Periodontal Affection and Pregnancy: Scope of the Problem

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Pregnancy has far-reaching systemic effects extending beyond the reproductive system involving complex physical and psychological changes that have an impact on even healthy women. Hormonal effects cause changes to almost every organ system[1] Oral and masticatory changes during pregnancy have been documented for many years; however, their magnitude and frequency have not been stressed[2] Wide spread social overlooking of dental hygiene measures as an essential factor for oral and general health maintenance and preservation combined with dental practitioner's attitude of waffling in confrontation with dental problems of pregnant women, simply, because they fear any unpleasant consequences, has all contributed to a higher prevalence of periodontal problems among our female population.

The forthcoming discussion will extend the vision into the effect of periodontal ligament (PDL) diseases on pregnant women as they manifest with very high prevalence and rather serious consequences, but prior to discussing the diseases, we have to take an in depth look into the anatomical, histological and physiological features of the PDL itself.

Anatomy of the Periodontal Ligament

Periodontal ligament (PDL) is a specialized form of Connective tissue derived from the dental sac, representing and filing the space of interaction between the teeth and the alveolar bone, contributing to attachment of teeth, it's made up of two main groups of collagenous fiber bundles called Gingival fibers and Principal fibers, between the principal fibers there are areas of loose connective tissue called Interstitial spaces along with blood vessels and nerves. The gingival fiber group includes four subcategories of fibers; Dentogingival, Dentoperiosteal, Transseptal and Circular fibers. Those fibers attach the tooth to the gum, periostium of the alveolar cortical plates and also extend from one tooth to another in horizontal and circular manners. The Principal fiber group includes five subcategories of fibers, named Alveolar crest fibers, Horizontal, Oblique, Apical and Inter radicular fibers; these fibers extends mainly in between the superficial layer of teeth roots (Cementum) and the alveolar bone and they are named according to their position and direction. The main function of these two main groups of fibers is to supply the tooth with optimal resistance to all kind of functional loading patterns (See Diagram 1).

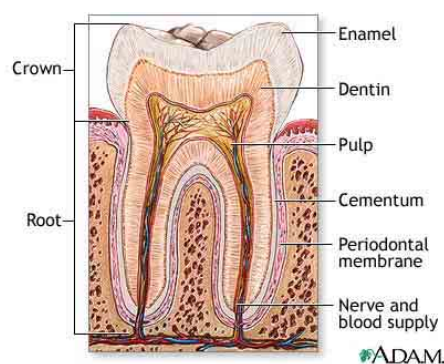

Diagram 1. By: www.dentalreference.com

Blood supply to the Periodontal ligament is very developed more than any other connective tissue, blood vessels are found in the interstitial spaces of the ligament as branches of the main arteries supplying the jaws, some of these branches inter the apical foramena of the teeth supplying the pulp, others supplies areas around the teeth and the alveolar bone in a very rich interconnected manner through the cribriform plates.

The Periodontal ligament contains two types of nervous supply, Autonomic-Sympathetic fibers traveling along with blood vessels controlling blood

flow to the tissues, and Afferent sensory fibers mainly from the second and third divisions of the fifth cranial nerve (Trigeminal nerve); Nerve endings in the Periodontal ligament are of two types, free unmyelinated nerve endings responsible for pain transmission, and encapsulated nerve endings responsible for registration of pressure changes.

The width of the periodontal ligament space varies according to functionality, age, position of tooth in the arch and untreated periodontal diseases

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which can cause damage to the supporting apparatus of the tooth leading to eventual loss of teeth[3].

Histology of the periodontal ligament and the junction between teeth and gum

Connective tissue of the Periodontal ligament is rich in Fibroblasts which are responsible for continually active fibrous matrix and ground substance production as the PDL has a very high turnover rate; the fibers are both collagenous and elastic fibers and the ground substance is made of Proteoglycans.

The tissue which forms the junction between teeth and gum is called the Junctional tissue extending as a lining for a circular sulcus around teeth of 0.5-3 mm depth in the healthy normal conditions. It's composed of nonkeratenized stratified squamous epithelium without rete pegs and divided into Sulcular epithelium found at the height of the gum and normally .5 mm depth, at times of inflammation, it shows rete pegs; and Junctional epithelium which begins at the base of the sulcus attached to tooth surface by hemidesmosomes, its located between two basal laminae one facing the tooth and the other facing the connective tissue of the gingival; Junctional epithelium has a great capacity for self repair as its easily invaded by micro organisms and its where the PDL diseases initially begin[3].

What is the periodontal disease?

Periodontal disease is an infection of the gums and bone, demonstrated in many stages ranging from the initial mild to the sever advanced and established stage; caused by bacterial plaque which is a dense non calcified highly organized bacterial mass firmly adherent to the teeth or other hard materials within the mouth; cannot be washed out by salivary or water flow[4]. Plaque forms constantly on teeth and can build up if it is not removed through daily dental hygiene and regular professional cleaning (See Diagram 2). Three out of four adults are affected by periodontal disease some time in their lives.

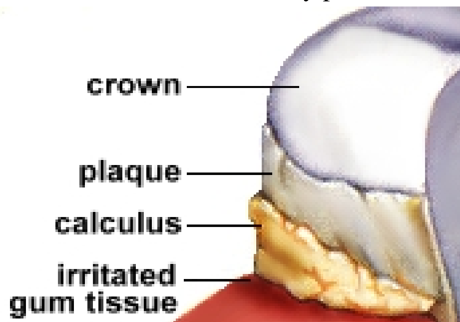


Diagram 2. By: www.dentalreference.com

Periodontal infection is a gram-negative, anaerobic oral infection. The bacteria responsible for this condition are capable of producing a variety of chemical inflammatory mediators, such as prostaglandins (PG), interleukins (IL), and tumor necrosis factor (TNF), that can directly affect the host[5,6,7,8]. Bacterial plaque contributes to periodontal breakdown by direct injury to the tissues and by stimulating host mediated responses that result in tissue destruction (See diagram 3); direct tissue injury is caused by both endotoxins and exotoxins produced by the bacterial mass, and Enzymes, mainly protease and collagenase, secreted by bacteria to facilitate its penetration by breaking down the structural barriers.

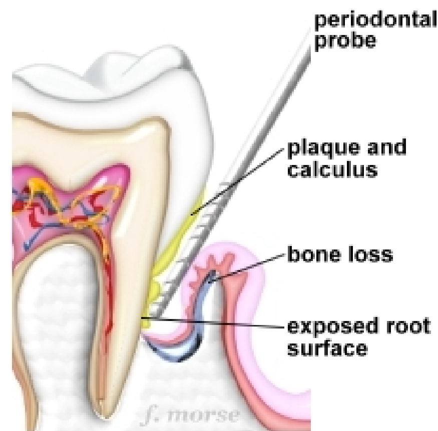
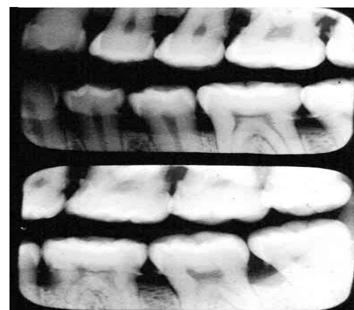


Diagram 3. By: www.dentalreference.com

Host mediated responses to bacterial plaque invasion are of two natures, protective and destructive; the protective responses include different stages of inflammation as chemotaxis, phagocytosis and involves Mast cells, Neutrophils, T & B Lymphocytes, Macrophages, antibodies and Immunoglobulin production and complement system activation. The destructive responses includes the release of interleukins, Prostaglandin, Collagenase and Lysosomal enzymes as well as Tumor necrosis factor-α which contributes to bone distruction[4] (See picture 1).



Picture 1. An X-ray showing Alveolar bone resorption in a case of periodontitis[9]

Periodontal affection and Pregnancy

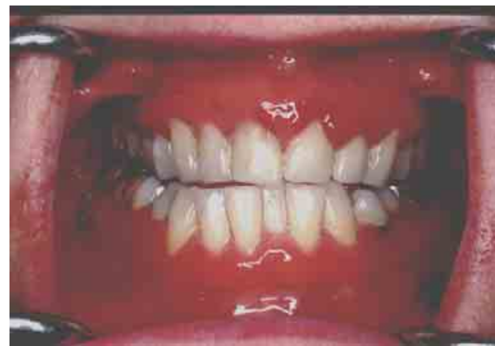
It is not completely understood how periodontal diseases affects pregnancy. Research suggests that the bacteria that cause inflammation in the gums can actually get into the bloodstream and target the fetus, potentially leading to premature labor and low birth weight babies (LBW). Recent epidemiological and microbiological immunological studies have suggested other postulated mechanisms including translocation of periodontal pathogens to the fetoplacental unit and action of a periodontal reservoir of lipopolysaccharides or inflammatory mediators[10,11] (See figure 1).

Table 1. Periodontal disease and preterm labor: A Proposed biological mechanism.
Periodontal infection – A Reservoir of gram negative anaerobes
↓ ↓
Host response →Elevated levels of chemical mediators (PG, IL, TNF).
↓ ↓
Premature labor – Mediators of parturition (PG, IL, TNF) that consequently may induce low birthweight preterm babies.

A cohort study of 1,115 pregnant women[12] demonstrated that women were at higher risk for preeclampsia if they had severe periodontal disease at delivery than periodontaly normal healthy women. The study hypothesized that transient translocation of oral organisms, predominant in periodontal disease, to the uteroplacental unit may incite placental inflammation or oxidative stress, resulting in placental damage and clinical manifestation of preeclampsia.

During pregnancy physiologic gingival changes evidently take place[1] leading to a sort of mild inflammation called Pregnancy gingivitis. It is usually first seen around the 8th week of pregnancy and reaches it's maximum around the 32nd week, due to an increased level of circulating progesterone and estrogen. The onset of pregnancy gingivitis in the second month of gestation coincides with an increase in the levels of these two hormones and recedes by the eighth month, showing perhaps a relationship between the two. These hormonal and vascular changes associated with pregnancy may exaggerate the response of the gingiva to bacterial plaque. Studies have shown that 30% to 100% of pregnant women have gingival inflammation[13,14] increased levels of female sex hormones. (Progesterone) causes increased exudation and affects the integrity of the capillary endothelial cells. It also influences the biosynthesis of prostaglandin in the gingival[15] and has also shown to alter the bacterial composition of plaque by substituting Naphthaquinone, an essential growth factor for bacteria, which may further promote the growth of these bacteria leading to an increase in the percentage of the gram-negative bacteria[16].

Pregnancy gingivitis, probably the most common periodontal disorder to affect pregnant women, is a reversible condition which may be localized or generalized, prominently seen in anterior teeth during the first and second trimesters of pregnancy, with no tissue attachment loss,[1] characterized by red swollen gums that bleed easily and become very sore and sensitive due to secondary infection with opportunistic micro organisms normally present in the oral cavity flora (See picture 2). In the late third trimester, a decrease in these symptoms of inflammation takes place following a decrease in the level of elevated sex hormones[13].



Picture 2. An advanced case of pregnancy gingivitis.[9]

A study in Italy stated that maternal infective processes sustained especially by Gram-negative anaerobic bacteria like periodontal disease, during pregnancy, have been demonstrated to perturb the physiologic course of parturition through inflammatory cytokine production, sometimes resulting in preterm labor, preterm premature rupture of membranes and preterm low birth weight in a matched case-control study. The hypothesis is that poor oral health of pregnant women is a risk factor for low birth weight (LBW) was evaluated. Gingival crevicular fluid (GCF) levels of Prostaglandin E2 (PGE2) and Interlukin-1beta (IL-1beta) were measured in order to determine whether mediator levels were related to current pregnancy outcome. Results indicate that GCF-PGE2 and GCF-IL-1beta levels are significantly higher in preterm low birth weight (PLBW) mothers as compared with normal birth weight controls. The data confirm that there is a possible correlation between periodontal problems typical of pregnancy and the occurrence of complications such as preterm low birth weight[17,18].

Another study in Chile investigated whether the maintenance of the mothers' periodontal health after 28 weeks' gestation reduces the risk of preterm low-birth-weight (PLBW). Of the 639 women studied, 406 had gingivitis and received treatment before 28 weeks' gestation, and 233 had periodontal diseases and were treated after delivery. Data about previous and current pregnancies and known risk factors were obtained from patients' medical records. Primary outcomes were delivery before 37 weeks' gestation or an infant with birth weight below 2500 g. The incidence of PLBW was 2.5% in periodontaly healthy women, and 8.6% in women with periodontal diseases, concluding that periodontal diseases were associated with both preterm birth and low birth weight, independent of other risk factors[19].

Pregnant diabetics also face a greater risk from severe periodontal disease than non-diabetic pregnant women, according to a study published in the December 2001 stating that periodontal disease may lead to premature labor, and this response may be even more common in women with diabetes[20].

Management of periodontal diseases in pregnant women

There are no evidence based guidelines available that describe which procedures can be performed during each trimester of pregnancy. Numerous articles have been written in scientific journals, but, for the most part, health care professionals are still unsure about dental care during pregnancy.[1] There is a strong tendency for dentists to postpone dental intervention until after delivery because of the added risks imposed by taking radiographs and prescribing drugs to pregnant women; Complications may arise during dental procedures, such as syncope, enhanced gag reflex, supine hypotensive syndrome, seizures and gestational hyperglycemia[21] have contributed to such attitude. In cases of periodontal affection, treatment deferring until after delivery may lead to more destructive results than those feared through immediate actions unless otherwise stated by the Obstetrician in charge.

The American College of Obstetricians and Gynecologists encourages women to consult their dentist early in their pregnancy[1]. In a survey of Obstetricians regarding dental interventions to pregnant ladies, they assured dental practitioners of how safe carrying out routine dental procedures to pregnant women. These obstetricians answered questions regarding consultations prior to dental treatment, use of radiographs during treatment, and stress during care. 91% percent of the obstetricians stated that they did not want to be consulted prior to routine dental care, and 56% stated they did not require consultation prior to emergency care. 97% percent stated that emergency radiographs were acceptable. Only 27% asked for consultation prior to use of local anesthetic as it is a commonly used agent and has no documented ill-effects. Obstetricians were most concerned about the use of prescription drugs such as antibiotics and analgesics. A very low percentage of surveyed obstetricians wanted to be consulted prior to administration of local anesthetic. The main concerns are radiographs and certain types of medications which might be prescribed during the course of dental treatment[22].

Managing the effect of periodontal diseases on both, the mothers and their babies, starts as early as the idea of conception, for women who are planning to get pregnant, it is carried out through periodontal examinations and appropriate treatment of any dental problem that may lead later to a periodontal affection like open margins or over hanged restorations, this process begins prior to pregnancy, professional dental cleaning alongside with regular home care for the whole period of pregnancy is then very essential to minimize both prevalence and severity of pregnancy gingivitis. For women who are already pregnant, meticulous oral hygiene including brushing, flossing, rinsing and frequent professional cleanings with strict adaptation to plaque control methods may be helpful in controlling mild cases of gingivitis. Oral rinses and dentifrices are generally not contraindicated during pregnancy; Chlorhexidine® mouthwash is a safe and effective mouth rinse to control gingivitis during pregnancy. However, it’s advisable to be cautious in the use of mouthwashes with moderate to high levels of alcohol (10% or higher) because of concerns about fetal alcohol syndrome[23].

In spite of good oral hygiene measures done both professionally and at home, subgingival calculus or tartar (below the gum line) may still be present, which will constantly irritate the gums, creating more inflammation, then scaling and root planning may be necessary, which is a more complicated procedure than the simple routine cleaning, although it is advisable to stick with routine teeth cleaning during the first trimester, scaling and root planning ,when mandatory, should wait until the second trimester for the necessity of local anesthetic administration and the expected need of medication use. Anesthetics like lidocaine and prilocaine can be safely used during the procedure. Others like mepivacaine and procaine need to be used with caution (See Table 2)[14].

Table 2. Drugs that can be prescribed and those that are contraindicated during pregnancy

	Those that can be prescribed during pregnancy	Those that are contraindicated during pregnancy
Antibiotics	Penicillin, Cephalosponins, Amoxicillin, Clindamycin, Erythromycin (except estolate form)	Tetracyclines, Doxycyclines, Erythromycin (estolate form)
Analgesics	Acetaminophen, Acetaminophen with codeine in small doses	Aspirin, Diflunisal, Etodolac

Source: www.agd.org/consumer/topics/pregnancy/main.html

Most often, dentists will require two types of drugs in treating such advanced cases. These include antibiotics and analgesics for control of infection and pain. Safe Antibiotics for dental prescription includes Penicillin, Cephalosporins, Amoxicillin, Clindamycin, and Erythromycin (except estolate form)[1]. While for analgesia it is safe to prescribe Paracetamol.

Antibiotics like Tetracycline, Doxycyclines, Erythromycin (Estolate form) should strictly be avoided; The use of Tetracycline poses a significant risk to both mother and fetus, it may cause hepatic and pancreatic injury to the pregnant woman; might cross the placenta and cause malformation and discoloration of deciduous teeth; and it can form chelates with calcium and be deposited in the skeleton of the fetus, resulting in depression of bone growth. In the case of erythromycin (estolate form), the potential adverse effects are secondary to hepatotoxicity.

Analgesics like Aspirin, Diflunisal, and Etodolac must also be avoided during pregnancy for the potential risk they implement on both mother and fetus. Aspirin may cause anemia, hemorrhaging or prolonged gestation or labor. Generally, prolonged use of non-steroidal, anti-inflammatory analgesics has been shown to have detrimental effects on the fetal circulation; they should be avoided during the third trimester, as they delay onset and increase duration of labor. Narcotics, when taken in large quantities, cause depression of the fetal central nervous system and produce addiction in the fetus[24].

As a final word, it is of no doubt that it is the sole responsibility of dental practitioners to take a proactive role in encouraging all patients of childbearing age to seek oral health counseling, examination and treatment, if necessary. The American Academy of Periodontology urges health care providers to motivate patients to treat periodontal infections during pregnancy by referral to the patient's dentist or periodont-ist[25,26]. Also, good communication should be established between the dental care providers and prenatal care providers. It is imperative to inform pregnant women of their dental needs and to motivate them to seek care so that we can have better dental health in mothers and children in the future.

Summary

Prematurity is of one of the main causes of neonatal morbidity and mortality. Clinical observations show, that periodontitis in pregnant women can be a direct risk factor for preterm labor[27].

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