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## RESEARCH ARTICLE

# RELATIONSHIP BETWEEN PREGNANCY AND PERIODONTITIS

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**ABSTRACT**

Given the profound perturbations in the maternal immune system during pregnancy and the postpartum period, it is not surprising that the clinical and biological features of periodontal infections are affected. Some of the pregnancy-induced immunological modifications in the mother increase her susceptibility to a number of infections, including periodontal disease. It also appears that periodontal infections, at least in some populations, can increase the risk of adverse pregnancy outcomes. Such outcomes include pre-term birth, preeclampsia, gestational diabetes, delivery of a small for-gestational-age infant, and fetal loss. The purpose of this review is to summarize the literature associated with the relationship between pregnancy and periodontal disease.



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## INTRODUCTION

During the course of a normal pregnancy, a series of profound and dynamic physiological changes occur in both the mother and developing baby. Some of the pregnancy-induced immunological modifications in the mother increase her susceptibility to a number of infections, including periodontal disease. It also appears that periodontal infections, at least in some populations, can increase the risk of adverse pregnancy outcomes. Such outcomes include pre-term birth, preeclampsia, gestational diabetes, delivery of a small gestational-age infant, and fetal loss (Boggess, 2008). The purpose of this review is to summarize the literature associated with the bi-directional relationship between pregnancy and periodontal disease. In addition, some of the possible mechanisms behind this interaction will be discussed.

### Maternal immunological changes during pregnancy

One of the major alterations in the immune system during pregnancy is partial dampening of the mothers cell-mediated immune responses associated with T-helper type 1 (Th1) lymphocytes (Singh and Perfect, 2007). This is accompanied by augmentation ofantibody-mediated immune responses by T-helper type 2 (Th2) lymphocytes, which promote replication and stimulation of antibody-producing B cells (Schumacher *et al*., 2007). Stimulated Th2 cells produce an array of cytokines, such as interleukin-4, interleukin- 5 and interleukin-10 that suppress cell mediated immune responses. The mechanisms of this partial shift in the Th1 / Th2 balance favoring Th2-mediated immune responses are not fully understood, but are partly dependent on changes in progesterone, estrogen and chorionic gonadotropin during pregnancy (Kanda and Watanabe, 2004).

### Pregnancy and increased susceptibility to gingival Pyogenic granulomas

Pyogenic granuloma is a non-specific inflammatory lesion of skin and mucous membranes that may occur in both males and females. However, it occurs most often during pregnancy, with gingival lesions developing in approximately 0.5–2.0% of pregnant women (Demir *et al*., 2004). When gingival lesions are found in association with pregnancy, they are sometimes called pregnancy tumors or granuloma gravidarum. The pathogenesis of the lesion has been linked to female sex hormones, which stimulate increased local synthesis of angiogenic factors such as vascular endothelial growth factor and angiopoietin-2 (Yuan and Lin, 2004).

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**Table 1. Major changes in innate and adaptive immunity during pregnancy (Gacy C. Armitage, 2000)**

**Components change in host responses innate immunity**

| | |
|---|---|
| **Monocytes and neutrophils** | **Effect on cellular immunity via enhanced phagocytosis and superoxide anion generation (respiratory burst) increased expression of CD14** |
| **Natural killer cells** | Effect on cellular immunity via down-regulation of cytotoxic activity by progesterone-induced blocking factor and IL-10; decreased IFN-c production |
| **Complement** | Effect on humoral immunity by increased C3, C4 and C1q levels, and elevated levels of complement regulatory proteins including membrane co-factor protein (CD46), decayaccelerating factor (CD55) and CD59 |
| **Acute-phase reactants** | Effect on humoral immunity via increased levels of acutephase reactants (e.g. fibrinogen and ceruloplasmin) |

**Adaptive immunity**

| | |
|---|---|
| T cells | Effect on cellular immunity via enhanced Th2 (e.g. IL-4, IL-10) and Th3 (i.e. TGF-b) and suppressed Th1 (IFN-c, IL- 12) responses<br>Effect on humoral immunity via increased T cell-dependent immunoglobulin production |
| B cells | Effect on cellular immunity via increased Th2-induced B-cell Activity |

The pathogenesis of the lesion has been linked to female sex hormones, which stimulate increased local synthesis of angiogenic factors such as vascular endothelial growth factor and angiopoietin-2. Treatment may include surgical removal, especially if the lesion is large and symptomatic. However, in many cases, the lesions undergo partial or complete resolution after delivery, especially if local irritants are removed (Gacy C. Armitage, 2000).

## Effects of pregnancy on plaque induced periodontal infections

Cross-sectional studies indicate that 100% of women develop gingivitis between 3–8 months of their pregnancy, with a gradual decrease after parturition (Gacy C. Armitage, 2000). In some cases, the gingival inflammation is very severe and may be accompanied by gingival tenderness and profuse bleeding (Fig. 5). Longitudinal studies have demonstrated that, during pregnancy, probing depths increase as the gingival inflammation increases (Gursoy *et al*., 2008). The increase in probing depths has been attributed to movement of the gingival margin in a coronal direction because of inflammation-induced swelling of the gingiva. In some individuals, especially those who have chronic periodontitis prior to becoming pregnant, progression of periodontitis can and does occur (Moss *et al*., 2007). Indeed, during pregnancy, there are a number of changes in the interactions of the periodontal microbiota with the host that may be conducive to periodontal damage. Several standard cultural microbiological studies have shown that estrogen and progesterone changes associated with pregnancy have an effect on thecomposition of the subgingivalmicrobiota. Some of the periodontal pathogens that apparently blossom under the selective pressure of pregnancy- associated steroids are Prevotellaintermedia (Khader *et al*., 2006; Klebanoff and Searle, 2006), Bacteroidesspecies and Campylobacter rectus (Yokoyama *et al*., 2008).

Because neutrophils are a critical component of the innate immune defenses of periodontal tissues, any reduction in their antimicrobial effectiveness would have an impact on the development and clinical course of periodontal disease. It is quite likely that the documented reduction in phagocytosis and bactericidal activities (Tsukimori *et al*., 2006) of peripheral neutrophils in pregnant individuals is related to the well-documented increase in gingival inflammation observed during gestation.

## Impact of periodontal infections on gestational diabetes mellitus

Gestational diabetes mellitus is the detection of glucoseintolerance for the first time during pregnancy. It occurs in approximately 7% of pregnancies, and is a multifactorial disease that has been associated with a long list of risk factors (Dasanayake *et al*., 2008). Prominent among these are infection and systemic inflammation. Crosssectionaldata from the third National Health and Nutrition Examination Survey (NHANES III) have been examined by two groups of investigators to determine whether there is a relationship between periodontal disease and self-reported current and past gestational diabetes mellitus (Novak *et al*., 2006; Xiong *et al*., 2006). Both groups concluded that there appears to be an association between periodontal disease and gestational diabetes mellitus.

## Impact of periodontal infections on pregnancy outcomes

Numerous epidemiological studies have reported that there is a statistically significant association between periodontal infections and adverse pregnancy outcomes (Toygar *et al*., 2007). If periodontitis is a cause of adverse pregnancy outcomes, it may be as a reservoir for hematogenous spread of oral bacteria and inflammatory mediators to the fetal–maternal unit. A suggested mechanism is that endotoxin from gram-negative bacteria enters the circulation at high enough levels to stimulate production of inflammatory mediators, such as prostaglandin E2, by the amnion (Klebanoff and Searle, 2006). Prostaglandin E2 and other inflammatory mediators are potent inducers of labor. Other direct effects of periodontal bacteria on the fetal–maternal unit are also likely. For example, it has been shown that periodontal pathogens (or their antigens) such as C. rectus, P. intermedia, F. nucleatum, P. micra, P. gingivalis, T. forsythia, T. denticola and P. nigrescens cross the placenta and reach the developing fetus in high enough levels to stimulate the fetus to produce IgM antibody against these bacteria (Boggess *et al*., 2006). Importantly, significantly higher titers of fetalIgM against C. rectus and P. intermedia were found in the cord blood from pre-term compared to term babies (Gacy C. Armitage, 2013). It is shown that elevated

subgingival levels of P. gingivalis, T. forsythia, P. intermedia and P. Nigrescens have been detected in the oral microbiota during pregnancy, as this may increase the chances of their hematogenous translocation to the amnion. Direct evidence of oral–utero transmission within an individual has been shown using culture-independent molecular methods (i.e. 16S and 23S rRNA sequences) (Lin *et al*., 2007).

**Relationship between periodontal infections and pre-Eclampsia**

Preeclampsia is a rapidly progressive condition observed during pregnancy, characterized by hypertension and the presence of protein in the urine. At least 3% to 5% of pregnancies are affected, resulting in high morbidity and mortality around the world. Altered vascular-related conditions have been proposed as the main pathogenic mechanisms leading to placental endothelial damage. Preeclampsia is also associated with short- and long-term abnormal cytokine responses in the mother and the fetus, related to high circulating levels of tumor necrosis factor (TNF)-a, interleukin (IL)-10, and IL-6. Thus, the result is an inflammatory vascular damage that induces preeclampsia and other pregnancy complications such as low birth weight (LBW) or preterm births. Periodontal disease is also a chronic infection that exposes the host to microbial challenges (antigens and virulence factors) for extended time periods (Contreras *et al*., 2006). Authors hypothesized that chronic subclinical infections may cause increased maternal cytokine levels sufficient to affect vascular endothelial function, thereby making pregnant women prime individuals for the subsequent development of preeclampsia (Contreras *et al*., 2006). A recent meta-analysis found that an increased risk of pre-eclampsia was most strongly related to periodontal disease (Conde-Agudelo *et al*., 2008).

**Effect of periodontal therapy on pregnancy outcomes**

Interventions to reduce the morbidity and mortality associated with pre-term birth can be classified as primary, secondary and tertiary (Iams *et al*., 2008). Primary interventions are administered to all women before and during pregnancy to prevent or reduce risk. Secondary interventions are aimed at eliminating or reducing risk in women with known risk factors. Tertiary interventions are started at or near parturition (i.e. around the time of labor and delivery) in order to delay delivery or to promote the health of pre-term infants (Iams *et al*., 2008). All interventions examined by existing studies on the effects of periodontal therapy on pregnancy outcomes can be classified as secondary interventions. It has been known for many years that non-surgical periodontal therapy is effective in reducing the increased amount of periodontal inflammation associated with pregnancy. Data clearly show that this therapy is safe and does not trigger an increase in adverse pregnancy outcomes (Newnham *et al*., 2009; Offenbacher *et al*., 2009). Although several epidemiological studies have shown a statistically significant relationship between periodontal infections and several adverse pregnancy outcomes, it has not been shown that routine non-surgical periodontal therapy decreases the incidence of these outcomes (Newnham *et al*., 2009; Offenbacher *et al*., 2009). If periodontal infections are truly important in the pathogenesis of adverse pregnancy outcomes, treatment of these infections should reduce the incidence of these outcomes. There have been at least 12 studies, of varying quality, that have attempted to determine the effect of non-surgical periodontal therapy on birth outcomes (Newnham *et al*., 2009; Offenbacher *et al*., 2009). Of these studies, six found that periodontal therapy resulted in a significant reduction in adverse pregnancy outcome (Tarannum and Faizuddin, 2007). Findings suggest that periodontal infections are not a dominant risk factor for low birth weight. However, they do not rule out the possibility that periodontal disease is an important contributor to the overall infectious / inflammatory burden carried by individual patients during pregnancy.

**Conclusion**

During pregnancy, there are profound perturbations in innate and adaptive immunity that have an impact on the clinical course of a number of infectious diseases, including those affecting periodontal tissues. Inflammation of periodontal tissues due to plaque induced periodontal diseases increases dramatically in extent and severity during the course of a normal pregnancy. Pregnancy-associated increases in gingival inflammation are a well-documented phenomenon that is universally accepted by the scientific community.

The effect of periodontal infections on the clinical course of pregnancy and birth outcomes is less clear. Although there are large numbers of epidemiological studies suggesting that periodontal infection is a modest risk factor for several adverse pregnancy outcomes, other studies do not confirm this hypothetical relationship. The inconsistent results of epidemiological studies may be due to variable case definitions of periodontal disease and / or adverse pregnancy outcomes. It is also highly likely that periodontal infection is a risk factor for adverse pregnancy outcomes in some, but not all, populations. Future intervention trials should include an evaluation of the effectiveness of periodontal treatment as part of the study design. If this variable is not included in the analysis, it is impossible to draw valid conclusions regarding the putative causal link between periodontal infections and risk of adverse pregnancy outcomes.

## REFERENCES

Boggess KA, Beck JD, Murtha AP, Moss K, Offenbacher S. 2006. Maternal periodontal disease in early pregnancy and risk for a small-for-gestational-age infant. *Am J ObstetGynecol*., 194: 1316–1322.

Boggess KA. 2008 For the Society for Maternal–Fetal Medicine Publications Committee. Maternal oral health in pregnancy. *ObstetGynecol*., 111: 976–986.

Conde-Agudelo A, Villar J, Lindheimer M. 2008. Maternal infection and risk of preeclampsia: systematic review and metaanalysis. *Am J ObstetGynecol*., 198: 7–22.

Contreras A., J.A. Herrera, J.E. Soto, R.M. Arce, A. Jaramillo, and J.E. Botero. 2006. Periodontitis Is Associated With Preeclampsia in Pregnant Women. *J Periodontol*., 77:182-188.

Dasanayake AP, Chhun N, Tanner ACR, Craig RG, Lee MJ, Moore AF, Norman RG. 2008. Periodontal pathogens and gestational diabetes. *J Dent Res*., 87: 328–333.

Demir Y, Demir S, Aktepe F. 2004. Cutaneous lobular capillary hemangioma induced by pregnancy. *J CutanPathol*., 31: 77–80.

Gacy C. Armitage. 2000. Bi directional relationship between pregnancy and periodontal diseases. *Periodontology*., Vol. 61, 2013, 160–176

Gursoy M, Pajukanta R, Sorsa T, Ko¨no¨nen E. 2008. Clinical changes in periodontium during pregnancy and postpartum. *J Clin Periodontol*., 35: 576–583.

Iams JD, Romero R, Culhane JF, Goldenberg RL. 2008. Primary, secondary, and tertiary interventions to reduce the morbidity and mortality of preterm birth. *Lancet*, 371: 164–175.

Kanda N, Watanabe S. 2004. Regulatory roles of sex hormones in cutaneous biology and immunology. *J DermatolSci*., 38: 1–7.

Khader YS, Jibreal M, Al-Omiri M, Amarin Z. 2006. Lack of association between periodontal parameters and preeclampsia. *J Periodontol*., 77: 1681–1687.

Klebanoff M, Searle K. 2006. The role of inflammation in preterm birth – focus on periodontitis. *Br J Obstet Gynaecol*., 113(Suppl. 3): 43–45.

Klebanoff M, Searle K. 2006. The role of inflammation in preterm birth – focus on periodontitis. *Br J Obstet Gynaecol*., 113(Suppl. 3): 43–45.

Lin D, Moss K, Beck JD, Hefti A, Offenbacher S. 2007. Persistently high levels of periodontal pathogens associated with preterm pregnancy outcome. *J Periodontol*., 78: 833–841.

Moss KL, Ruvo AT, 2007. Offenbacher S, Beck JD, Mauriello SM, White RP Jr. Third molars and progression of periodontal pathology during pregnancy. *J Oral MaxillofacSurg*., 65: 1065–1069.

Newnham JP, Newnham IA, Ball CM, Wright M, Pennell CE, Swain J, Doherty DA. 2009. Treatment of periodontal disease during pregnancy. A randomized controlled trial. *ObstetGynecol*., 114: 1239–1248.

Novak KF, Taylor GW, Dawson DR, Ferguson JE, Novak MJ. 2006. Periodontitis and gestational diabetes mellitus: exploring the link in NHANES III. *J Public Health Dent*, 66: 163–168.

Offenbacher S, Beck JD, Jared HL, Mauriello SM, Mendoza LC, Couper DJ, Stewart DD, Murtha AP, Cochran DL, Dudley DJ, Reddy MS, Geurs NC, Hauth JC, 2009. For the Maternal Oral Health to Reduce Obstetric Risk (MOTOR) Investigators. Effects of periodontal therapy on rate of preterm delivery. A randomized controlled trial. *ObstetGynecol*., 114: 551–559.

Schumacher A, Wafula PO, Bertoja AZ, Sollwedel A, Thuere C, Wollenberg I, Yagita H, Volk H-D, Zenclussen AC. 2007. Mechanisms of action of regulatory T cells specific forpaternal antigens during pregnancy. *ObstetGynecol*., 110: 1137–1145.

Singh N, Perfect JR. 2007. Immune reconstitution syndrome and exacerbation of infections after pregnancy. *Clin Infect Dis*., 45: 1191–1199.

Tarannum F. and Faizuddin M. 2007. Effect of periodontal therapy on pregnancy outcome in women affected by periodontitis. *J Periodontol*., 78: 2095–2103.

Toygar HU, Seydaoglu G, Kurklu S, Guzeldemir E, Arpak N. 2007. Periodontal health and adverse pregnancy outcome in 3,576 Turkish women. *J Periodontol*., 78: 2081–2094.

Tsukimori K, Fukushima K, Komatsu H, Nakano H. 2006. Neutrophil function during pregnancy: is nitric acid production correlated with superoxide production? *Am J ReprodImmunol*., 55: 99–105.

Xiong X, Buekens P, Vastardis S, Pridjian G. 2006. Periodontal disease and gestational diabetes mellitus. *Am J ObstetGyneco*l., 195: 605–615.

Yokoyama M, Hinode D, Yoshioka M, Fukui M, Tanabe S, Grenier D, Ito H-O. 2008. Relationship between Campylobacter rectus and periodontal status during pregnancy. *Oral MicrobiolImmunol*., 23: 55–59.

Yuan K, Lin MT. 2004. The roles of vascular endothelial growth factor and angiopoietin-2 in the regression of pregnancy pyogenic granuloma. *Oral Dis*., 10: 179–185.

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