

Hormonal therapies in reproductive medicine and their impact on periodontal tissues: A structured review

Svanishvili T.^{1,2}, Gogilashvili K.^{1,2}, Alkhanishvili Z.¹, Tatishvili N.³

Abstract

Background: Periodontal tissues are responsive to systemic hormonal changes due to the presence of estrogen and progesterone receptors. Hormonal therapies used in reproductive medicine may influence periodontal health through inflammatory, microbial, and metabolic pathways.

Aim: To review current evidence on the impact of hormonal therapies used in reproductive medicine on periodontal tissues and to assess their potential clinical implications.

Methods: A structured narrative review was conducted based on selected literature, including systematic reviews, meta-analyses, and clinical studies published between 2020 and 2026. Databases searched included PubMed, Scopus, and Web of Science. Studies addressing hormonal exposure and periodontal outcomes were included and analyzed thematically.

Results: Hormonal contraceptives were associated with increased clinical attachment loss, while estrogen deficiency contributed to enhanced bone resorption and progression of periodontal disease. Endocrine therapies, particularly aromatase inhibitors, were linked to more severe periodontal outcomes compared to selective estrogen receptor modulators. Assisted reproductive technologies were associated with transient increases in gingival inflammation during treatment cycles. In addition, associations were identified between periodontal disease and reproductive conditions, including female infertility and impaired sperm parameters. Hormonal modulation was also associated with changes in microbial composition and inflammatory cytokine expression.

Conclusions: Hormonal therapies used in reproductive medicine are associated with measurable changes in periodontal tissues. These effects are mediated through complex interactions involving inflammatory pathways, microbiome alterations, and bone metabolism. Although current evidence supports an association, further research is required to clarify causality and clinical significance. (TCM-GMJ August 2026; 11 (3): P17-P21)

Keywords: Periodontitis; Hormonal Therapy; Reproductive Medicine; Oral Contraceptives; In Vitro Fertilization; Estrogen Deficiency; Endocrine Therapy; Cytokines; Microbiome.

Introduction

The periodontium is a dynamic tissue complex composed of the gingiva, periodontal ligament, cementum, and alveolar bone, which maintains structural and functional integrity of the dentition. Its homeostasis depends on a balance between microbial challenge and host immune response, and is influenced by systemic factors, including endocrine regulation. Evidence demonstrates that periodontal tissues express receptors for estrogen and progesterone, indicating their sensitivity to hormonal fluctuations [1,2].

Hormonal changes occurring during different stages of the reproductive life cycle, as well as those induced by exogenous therapies, have been associated with alterations

in gingival inflammation, vascular response, and bone metabolism. Therapies commonly used in reproductive medicine, including oral contraceptives, ovarian stimulation protocols for assisted reproductive technologies, and endocrine treatments for gynecological and oncological conditions, may modify periodontal tissue responses through multiple biological pathways [3].

These effects are mediated, in part, by changes in inflammatory signaling and microbial composition. Hormonal fluctuations can influence the host immune response and promote shifts in the subgingival microbiome, potentially increasing susceptibility to periodontal disease [3]. In addition, systemic inflammatory mediators associated with periodontal disease, such as interleukin-6 and tumor necrosis factor-alpha, have also been implicated in reproductive processes, suggesting a potential bidirectional relationship between periodontal and reproductive health.

Recent literature has increasingly focused on the interaction between periodontal status and reproductive out-

From the ¹Ivane Javakhiashvili Tbilisi State University, Georgia; ²Albius Dental Center, Georgia; ³Georgian-German Reproduction Center, Georgia. Received May 15, 2026; accepted Jun 12, 2026. Address requests to: Svanishvili Tinatin
E-mail: : svanishvilitika@gmail.com
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comes. Associations have been reported between periodontal disease and conditions such as polycystic ovary syndrome, endometriosis, and reduced fertility, as well as alterations in sperm quality [3]. Although these relationships are not fully understood, they highlight the need to consider oral health within the broader context of systemic and reproductive medicine.

Despite the growing body of evidence, findings remain heterogeneous, and the extent to which hormonal therapies directly influence periodontal outcomes is not fully established. Variability in study design, populations, and outcome measures limits the ability to draw definitive conclusions.

The aim of this review is to synthesize current evidence on the effects of hormonal therapies used in reproductive medicine on periodontal tissues, with particular focus on biological mechanisms, clinical manifestations, and potential implications for interdisciplinary patient management.

Methods

This study was designed as a structured narrative review aimed at synthesizing current evidence on the effects of hormonal therapies used in reproductive medicine on periodontal tissues.

A targeted literature search was conducted using electronic databases, including PubMed, Scopus, and Web of Science. The search focused on publications from 2020 to 2026 in order to capture recent developments in the field. Earlier studies were included where necessary to support fundamental biological mechanisms. Key search terms included combinations of the following: periodontitis, gingival inflammation, hormonal therapy, oral contraceptives, assisted reproductive technologies, in vitro fertilization, estrogen, progesterone, endocrine therapy, and reproductive health.

Studies were considered eligible if they investigated the relationship between hormonal exposure and periodontal outcomes or explored biological mechanisms linking endocrine factors and periodontal tissues. Priority was given to systematic reviews, meta-analyses, and clinical studies with clearly defined periodontal parameters. Narrative reviews were included selectively when they provided relevant mechanistic insights.

Studies not directly addressing periodontal outcomes or lacking sufficient methodological clarity were excluded. No restrictions were applied based on geographic location; however, only articles published in English were considered.

Data from the included studies were analyzed and synthesized thematically. The findings were organized into key domains, including biological mechanisms, effects of specific hormonal therapies, systemic interactions, and clinical implications.

Due to heterogeneity in study design, populations, and outcome measures, a quantitative synthesis was not performed. Instead, a qualitative approach was used to summarize and interpret the available evidence.

Results and discussion

Biological Mechanisms Linking Hormonal Factors and Periodontal Tissues

Periodontal tissues are responsive to systemic hormonal signals due to the presence of estrogen and progesterone receptors in gingival epithelium, connective tissue, and vascular structures [1, 2]. These receptors mediate the effects of sex steroids on tissue metabolism, immune response, and vascular dynamics.

Estrogen plays a role in maintaining epithelial integrity and regulating bone metabolism. It supports collagen synthesis and modulates osteoblastic and osteoclastic activity. In contrast, progesterone is associated with increased vascular permeability and enhanced production of inflammatory mediators, which may contribute to gingival edema and bleeding.

Hormonal fluctuations can also influence the host immune response. Changes in hormone levels may alter cytokine expression and immune cell activity, thereby affecting the balance between host defense and microbial challenge.

In addition, hormonal changes contribute to alterations in the subgingival microbiome. Certain periodontal pathogens, including *Prevotella intermedia*, have been shown to utilize steroid hormones as growth factors, which may enhance their proliferation under specific hormonal conditions [3]. This interaction may increase susceptibility to gingival inflammation and periodontal disease progression.

Effects of Hormonal Therapies on Periodontal Tissues

Hormonal Contraceptives

Hormonal contraceptives represent a common form of exogenous hormonal exposure and have been investigated in relation to periodontal health. Their effects are mediated through estrogen- and progesterone-dependent pathways that influence vascular response, inflammatory processes, and epithelial integrity [1,2,3].

A systematic review and meta-analysis evaluating the association between hormonal contraceptive use and periodontal parameters demonstrated a statistically significant increase in clinical attachment loss among users compared to non-users [3]. In contrast, no significant differences were observed in probing depth, suggesting that structural changes in periodontal tissues may occur without pronounced alterations in pocket depth.

As presented in **Table 1**, hormonal contraceptive use is associated with increased clinical attachment loss and a higher prevalence of gingival inflammation, although the latter is often reported qualitatively. These findings indicate that hormonal exposure may contribute to both inflammatory and structural periodontal changes.

The underlying mechanisms may involve alterations in epithelial barrier function, including reduced keratinization and increased glycogen content, which facilitate bacterial penetration and amplify local inflammatory responses [4].

Overall, current evidence supports an association between hormonal contraceptive use and adverse periodontal outcomes; however, the extent of this effect is influenced by individual factors such as oral hygiene and baseline periodontal status.

Reproductive Aging and Estrogen Deficiency

The decline in estrogen levels during reproductive aging has been associated with increased periodontal destruction. Estrogen deficiency promotes osteoclast activity and disrupts the balance between bone formation and resorption [5,6].

These changes contribute to decreased alveolar bone density and may accelerate the progression of periodontitis, particularly in postmenopausal populations. These findings suggest that estrogen deficiency may enhance susceptibility to periodontal tissue breakdown through combined inflammatory and metabolic mechanisms.

Endocrine Therapy in Oncology

Endocrine therapies used in cancer treatment, particularly those targeting estrogen pathways, have been associated with changes in periodontal health. These therapies include aromatase inhibitors and selective estrogen receptor modulators, which differ in their mechanisms of action and systemic hormonal effects [7].

A systematic review evaluating the impact of endocrine therapy on periodontal tissues reported varying degrees of periodontal involvement depending on the treatment modality.

As presented in **Table 2**, aromatase inhibitors are associated with more severe periodontal outcomes, including increased bleeding on probing and greater bone loss. In contrast, tamoxifen demonstrates a more moderate effect, while androgen deprivation therapy has been linked to an increased prevalence of periodontitis.

These differences may be explained by the extent of estrogen suppression. Aromatase inhibitors significantly reduce systemic estrogen levels, which may enhance inflammatory activity and promote bone resorption in periodontal tissues.

Overall, current evidence suggests that endocrine therapies, particularly those leading to pronounced estrogen deficiency, may negatively influence periodontal health and should be considered in patient management.

Ovarian Stimulation and Assisted Reproductive Technologies

Hormonal stimulation during assisted reproductive procedures, including in vitro fertilization, is associated with increased gingival inflammation. Clinical studies report elevated gingival index and bleeding scores during treatment cycles, even in patients with low plaque levels [8]. As presented in **Table 3**, gingival index and bleeding parameters increase during ovarian stimulation phases and remain elevated during the luteal phase.

These changes are likely related to supraphysiological levels of estrogen and progesterone. However, the available evidence is limited and based on relatively small-scale clinical studies.

Although these effects are generally transient, individuals with pre-existing periodontal disease may experience more pronounced inflammatory responses, including increased bleeding on probing and pocket depth measurements.

Systemic Interactions Between Periodontal and

Reproductive Health

Female Reproductive Health

Associations have been reported between periodontal disease and reproductive conditions such as polycystic ovary syndrome and endometriosis [3]. These conditions share common inflammatory pathways, including increased levels of pro-inflammatory cytokines.

Chronic systemic inflammation may influence reproductive processes, including follicular development and endometrial receptivity, although the exact mechanisms remain under investigation.

Male Fertility

In addition to female reproductive health, emerging evidence suggests a potential association between periodontal disease and male fertility parameters. Systemic inflammation and microbial dissemination originating from periodontal tissues have been proposed as contributing factors.

A systematic review and meta-analysis evaluating the relationship between periodontitis and sperm quality reported significant associations between periodontal disease and multiple adverse sperm parameters [9].

As presented in **Table 4**, periodontitis is associated with an increased likelihood of sperm abnormalities, including reduced sperm count and overall impaired semen quality. The reported odds ratios indicate a statistically significant relationship, particularly in cases of moderate-to-severe periodontal disease.

These findings suggest that systemic inflammatory processes and possible bacterial translocation may influence reproductive function in males. However, the available evidence is primarily observational, and further research is required to clarify underlying mechanisms and causality.

Microbiome and Hormonal Modulation

Hormonal therapies can influence microbial composition in both oral and reproductive systems. Changes in estrogen levels, particularly in hypoestrogenic states, have been associated with reduced beneficial microbial populations and increased prevalence of opportunistic pathogens [11].

Similar patterns have been observed in the oral cavity, where hormonal fluctuations are linked to increased proportions of periodontal pathogens. These findings suggest that hormonal regulation may play a role in shaping microbial ecosystems across different body sites.

Inflammatory Pathways and Cytokine Regulation

Inflammatory mediators, including interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF- α), are central to both periodontal disease progression and systemic inflammatory responses [12].

Their expression varies during the menstrual cycle, with higher levels observed during phases associated with increased progesterone levels [13].

These cytokines contribute to tissue breakdown by promoting osteoclast activity and extracellular matrix degradation. In addition, they may influence systemic metabolic and reproductive pathways, suggesting a potential link between periodontal inflammation and broader systemic

effects.

Clinical Implications

The available evidence supports the consideration of periodontal health in patients undergoing hormonal therapies in reproductive medicine.

Preventive strategies may include periodontal assessment prior to initiation of treatment, particularly in patients undergoing assisted reproductive procedures. Regular monitoring and maintenance may help reduce inflammation during periods of hormonal fluctuation.

Interdisciplinary collaboration between dental and medical professionals may improve patient outcomes, particularly in individuals with coexisting reproductive and periodontal conditions.

Limitations

This review is subject to several limitations, primarily stemming from the substantial heterogeneity in study designs, population characteristics, and periodontal outcome measures across the included literature. Such variability restricts direct comparisons and prevents a definitive quantitative synthesis. Additionally, the reliance on observational data and existing systematic reviews limits the ability to establish clear causal relationships between hormonal therapies and periodontal changes. Variations in diagnostic criteria for periodontal disease and the scarcity of high-quality, recent clinical data in specific areas further underscore the need for cautious interpretation of the reported associations.

Conclusion

Current evidence indicates that hormonal therapies used in reproductive medicine are associated with measurable changes in periodontal tissues. These effects are mediated through multiple pathways, including modulation of inflammatory responses, alterations in microbial com-

position, and changes in bone metabolism.

Hormonal contraceptives have been associated with increased clinical attachment loss, while estrogen deficiency contributes to bone resorption and progression of periodontal disease. Assisted reproductive technologies are linked to transient increases in gingival inflammation, particularly in individuals with pre-existing periodontal conditions.

In addition, associations between periodontal disease and reproductive health outcomes, including female infertility and male reproductive parameters, suggest the presence of shared inflammatory mechanisms. However, these relationships remain incompletely understood and should be interpreted with caution.

Overall, the available evidence supports an association between hormonal modulation and periodontal health, although causality cannot be established based on current data.

Future Directions

Future research should focus on conducting well-designed longitudinal studies to clarify the long-term impact of hormonal exposure on periodontal health. A critical step involves the standardization of diagnostic criteria and outcome measures to ensure better comparability across different clinical trials. Furthermore, investigating the role of specific inflammatory biomarkers and the intricate interaction between the oral and reproductive microbiomes will provide deeper insights into the underlying biological mechanisms. Finally, it is essential to evaluate whether targeted periodontal interventions can directly improve reproductive outcomes, particularly for patients undergoing assisted reproductive technologies.

Table 1. Association between hormonal contraceptive use and periodontal parameters

Parameter	Effect Size (Mean Difference)	Statistical Significance	Interpretation
Clinical Attachment Loss	0.24 [0.09, 0.40]	p = 0.002	Significant increase in CAL
Probing Depth	0.05 [-0.05, 0.15]	p = 0.33	No significant difference
Gingival Inflammation	Increased (qualitative)	Not reported	Higher prevalence in users

Table 2. Impact of endocrine therapies on periodontal health

Treatment Modality	Periodontal Outcome	Clinical Manifestation
Aromatase inhibitors	Severe	Periodontitis, bleeding on probing, bone loss
Tamoxifen	Moderate	Mild or neutral periodontal effects
Androgen deprivation	Negative	Increased prevalence of periodontitis

Table 3. Gingival changes during IVF cycles

IVF Stage	Hormonal Status	Gingival Response
Pretreatment	Baseline	Normal gingival index (≈ 0.13)
Superovulation (HCG phase)	Supraphysiological levels	Increased GI (≈ 0.51), increased bleeding
Luteal phase	Elevated progesterone	Sustained gingival inflammation

Table 4. Association between periodontitis and sperm parameters

Parameter	Odds Ratio (OR)	Statistical Significance
Any sperm abnormality	1.86 [1.32–2.60]	$p = 0.0003$
Subnormal sperm count	2.08 [1.03–4.23]	$p = 0.04$
Moderate-to-severe periodontitis	2.76 [1.78–4.26]	$p < 0.0001$

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