# Is Periodontal Disease a Risk Factor for Onset of Preclampsia and Fetal Outcome?

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**Citation**

B Rai, S Kharb, S Anand. *Is Periodontal Disease a Risk Factor for Onset of Preclampsia and Fetal Outcome?*. The Internet Journal of Dental Science. 2007 Volume 6 Number 1.

**Abstract**

Preclampsia and preterm delivery of low birth weight infants (PLBW) remains a significant public health issue and a leading cause of neonatal death and long-term neuro-developmental disturbance and health problems. Recent epidemiological and microbiological immunological studies have suggested that periodontal disease may be an independent risk factor for preeclampsia and low birth weight babies. Inflamed periodontal diseases produce significant amounts of pro-inflammatory cytokines, mainly interleukin, beta, IL-6, prostaglandin E2, and tumor necrosis factor alpha (TNF-) which may have systemic effects i.e. adverse effect in pregnancy on the host.

## INTRODUCTION

The concept that the periodontal disease might influence systemic health is not new. Miller originally his “focal infection therapy” in 1891, suggesting that “micro-organisms or their waste products obtain entrance of parts of the body adjacent to or remote from the mouth.[1] Before the development of modern periodontal treatments, may teeth were extracted prophylactically because of the focal infection therapy.[2] Epidemiological and microbiological immunological studies have lent credence to the concept that periodontal disease may be a separate risk factor for cardiovascular disease, cerebrovascular disease and respiratory disease, preclampsia, as well as preterm delivery of low birth weight infants.[3,4]

This article reviews the relationship between periodontal disease, preterm low birth weight and preeclampsia.

## PRECLAMPSIA AND PERIODONTAL DISEASE

Preeclampsia is a common hypertensive disorder of pregnancy, affecting 5-10% of pregnancies and contributing significantly to maternal and perionatal morbidity and mortality. Several etiologies have been proposed, a common final pathway is likely. Preeclampsia and atherosclerosis share some common epidemiologic risk factors, and placental pathologic changes similar to atherosclerotic vascular changes have been described.[5] It has been recently studied that women were at higher risk for preeclampsia if they had severe periodontal disease at delivery.[6] Periodontal disease, a chronic oral gram negative infection, has been associated with atherosclerotic thromboembolic events and hypercholesterolemia.[7,8] Periodontal disease may provide a chronic burden of endotoxin and inflammatory cytokines, which serve to initiate and exacerbate atherogenesis and thrombogenesis. It is possible that the placenta may be similarly burdened in pregnant women who develop preeclampsia. If the relationship between periodontal disease and preeclampsia risk proves causal in nature, then treatment of periodontal disease during pregnancy may represent a novel approach to the prevention of preeclampsia.

Periodontal disease and preterm delivery of low-birth-weight infants (PLBW):

Pregnant women with periodontal disease may be at increased risk for having preterm low-birth-weight children. A case control study has found that periodontal infection may be a potential independent risk factor for preterm low birth weight (PLBW), and low prospective studies showed an association between preterm birth and periodontal infection.[9,10,11] Preliminary study provide evidence that maternal periodontal disease and incident progression are significant contributors to Obstetric risk for preterm delivery low-birth weight and low weight for gestational age.[12] The high prevalence of elevated fetal IgM to C. rectus among premature infants renses the possibility that this specific maternal oral pathogen may serve as a primary fetal infectious agent eliciting prematurity.[13]

Maternal periodontal infection in the absence of a protective maternal antibody response is associated with systemic dissemination of oral organisms that translocate to the fetus resulting in prematurity.

## RISK FACTORS FOR PLBW

Since we have not as yet identified all of the contributing causes of preterm birth and therefore fail to appropriately target and manage relevant risk factors. PLBW health care system are to unable to decrease the occurrence of these unfavourable pregnancy outcomes. So far, smoking and alcohol consumption are generally accepted as two major modifiable risk factors.[14] Currently, the history of preterm delivery seems to be good predictor of risk for preterm birth among multiparous pregnant women increasing the risk almost to three fold. The role of concomitant infection from the reproductive tract or the oral cavity is currently believed to play a role in effecting pregnancy outcomes[15] identified risk factors for PLBW include (< 17 years) maternal age: low socio-economic status, alcohol and tobacco abuse, inadequate prenatal care, drug, genitourinary tract infection, hypertension; multiple pregnancies and diabetes mellitus.

## MICROBIOLOGICAL ASPECT OF PERIODONTAL DISEASE AND PLBW

The organisms associated with gingivitis and periodontitis include major pathogens that comprise the 'red' and 'orange' clusters of organisms.[16] Pregnancy outcomes were elevated in these animals after either the establishment of experimental periodontitis, the establishment of a non-disseminating subcutaneous tissue infection with porphyromonas gingivalis or intravenous injection of LPS from P.gingivalis.[17,18] Fetal weights were significantly lower in the experimental animals, and the severity of fetal effects was directly related to the levels of $PGE_2$ and TNF-. It has been observed in animal models that infection with grams-negative periodontitis associated micro-organisms may adversely affect pregnancy infections, for example, the organisms is known to cross the placental barrier and induce a fetal IgM response.[19,20,21]

The biological mechanisms involve bacterially induced activation of cell mediated immunity, which lead to production of cytokines, TNF- synthesis and release of prostaglandins.[22,23] During normal pregnancy, when the intraamniotic levels are reached, cervical dilatation and delivery are induced.[24] Abnormal production of these mediators during the pregnancy in the setting of infection triggers preterm labour and low birth weight.[25,26] Cytokines (IL-1, IL-6 & TNF-) can cross human fetal membranes, and it is plangible that the high concentrations of these cytokines that are generated placenta. Active periodontal disease during pregnancy may have transient translocation of oral organisms to the ultra placental unit, inciting placental inflammation or oxidative stress early in pregnancy, which may ultimately produce placental damage and clinical manifestation of preeclampsia. Umbilical cord serum IgM to oral pathogens porphyromonas gingivilis has been demonstrated[13], documentation of fetal humoral response to organisms distant from the intrauterinal environment lends support to the concept of translocation of oral pathogens to the uteroplacental unit. A case control study suggested that mothers with premature, low birth weight babies (PLBW) had more serve periodontal disease than mothers with full-term deliveries and periodontitis appeared to an important risk factors independent of other traditional obstetric risk factors.[9] It has been reported that antenatal maternal periodontitis is an independent risk factor for preterm birth and low birth weight.[33]Another study by Devenport failed to demonstrate an association between periodontal disease and PLBW deliveries.[34] Thus, women are higher risk for preeclampsia if they had moderate/severe periodontal disease at delivery or if they had periodontal disease progression during pregnancy adjusting for maternal race, age parity and tobacco use.[6]

## CONCLUSION

Pregnant women with periodontal disease may be at increased risk for having preterm low birth weight (PLBW) children. It has been suggested that effect of periodontal disease on PLBW could result from stimulation of fetal membranes on prostaglandin synthesis by cytokines produced by inflamed gingival tissues or through the effect of endotoxin derived from periodontal infection. Endotoxin derived from periodontal pathogens in women with periodontal disease might signal preterm labour through primed monocyte macrophage activation in peripheral blood and deciduas. If the relationship between maternal periodontal disease and preeclampsia and PLBW risk proves casual in nature, treatment of periodontal disease during pregnancy may represent a noval approach to the prevention of preeclampsia and PLBW.

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