employment, Lifestyle and Periodontal Health

The relationship between employment and periodontal health is likely to be mediated by multiple socioeconomic and behavioural pathways. Working women may have stable income and healthcare access but may also experience time constraints, occupational stress and irregular schedules. These factors may influence oral-health behaviours, diet, smoking, sleep and attendance for preventive dental care. Conversely, women outside paid employment may have greater scheduling flexibility but may experience financial constraints or reduced access to dental services depending on household circumstances. Therefore, neither employment nor non-employment should be considered intrinsically beneficial or harmful to periodontal health. Employment may influence oral and reproductive health through socioeconomic circumstances, occupational stress, working patterns, lifestyle behaviours and access to healthcare (Figure 2). These pathways are likely to vary according to individual and workplace characteristics.^[14,20]

9. Occupational Stress, Periodontal Health and Reproductive Health

Psychological stress is a potentially important bridge between occupational and oral health. Stress may influence oral health indirectly through changes in oral hygiene, smoking, dietary patterns, sleep and healthcare-seeking behaviour. It may also interact with immune and inflammatory pathways. At the same time, occupational stress has been investigated independently in relation to fertility. The available evidence suggests possible associations with fertility intentions and fertility-treatment outcomes, but the evidence remains inconsistent.^[20]

10. Biological Pathways Connecting Periodontal Inflammation With Reproductive Health

Periodontal inflammation may theoretically influence reproductive health through systemic inflammatory signalling, microbial dissemination, oxidative stress and immune-mediated pathways (Figure 2). However, biological plausibility alone does not establish a causal relationship between periodontitis and impaired conception.^[6,8–10,18,19] Several mechanisms have been proposed to explain how periodontal disease could potentially influence reproductive health.

10.1 Systemic inflammatory mediators

Periodontal tissues release multiple inflammatory mediators during active disease. Persistent periodontal inflammation could contribute to systemic inflammatory

signalling. Such mechanisms are biologically relevant to reproductive physiology because implantation and early pregnancy require tightly regulated inflammatory and immune processes. Nevertheless, the clinical importance of this pathway in natural conception remains uncertain.

10.2 Microbial translocation

Oral microorganisms or their components may enter systemic circulation, particularly in the presence of inflamed periodontal tissues. Oral bacteria such as *Porphyromonas gingivalis* and *Fusobacterium nucleatum* have been studied in relation to systemic and pregnancy-related outcomes.^[6,8] Evidence from pregnancy research demonstrates biological plausibility for microbial and inflammatory pathways, but extrapolation from pregnancy complications to preconception infertility must be performed cautiously.^[23,24]

10.3 Oxidative stress

Oxidative stress has been proposed as a common pathway linking periodontal disease with several systemic conditions. It is also relevant to reproductive biology. However, whether periodontal oxidative stress independently alters human fecundability remains inadequately established.

10.4 Metabolic and inflammatory comorbidities

Obesity, insulin resistance, diabetes and polycystic ovary syndrome can influence both periodontal health and reproductive function. These shared conditions create substantial potential for confounding. Thus, future research should distinguish a direct periodontal effect from an association produced by shared metabolic or inflammatory risk factors.

11. Periodontal Health in Women Undergoing Fertility Treatment

Fertility treatment introduces an additional complexity because ovarian stimulation and hormonal manipulation may influence periodontal tissues. Lalasa *et al.* reported greater gingival inflammation and attachment loss among women undergoing infertility treatment compared with naturally conceiving controls.^[13] Similarly, Smadi reported changes in gingival parameters during IVF treatment, while clinical attachment loss remained unchanged during the observation period.^[15] These findings suggest that fertility treatment may itself influence periodontal and gingival status through hormonal changes. Consequently, cross-sectional comparisons between infertile women and fertile controls may not distinguish whether periodontal differences preceded infertility or developed during treatment. This issue illustrates why temporal sequencing is critical in future research.^[27]

12. Oral Health, Pregnancy and the Broader Reproductive Continuum

Although conception is the primary focus of this review, the evidence concerning periodontal disease and pregnancy provides important biological context.

Periodontal disease has been associated in observational research with preterm birth, low birth weight and preeclampsia, although the strength and causal interpretation of these associations vary across studies.^[7,21] A major review of oral bacteria and pregnancy outcomes identified two principal proposed mechanisms: direct invasion of oral microorganisms or microbial components into the fetal-placental unit and effects mediated through inflammatory mediators originating from periodontal tissues.^[8] However, evidence regarding whether periodontal treatment prevents adverse pregnancy outcomes remains mixed. This is relevant to the present review because it demonstrates that even where associations between periodontal disease and reproductive outcomes appear biologically plausible, evidence that treating periodontal disease changes reproductive outcomes may be more difficult to establish.^[21,22]

13. Working and Non-Working Women: An Integrated Oral-Reproductive Perspective

The comparison between working and non-working women necessitates careful interpretation. Working women often experience several benefits, including greater financial independence, improved access to healthcare, enhanced autonomy, and more stable household resources. However, they may also face challenges such as occupational stress, long working hours, shift work, reduced time for preventive healthcare, and potential delays in pregnancy. On the other hand, non-working women might enjoy greater scheduling flexibility, which could allow for more opportunities to attend dental or medical appointments. Nonetheless, non-employment can also lead to financial dependence and, in some cases, reduced access to healthcare. Therefore, employment status should be treated as a social determinant and contextual variable, not as a direct biological determinant of either periodontal disease or fertility. The changing employment-fertility relationship identified by Matysiak and Vignoli further supports this interpretation.^[14]

14. Integrated Oral-Reproductive Health Model

The available literature supports a multifactorial model in which employment, socioeconomic conditions, lifestyle, periodontal health and established reproductive determinants may interact with one another (Figure 3). This model should be interpreted as a conceptual framework rather than evidence of a direct causal pathway.^[23-26]

15. Clinical Relevance for Dental Practice

15.1 Importance of periodontal assessment

Women of reproductive age should receive routine evidence-based oral healthcare irrespective of employment or fertility status. Periodontal assessment is particularly important when signs of gingival inflammation or periodontitis are present.

15.2 Preconception oral-health counseling

Preconception counseling provides an opportunity to reinforce.

- Effective plaque control
- Regular dental attendance
- Periodontal assessment when indicated
- Smoking cessation
- Management of established periodontal disease
- Appropriate preventive dental care

The purpose should be to optimize oral health rather than to imply that periodontal treatment is a proven fertility treatment.

15.3 Women undergoing infertility treatment

Dental professionals should recognize that women undergoing IVF or other fertility treatments may experience hormonal changes that influence gingival tissues. Collaboration with fertility specialists may therefore be useful when clinically indicated.^[13,15]

15.4 Patient communication

Patients should not be told that periodontitis is definitively responsible for infertility. The evidence supports an association and biological plausibility, but causal evidence remains insufficient. A scientifically appropriate counseling statement would be.

"Maintaining good periodontal health is important for your general and oral health. Research is investigating whether periodontal inflammation may also be related to reproductive outcomes, but current evidence does not establish periodontal disease as a direct cause of infertility."

16. Prevention and Periodontal Management

Periodontal disease is preventable and treatable through established dental interventions. Appropriate oral hygiene, professional periodontal assessment, risk-factor modification and evidence-based periodontal treatment remain the foundations of periodontal care. The potential reproductive implications provide an additional reason to maintain good oral health, but they should not replace established indications for periodontal treatment. This distinction is important because evidence that periodontal treatment improves pregnancy or fertility outcomes is less robust than evidence supporting periodontal treatment for oral-health outcomes. Therefore, periodontal treatment should currently be recommended on standard dental and periodontal indications, rather than specifically as a treatment for infertility.

17. Critical Narrative Synthesis

The available literature reveals three broad levels of evidence.

First: strong evidence

There is established evidence that periodontitis is a chronic inflammatory oral disease and that periodontal health is relevant to general health. Standardized

periodontal diagnosis and risk assessment are therefore fundamental to clinical practice.^[4,5]

Second: emerging association

Observational studies have identified relationships between periodontal disease and female infertility or reduced fecundability. Hart et al. reported longer time to conception among some women with periodontal disease, while Bond et al. found that self-reported periodontitis may be associated with reduced fecundability.^[10,11]

Third: unresolved causality

The evidence remains insufficient to establish that periodontitis independently causes infertility. Studies vary in periodontal assessment, reproductive outcome definitions, study populations and control of confounding. Some studies have also failed to identify meaningful associations with IVF outcomes.^[9,16,19] [23–25]

Employment presents a similarly complex picture. Contemporary evidence does not support a universal negative employment–fertility relationship. Instead, the relationship varies according to socioeconomic and institutional context.^[14] Occupational stress may represent a more specific exposure than employment status itself, with some evidence suggesting relationships with fertility and infertility treatment. However, findings remain heterogeneous.^[20] The most appropriate interpretation is therefore a multifactorial model rather than a single causal pathway.

18. Research Gaps and Future Directions

Several important questions remain unanswered.

18.1 Prospective periodontal assessment before conception

Future studies should examine women before they begin attempting pregnancy, using professional periodontal examinations rather than relying primarily on self-report.

18.2 Standardized reproductive outcomes

Studies should clearly distinguish among several key outcomes related to reproduction, including fecundability, time to pregnancy, clinical pregnancy, infertility, IVF pregnancy, and live birth. Each of these terms has a specific meaning and importance in understanding reproductive health. Fecundability refers to the biological ability to conceive within a given menstrual cycle, while time to pregnancy indicates the duration it takes to achieve a clinical pregnancy. Clinical pregnancy, on the other hand, confirms the presence of a viable embryo as evidenced by medical assessment. Infertility is defined as the inability to conceive after a year of unprotected intercourse, whereas IVF pregnancy specifically relates to pregnancies achieved through in vitro fertilization. Lastly, live birth refers to the delivery of a living baby. Combining these various outcomes can obscure the important biological differences among them, potentially leading to misunderstandings in research and clinical practice.

18.3 Better control of confounding

Future research should take into consideration several important factors that may influence health outcomes. These include maternal age, smoking habits, and body mass index (BMI), as they can significantly affect both maternal and fetal health. Additionally, conditions such as diabetes and metabolic health are crucial to account for, as they can impact pregnancy and overall well-being. Polycystic ovary syndrome (PCOS) also plays a role in reproductive health and should be included in studies. Socioeconomic status is another significant factor, as it can affect access to healthcare and health behaviors. Furthermore, oral health behaviors, reproductive history, and partner characteristics are essential elements to consider, ensuring that research captures a comprehensive view of the various influences on maternal and child health.

18.4 Employment characterization

Future studies should focus on a more nuanced understanding of employment beyond the simplistic dichotomy of "working versus non-working." This involves characterizing various aspects of work life, including working hours, shift patterns, job demands, and levels of job control. Additionally, it is important to examine occupational stress, employment stability, income, and access to workplace healthcare. By exploring these dimensions, researchers can gain a more comprehensive view of the factors that affect worker well-being and productivity.

18.5 Interventional studies

One of the most clinically important unanswered questions is whether effective treatment of periodontal disease before conception changes fecundability or infertility-treatment outcomes. At present, this should be

regarded as a research question rather than an established therapeutic indication.

18.6 Oral microbiome research

Future studies could investigate whether specific oral microbial signatures are associated with reproductive outcomes and whether these associations remain after adjustment for conventional infertility risk factors.

18.7 Interdisciplinary care

Integrated models involving dentists, periodontists, gynaecologists, reproductive specialists and primary-care providers warrant further investigation.

This narrative review was developed from published literature relevant to periodontal health, female fertility, conception, infertility, employment, occupational stress, and oral-reproductive health. The literature was interpreted narratively, with emphasis on study design, population, periodontal assessment, reproductive outcomes, potential confounding, biological plausibility, and clinical relevance. No systematic-review, meta-analytic, or formal evidence-synthesis methodology was applied.

Review Approach

This narrative review was informed by published literature relevant to periodontal health, female fertility, conception, infertility, assisted reproduction, employment, occupational stress, and oral-reproductive health. Relevant studies and reviews were considered for their study design, population, periodontal assessment, reproductive outcome definitions, potential confounding, biological plausibility, and clinical relevance. The literature was synthesized narratively rather than through a systematic-review or meta-analytic framework; no PRISMA process, formal risk-of-bias assessment, or quantitative pooling was undertaken.

Legends

Figure 1. Determinants of Female Conception



Legend: Conception is a multifactorial outcome. Periodontal health and employment-related factors act as potential modifiers within this framework.

Figure 1: Conceptual framework illustrating the multifactorial determinants of natural conception. The figure emphasizes that periodontal health and employment represent potential modifying factors rather than isolated determinants of conception.

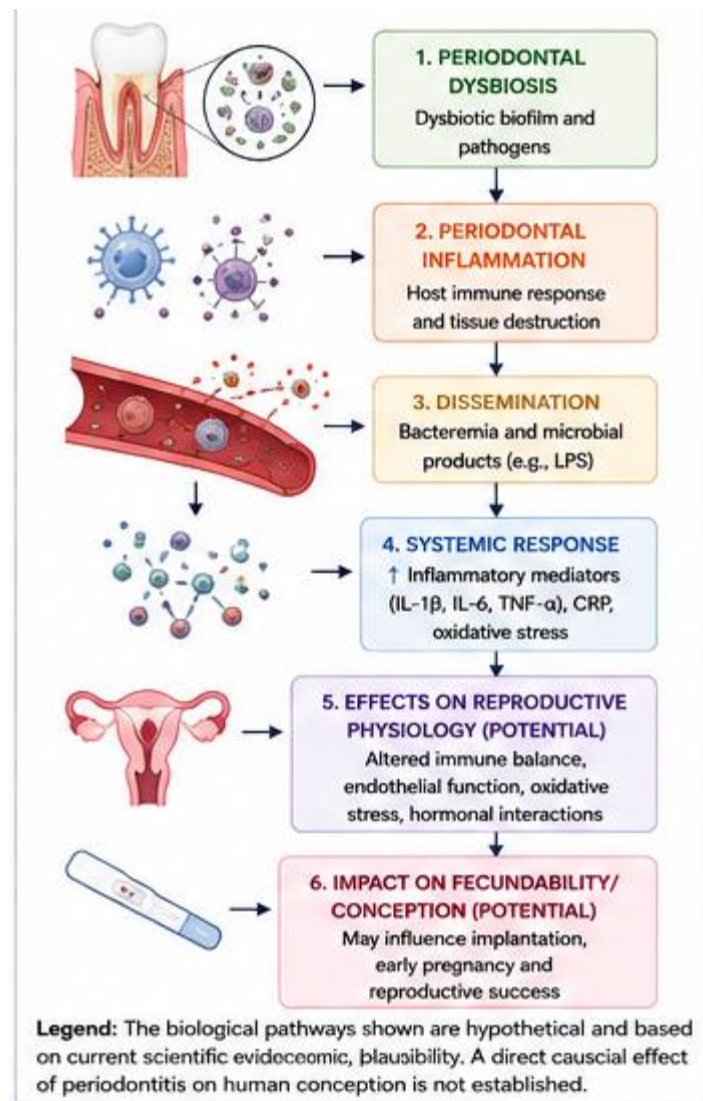


Figure 2. Proposed biological pathways linking periodontal inflammation with reproductive health. These pathways represent biological plausibility; a direct causal effect of periodontitis on human conception has not been established.

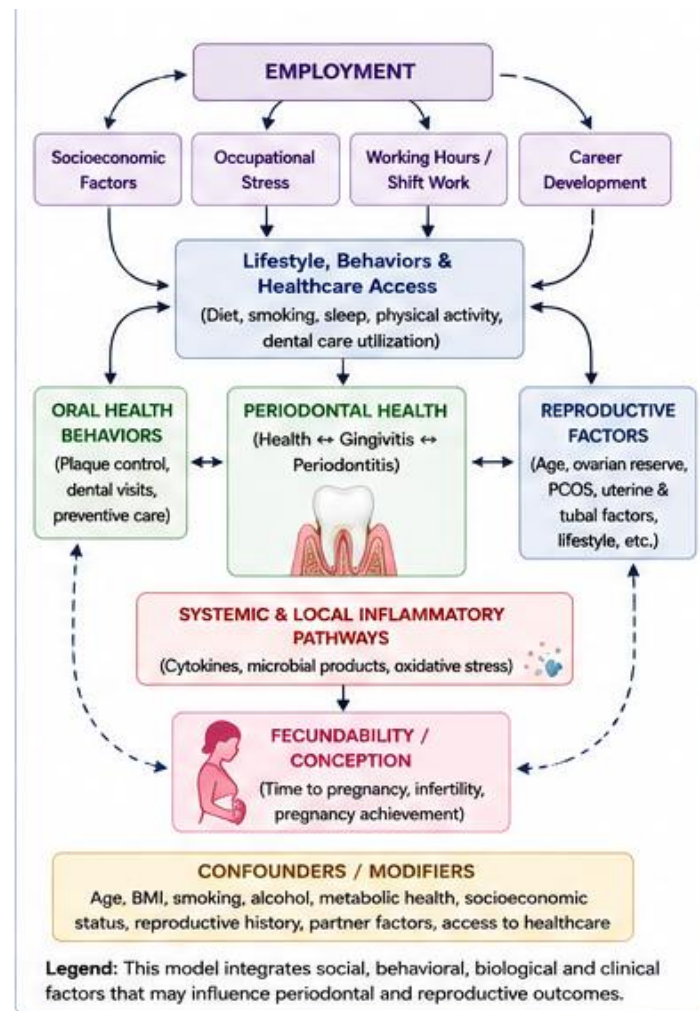


Figure 3: Integrated employment, periodontal, reproductive health model. Conceptual framework linking employment-related socioeconomic circumstances, occupational stress, working patterns, lifestyle, oral-health behaviors, periodontal health, and reproductive factors. The arrows represent potential pathways and do not establish causality.

Table 1: Definitions of major terms used in the review.

Term	Definition	Relevance in this Review
Periodontal health	Periodontal tissues without signs of active inflammation or attachment loss.	Baseline dental status
Gingivitis	Gingival inflammation without periodontal attachment loss.	Early, reversible inflammatory condition
Periodontitis	Chronic inflammatory disease with attachment and bone loss.	Primary dental exposure
Fertility	Capacity to reproduce.	Broad reproductive outcome
Fecundability	Probability of achieving pregnancy in a menstrual cycle.	Specific measure of conception potential
Conception	Achievement of clinically recognized pregnancy.	Principal reproductive event
Infertility	Failure to achieve pregnancy after ≥12 months of regular unprotected intercourse.	Clinical reproductive condition
Employment	Participation in paid or formal work.	Key occupational and social determinant

Legend: Clear definitions are essential because reproductive outcomes are not interchangeable.

Table 2: Summary of evidence linking periodontal health with female reproductive outcomes.

Table 2. Summary of Evidence Linking Periodontal Health with Female Reproductive Outcomes

Study (Year)	Design / Population	Periodontal Assessment	Reproductive Outcome	Principal Finding	Major Limitation
Hart et al., 2012 [11]	Cohort of pregnant women	Clinical examination	Time to conception	Periodontal disease associated with longer time to conception in some ethnic groups.	Observational; ethnicity and other confounders
Lalasa et al., 2014 [13]	180 women (infertility treatment vs controls)	Clinical examination	Infertility status	Greater gingival inflammation and CAL in infertility groups.	Cross-sectional; hormonal treatment effects
Bond et al., 2021 [10]	2,764 pregnancy planners (prospective cohort)	Self-reported periodontitis	Fecundability	Self-reported periodontitis may be associated with reduced fecundability.	Self-reported exposure
Telatar et al., 2021 [12]	50 unexplained infertility vs 50 fertile	Clinical examination	Infertility status	Higher BOP, PD, CAL, PISA, PESA in infertile women.	Small sample; case-control
Smadi, 2017 [15]	179 IVF patients (longitudinal)	Clinical examination	IVF treatment period	Gingival inflammation increased during IVF treatment.	Does not prove causality with infertility
IVF pilot study, 2019 [16]	Small IVF cohort	Clinical examination	IVF outcome / Live birth	No significant association between periodontal inflammation and outcomes.	Very small sample size

Legend: Studies are heterogeneous in design, exposure assessment and outcomes; causality cannot be inferred.

CONCLUSION

The relationship between periodontal health, employment and female fertility represents an emerging interdisciplinary area at the intersection of periodontology, oral medicine, public health and reproductive medicine. Current evidence provides a biologically plausible basis for considering periodontal inflammation as one component of the broader oral-reproductive health environment. Several observational studies have reported associations between periodontal disease and reduced fecundability or infertility, including evidence from pregnancy planners and women with unexplained infertility.^[10-12] Nevertheless, the evidence remains heterogeneous and predominantly observational. Differences in periodontal assessment, reproductive definitions, population characteristics and confounding factors limit causal interpretation. Evidence from IVF populations is also inconsistent.^[9,15,16] Employment should similarly be interpreted as a multidimensional social determinant rather than a direct cause of reduced fertility. Contemporary evidence demonstrates that the historical negative relationship between women's employment and fertility has weakened considerably, while occupational stress and specific workplace characteristics may have more relevant associations with reproductive outcomes.^[14,20] For dental professionals, the present evidence supports maintaining periodontal health as part of comprehensive women's healthcare, particularly before and during reproductive planning. However, periodontal disease should not currently be described as a proven cause of infertility, and periodontal treatment should not be promoted as an established fertility treatment.

Future prospective studies using standardized periodontal examinations, clearly defined reproductive outcomes and

careful adjustment for age, socioeconomic status, lifestyle, metabolic factors and reproductive history are required. Interventional studies are particularly important to determine whether effective periodontal treatment can influence fecundability or fertility-treatment outcomes. The oral-reproductive connection is therefore promising but not yet conclusive. A scientifically cautious approach that integrates periodontal prevention and treatment into comprehensive women's healthcare, while avoiding unsupported causal claims, represents the most appropriate current clinical position.

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