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GRAVIDA AND PERIODONTITIS AN OVERVIEW

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INTRODUCTION

Gravida comes from latin word gravis meaning heavy it can refer ton a female who is literally pregnant. Periodontitis, also known as gum disease, is a severe gum infection which destroys the soft tissue encircling the tooth. Pregnancy and periodontitis are known to have been associated with one another for many years. Although there is awareness of pregnancy and it's impact on periodontal disease, various researches indicating an adverse association to systemic health has just recently emerged. According to recent studies, periodontal disease may have an adverse effect on the fetus's health as well as the patient's overall health.

Modification of female sex hormones is thought to be either the triggering or complicating element in various types of gingival disease. Pregnancy gingivitis is characterized by nonspecific inflammatory reactions with a predominantly vascular component and a pronounced bleeding tendency. These alterations to the gingiva are typically linked to physiological and hormonal changes(1).

CLINICAL FEATURES OF GINGIVAL ENLARGEMENT IN PREGNANCY

Gingivitis cannot be brought on by pregnancy alone. Pregnancy does not cause gingivitis, but may aggrevate preexisting disease. The gingival enlargement occurs solely in the presence of bacterial plaque. The extent of previously inflamed areas alters during pregnancy, while the healthy gingiva remains unaffected. The response of the gingiva to plaque increases during pregnancy. In the absence of local factors, the gingiva does not experience any significant alterations during pregnancy(2).

Early in the second or third month of pregnancy, gingivitis becomes more severe. During the eighth month of pregnancy, gingivitis gets worse and subsides during the ninth month. This same pattern is followed up by plaque accumulation too(2). After parturition, there is a stronger association between gingivitis and plaque quantity than during pregnancy, suggesting that pregnancy introduces additional elements that exacerbate the gingival response to local factors(3).

The most pronounced clinical feature is the ease of bleeding(3). Mild to severe inflammation, which might progress to severe hyperplasia, discomfort, and bleeding, is frequently observed(4). The color of the inflamed gingiva ranges from bright red to bluish red(3). The interdental and marginal gingiva are soft, pliable, smooth, glossy, edematous, pit on pressure, and occasionally have a rasberry-like appearance(5).

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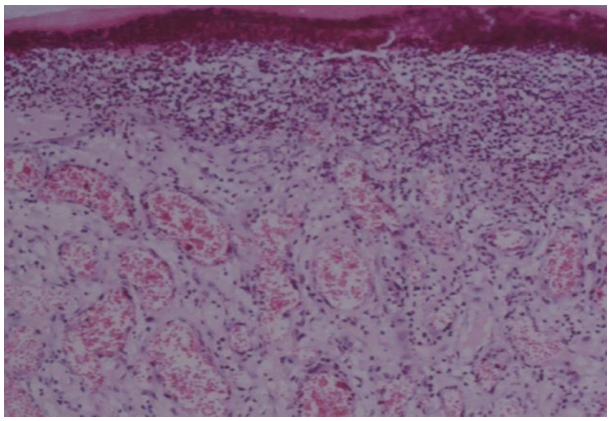
Increased tissue edema may result in deeper pockets and contribute to transient tooth mobility[6]. Vascularity is formed as a result of extreme redness. Unless an acute infection prompts them to be painful, gingival variations are often painless[5]. The only microorganism that significantly grows throughout pregnancy is Prevotella. intermedia[3]. Compared to the clinical characteristics of gingivitis, the proportionate increase in the number of P. intermedia may be more sensitive sign of an altered systemic hormonal state[7].

MICROSCOPIC FEATURES

Angiogranuloma is the term used to describe gingival enlargement in pregnancy[5]. Gingival disease in pregnancy manifests microscopically as a nonspecific, vascularizing, proliferative inflammation[3]. Edema, connective tissue degeneration, significant inflammatory cellular infiltration, and gingival epithelial degradation occur[8]. The epithelium is hyperplastic, exhibiting enhanced rete pegs, reduced surface keratinization, varying degrees of intracellular and extracellular edema, and leukocyte infiltration. There are plenty of newly produced, engorged capillaries[5].



PERIODONTITIS AND ADVERSE PREGNANCY OUTCOMES

1- Preterm and Low birth weight infants

Pregnant women who have untreated periodontal disease have a considerable risk of having preterm, low-birth-weight(LPBW) infants. Preterm labor, or premature membrane rupture (PROM), is the primary root cause of LBW deliveries[3].

The relationship between periodontal disease and PLBW births is caused by infection and is indirectly mediated, mostly by the transmission of bacterial products like endotoxin and the effects of inflammatory mediators produced by the mother. *Fusobacterium nucleatum* is the species most frequently identified in the amniotic fluid of pregnant women who have undergone premature labor[9]. Fusobacterium nucleatum is frequently found in amniotic fluid but is not commonly present in the vaginal microflora.

Fusobacterium nucleatum is frequently present in the oral cavity and has the potential to disseminate from the bloodstream to the amniotic fluid in individuals experiencing transitory bacteremia. Another potential explanation is that oral fusobacteria are transmitted to the vagina during orogenital sexual activities[9]. A study was done to precisely characterize the species and subspecies of fusobacteria present in amniotic fluid and the lower genital tract. The study also aimed to examine the hypothesis that fusobacteria in amniotic fluid could originate from the oral cavity. The aforementioned study was conducted to gather data that could be utilized to assess the feasibility of a future, more extensive, prospective study and to examine the connections between fusobacteria and other bacteria in oral and lower genital tract sites, specifically in relation to amniotic infection and preterm labor. The study findings indicated notable statistical disparities in the distribution of species and subspecies between the amniotic fluid and the lower genital canal. F. nucleatum, including all subspecies, accounted for 83% of the strains obtained from amniotic fluid and only 31% of the strains obtained from the lower vaginal tract. The species and subspecies of fusobacteria found in the amniotic fluid were highly comparable to the species and subspecies of fusobacteria obtained from both healthy and diseased subgingival locations[9]. *F. nucleatum* is a common oral species that is quite common in people with periodontitis and can spread hematogenously from the oral cavity into the amniotic fluid. This route is further supported by the discovery of *Capnocytophaga* species, a common oral cavity microbe, in the amniotic fluid of women with preterm labor[10].

Maternal periodontal disease has been seen to

result in the movement of P. gingivalis bacteria to the amniotic fluid and placenta. This connection has been linked to negative pregnancy outcomes, including preterm birth or low birth weight. It is important to note that alterations in placental development caused by environmental factors are likely to impact fetal development within the uterus through many mechanisms. Alterations in the quantity of nutrients accessible to the fetus, modifications in the endocrine function of the placenta, or any variations in the physical characteristics of the placenta are pivotal in the process of intrauterine programming[11].

While the precise biochemical processes by which P. gingivalis might cause negative consequences during pregnancy and impact babies remain uncertain, Chopra et al. (2020) put up seven probable pathogenic mechanisms that may be implicated:

(1) The act of directly invading, migrating across, and causing harm to the unit/interface between the fetus and placenta, as well as the tissues of the mother.

(2) The ability to persist and survive within the tissues of both the fetus and the mother, while evading the immune response.

(3) The production of proinflammatory cytokines increases and there is a change in the immune response from Th2 to Th1, accompanied by an imbalance between Th17 and T regulatory cells.

(4) The acute-phase response is activated.

(5) Polymicrobial dysbiosis occurs and pathobiont species start to develop.

(6) There is an increase in oxidative stress in both the fetal and maternal tissue.

(7) Fetal adrenal cortisone production increases and fetal stress begins[11].

Wide-ranging effects may be caused by periodontopathic organisms and their byproducts, most likely by the activation of host cytokine production in the target tissues. According to studies on animals, fetal death and growth retardation, as well as TNF- α (tumor necrosis factor) and PGE2(prostaglandin) levels, were significantly correlated. When *P. gingivalis* was implanted in subcutaneous chambers during pregnancy, TNF- α and PGE2-levels significantly increased[12]. The number of fetal deaths and fetal birth weight were both significantly increased as a result of this localized subcutaneous infection.

These findings imply that a remote, non-disseminated *P. gingivalis* infection may lead to adverse pregnancy outcomes. Further, after receiving intravenous injections of LPS made from *P. gingivalis*, there was a decrease in fetal birth weight and an increase in fetal mortality[13]. Preliminary trials demonstrated that intestinal endotoxins had the ability to cause placental necrosis, spontaneous abortions, fetal organ damage, fetal death, and abnormalities in different animal species. Endotoxin was discovered to be embryolethal and to cause various abnormalities, spontaneous miscarriages, and reduced fetal weight[13]. Experimental periodontitis brought on by *P. gingivalis* elevated TNF- α and PGE2 levels in amniotic fluid and lowered fetal birth weight in animal models. This offers strong evidence that gingivitis can alter the fetus' surroundings and pregnancy outcome[14].

These studies on animals have prompted researchers to investigate the potential impact of periodontitis on human pregnancy outcomes[15]. In a large prospective study involving over 1300 pregnant women, those with generalized periodontitis had a five-fold higher risk of premature birth before 35 weeks and a seven-fold higher chance of delivery before 32 weeks than those without periodontitis. According to these studies, there is a direct link between periodontal disease and adverse pregnancy outcomes[16].

In a cross-sectional investigation, women who had LBW infants had significantly greater subgingival plaque concentrations of *Actinobacillus actinomycetemcomitans*, *Tannerella forsythia, P. gingivalis,* and *Treponema denticola* than did the control women who had NBW infants. PGE2 and IL-1 levels in gingival crevicular fluid were greater in women who had LBW infants. As a result, when compared to mothers who had NBW infants, women who had LBW infants had a higher prevalence and severity of periodontitis, more gingival inflammation, higher levels of periodontal pathogens, and an increased subgingival inflammatory response[15].

2- Pre-Eclampsia

Preeclampsia is a prevalent condition characterized by high blood pressure during pregnancy. It affects approximately 5-10% of pregnancies and has a substantial impact on the health of both the mother and the baby, leading to increased rates of morbidity and mortality. Pre-eclampsia risk may also be increased by periodontal disease. There are numerous probable causes of pre-eclampsia, several of which involve vascular alterations in the placenta that are related to those found in atherosclerosis. Periodontal disease is defined by alternating periods of exacerbation and periods of remission, and it involves a buildup of harmful microorganisms that cause inflammation and damage to the local tissues. Pregnant women who have active periodontal disease may experience a temporary movement of dental bacteria to the area where the uterus and placenta (uteroplacental unit) are located. This can cause inflammation or oxidative stress in the placenta early in pregnancy, leading to damage and the development of preeclampsia. As a part of a study, a subgroup of women had undergone evaluation of umbilical cord serum to determine the existence of fetal immunoglobulin M against oral infections. Out of the 351 fetal cord blood samples collected, 57 (16%) showed the presence of fetal immunoglobulin M to the oral pathogen Porphyromonas gingivalis. This indicates that the fetus had an immune response to the bacteria, which suggests that oral pathogens can travel to the area between the uterus and placenta. Therefore, Periodontitis or a worsening of periodontal disease during pregnancy may increase the risk of developing preeclampsia(17).

3- Pregnancy tumour

The alleged pregnancy tumor isn't a neoplasm; rather, it's an inflammatory reaction to bacterial plaque that is influenced by the patient's health(5). It is also known as pyogenic granulomas or pregnancy epulides. It usually occurs in 0.2% to 9.6% of pregnancies.

Most frequently, they appear in the second or third month of pregnancy(3).

The lesion manifests as a distinct, mushroom-like, flattened spherical mass that extends from the gingival margin or, more frequently, from the interproximal space and is bound together by a sessile or pedunculated base(5). Clinically, they bleed easily and exhibit nodules and hyperplasia(3). It has a smooth, shining surface that frequently displays multiple deep-red, pinpoint structures and is typically dark crimson red or magenta in color. In most cases, it is painless until its size and shape cause debris to accumulate

beneath its margin or hinder occlusion, in which instance painful ulceration may develop(5). The lesion typically develops in a gingivitis-affected area and is linked to calculus and poor oral hygiene(3).

ETIOLOGY

1) Alteration in the composition of subgingival plaque:

Kornman and Loesche founded that in second semester gingivitis and gingival bleeding is increased without increasing in plaque levels (18).The bacterial anaerobic or aerobic ratios is increased and propotions of bacteroids melaninogenicus and Prevotella intermedia is also increased upto 2.2-10.1%.

The study authors suggest that estradiol or progesterone can substitute for menadione[vitamin k] as essential growth factor for Prevotella intermedia.An increase in number of Prevotella intermedia is a sensitive indicator of an altered systemic hormonal situation than clinical parameters of gingivitis(19).

One study shown that the subgingival levels of bacteria associated with periodontitis does not change. The bacteria P.gingivalis and Tannerella forsythia counts are higher and is associated with bleeding on probing at week 12(20).

2) Changes in maternal immunoresponse:

The maternal immune system is suppressed during pregnancy. This response allow the fetus to survive as allograft.The immunosuppressive factors in a pregnant women can be noted by marked increase of monocytes(21) and pregnancy-specific beta 1-glycoproteins which contribute diminished lymphocyte

responsiveness to mitrogens and antigens[19]. A decrease in ratio of peripheral helper T cells to suppessor T cells [CD4/CD8] has seen throughout the pregnancy[19].

In one study, the gingival index is high T3, T4 and B cells are decreased in peripheral blood and gingival tissues during pregnancy[22]. In other studies , there is decreased PMN [neutrophil] chemotaxis, depression of cell-mediated immunity, phagocytosis and decreased T cell response with elevated ovarian hormone levels especially progesterone[19]. A decrease in absolute numbers of CD4+cells in peripheral blood during pregnancy is compared with postpartum[19].

The ovarian hormone stimulate the production of prostaglandins, PGE1 and PGE2 which are mediators of inflammatory response. With prostaglandin which act as immunosuppresent, gingival inflammation is increased when mediator level is high[19].

3) Alteration in sex hormone concentration:

Estrogen regulates cellular proliferation, differentiation and keratinization and progesterone influences the permeability of microvasculature[23,24] , alters collagen production and increases the metabolic breakdown of folate[19].

Probing depth , bleeding tendency and redness increases until 1 month postpartum. Evidence shows that the sex hormone concentration in GCF, provides a growth media for periodontal pathogens.

MANAGEMENT

1) Plaque Control:

The increasing tendency for the gingival inflammation during pregnancy should be clearly explained to the patient, so that the oral hygiene techniques is administered throughout the pregnancy. During pregnancy the scaling , polishing, root planing is performed whenever necessary. The practitioners are preferred to use non- alcohol based oral rinses.

2) Prenatal Fluoride:

The American Dental Association (ADA) doesn't recommend use of prenatal fluoride, because it's efficacy has not demonstrated. The mechanism by which prenatal flourides impart the cariostasis is unclear[19].

TREATMENT

1) Elective dental treatment:

Avoid elective dental care during the first trimester if possible and last half of third trimester. In the first trimester the fetus is highly susceptible to environmental influences. In the last half of third trimester the uterus is very sensitive to external stimuli because of the hazard of premature delivery.

The supine hypotensive syndrome may occur. In supine position particularly the inferior vena cava are compressed by uterus. This causes maternal hypotension, decreased cardiac output, and loss of consciousness. This syndrome can be reversed by turning the patient on her left side, thereby removing the pressure on the vena cava. A 6-inch soft wedge [cotton towel] should be placed on patients right side for clinical treatment.

Early in the second trimester is the safest period for doing dental care. The major oral or periodontal surgery should be postponed after delivery.

Pregnancy tumors, which are painful, interfere mastication or continue to bleed after debridement may require excision and biopsy before delivery.

2) Medications:

Ideally no drug should be given during pregnancy, especially in the first trimester[19].

The practitioner should consult reference that is Briggs and colleagues' Drugs in pregnancy and Lactation[19] and Olin's Drug facts and Comparisons[19] for information on FDA pregnancy risk factors associated with prescription drugs.

3) Breastfeeding:

There is a risk that drug can enter breast milk and is transferred to nursing infant, so this could have

adverse effects. The amount of drug excreted in breast milk is not more than 1% to 2% of maternal dose, so it is unlikely that any drugs have pharmacological significant on infant(19).

The mother should take drugs which are prescribed just after breastfeeding and then avoid nursing for 4 hours or more if possible(19) so as to decrease drug concentration in breast milk.

CONCLUSION

Periodontitis is a multifaceted disease. Prior epidemiological and experimental research has demonstrated that it can also affect various systemic illnesses, while treatment for periodontal disease results in enhanced regulation of blood sugar levels in patients with type 2 diabetes and metabolic syndrome, as well as improved kidney function linked to diabetes. Maternal periodontal disease is also associated with an elevated risk of preeclampsia and premature deliveries. Periodontitis has been associated with these medical conditions through various mechanisms and pathogenic pathways. Furthermore, numerous studies have identified a substantial correlation between periodontal disease during pregnancy and both immediate and long-lasting negative consequences for the progeny. This correlation has also been indicated in other reviews. While the exact methods by which maternal periodontal changes affect fetal development are intricate, it is reasonable to consider periodontal treatment as one of the suggested procedures for preparing for pregnancy. Obstetricians should advise women who are contemplating to conceive that it may be advantageous for the future pregnancy and the long-term health of the child to have a periodontal examination and treatment prior to conception.

Furthermore, administering periodontal treatment to expectant moms with mild to moderate periodontitis, prior to the 21st week of pregnancy, has been demonstrated to effectively prevent premature births. Pregnant women should be cognizant of the periodontal alterations linked to pregnancy, and that periodontal treatment during pregnancy is efficacious and harmless, for both the mother and the developing fetus.

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