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# Review Article

## Protocols and guidelines for management of pregnant women requiring dental treatment: A Review

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### ABSTRACT:

Pregnancy is a dynamic physiological state which is evidenced by several transient changes. These can develop as various physical signs and symptoms that can affect the patient's health, perceptions and interactions with others in the environment. Oral health care in pregnancy is often avoided and misunderstood by physicians, dentists, and patients. Unfortunately, there's still a widespread belief that visiting the dentist while pregnant can be harmful to patient and her baby. Routine dental treatment is safe during pregnancy, although some procedures or medication should be avoided in the first 3 months. This review highlights the some of the physiologic changes and the oral pathologies which are associated with pregnancy, and how these alterations can affect the dental care of the patient.

**Key words:** Pregnancy, dental treatment, dental care, oral changes in pregnancy.

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### Introduction

Pregnancy is the term used to describe the period in which a fetus develops inside a woman's womb or uterus. Pregnancy usually lasts about 40 weeks, or just over 9 months, as measured from the last menstrual period to delivery. Health care providers refer to three segments of pregnancy, called trimesters. The major events in each trimester are:

#### First trimester (week 1 to week 12)

1. The events that lead to pregnancy begin with conception, in which a sperm penetrates an egg. The fertilized egg (called a zygote) then travels through the woman's fallopian tube to the uterus, where it implants itself in the uterine wall. The zygote is made up of a cluster of cells that later form the fetus and the

placenta. The placenta connects the mother to the fetus and provides nutrients and oxygen to the fetus.

2. Between 18 and 20 weeks, the typical timing for ultrasound to look for birth defects of baby.
3. At 20 weeks, a woman may begin to feel movement.
4. At 24 weeks, footprints and fingerprints have formed and the fetus sleeps and wakes regularly.

#### Second trimester (week 13 to week 28)

According to research from the NICHD Neonatal Research Network, the survival rate for babies born at 28 weeks was 92%, although those born at this time will likely still experience serious health complications, including respiratory and neurologic problems.

#### Third trimester (week 29 to week 40)

At 32 weeks, the bones are soft and yet almost fully formed, and the eyes can open and close. Infants born before 37 weeks are considered preterm. These children are at increased risk for problems such as developmental delays, vision and hearing problems, and cerebral palsy.<sup>4</sup> Infants born between 34 and 36 weeks of pregnancy are considered to be "late preterm."

Infants born in the 37th and 38th weeks of pregnancy—previously considered term—are now considered "early term." These infants face more health risks than infants who are born at 39 weeks or later, which is now considered full term. Infants born at 39 or 40 weeks of pregnancy are considered full term. Full-term infants have better health outcomes than do infants born earlier or, in some cases, later than this period. Therefore, if there is no medical reason to deliver earlier, it is best to deliver at or after 39 weeks to give the infant's lungs, brain, and liver time to fully develop.

Infants born at 41 weeks through 41 weeks and 6 days are considered late term. Infants who are born at 42 weeks and beyond are considered post term.<sup>1,2,3,4,5,6</sup>

### **Physiological changes during pregnancy**

An increase in the secretion of the female sex hormones, oestrogen by 10 fold and progesterone by 30 fold, is important for the normal progression of a pregnancy. The increased hormonal secretion and the foetal growth induce several systemic, as well as local physiologic and physical changes in a pregnant woman. The main systemic changes occur in the cardiovascular, haematologic, respiratory, renal, gastrointestinal, endocrine, and genitourinary systems.<sup>7,8</sup> During pregnancy, women may experience systemic disorders such as:

#### **Cardiovascular System Alterations**

1. Increase in cardiac output and increase in blood volume by an average of 50%.
2. Anemia due to increased blood volume (20% of women).
3. Decrease in pulse by 10-15 beats per minute.
4. The inferior vena cava gets compressed while patient is lying in flat supine position; the uterus compresses the inferior vena cava which decreases the venous return resulting in decreased cardiac output which leads to supine hypotension syndrome.
5. Sweating, nausea and weakness are common symptoms.

#### **Gastrointestinal System Alterations**

1. Gastric emptying & intestinal transit times are delayed.
2. Heart burn/reflux is common.
3. Nausea and vomiting.

#### **Renal System Alterations**

1. Increased glomerular filtration rate and renal plasma flow by about 50%.

2. Nocturia.
3. Increased frequency in renal flow and reduced bladder capacity from uterine growth.

#### **Endocrine Alterations**

1. Estrogen, progesterone, human gonadotropin are increased.
2. Thyroxin, steroid and insulin levels are also increased.
3. Estrogen & progesterone are insulin antagonists, so increased levels of these hormones leads to insulin resistance. Thus insulin levels are elevated in pregnant patients.
4. About 45 % of women fail to produce sufficient amount of insulin to overcome this antagonist action & thus develop gestational diabetes.

#### **Hematological Alterations**

1. Increased Red Blood Cell count, increased Erythrocyte Sedimentation Rate, decrease in Hemoglobin.
2. Increased White Blood Cell count.
3. Increased circulatory catecholamine and cortisol lead to leukocytosis.
4. Increase in Coagulation factors except factor XI & XIII (anticlottting factor).
5. Pregnancy is a hypercoagulable state & increased risk for thromboembolism. The proximity of fetal and maternal circulations increases the risk of isoimmunization in a Rho-negative woman with a Rho-positive fetus.

#### **Respiratory Alterations**

1. Diaphragm rises about 4 cm.
2. Decreased residual volume.
3. Increased awareness of a desire to breathe is common—may be interpreted as dyspnea.
4. Increased estrogen in blood causes engorgement of the nasal capillaries and rhinitis in pregnant women.
5. Frequent nosebleeds & predisposition to upper respiratory infection.<sup>9</sup>

#### **Pigmentary changes**

Hyperpigmentation is most common presentation of pregnancy due to elevated serum levels of MSH, estrogen or progesterone. Estrogen increases the output of melanin by the melanocytes and effect of estrogen is augmented by progesterone, resulted from melanin deposition into epidermal and dermal macrophages. It starts from the first trimester of pregnancy, and occurs in areas that are already pigmented particularly nipples, areola, and genital areas. Freckles, nevi, and recent scars become dark and even enlarge during pregnancy. Generalized hyperpigmentation occur in people with Fitzpatrick skin type 1 or 2. Linea nigra is hyperpigmented line, found on the abdomen in pregnant women and noticed in the second trimester.

Chloasma or melasma is also known as mask of pregnancy, presented with irregular sharply demarcated brownish

pigmentation of the face mainly over centrofacial or malar region. Striae distensae (striae gravidarum) develop in up to 90% of women during the sixth and seventh month of pregnancy and are partial tears in the structures of the skin, which appear as reddish or bluish depressed streaks, usually on the abdomen but also on the breasts and thighs.<sup>10</sup>

### Hair changes

A mild to moderate hirsutism and hypertrichosis is seen during pregnancy. After delivery it usually resolves. There is an increased proportion of anagen growing hairs due to estrogen and androgen stimulation in the second half of pregnancy. After the end of pregnancy the follicles in which anagen has been prolonged rapidly enters catagen followed by telogen and increased hair shedding is evident in 6-16 weeks, called telogen effluvium, more marked in the frontal and temporal regions.<sup>10</sup>

### Oral changes in pregnancy

The storm of (chemicals produced by the body) which is caused during pregnancy causes changes in the mother's body, and the oral cavity.

The oral changes which are seen in pregnancy include gingivitis, gingival hyperplasia, pyogenic granuloma, and salivary changes. Increased facial pigmentation is also seen. Elevated levels of the circulating oestrogen, which cause an increased capillary permeability, predispose the pregnant women to gingivitis and gingival hyperplasia.

Pyogenic granulomas (pregnancy tumours) occur in about 1% to 5% of the pregnant women. Increased angiogenesis, which is caused by sex hormones, coupled with gingival irritation which is caused by local factors such as plaque, is believed to cause pyogenic granuloma.<sup>11</sup>

Pregnancy does not cause periodontal disease but it does worsen an existing condition. The increased mobility probably results from the changes in the lamina dura, the changes in the attachment apparatus, or from the underlying pathology which is unrelated to the pregnancy. It does not result from the loss of the calcium stores, which is secondary to the pregnancy. If the tooth mobility increases, this problem typically resolves postpartum. Wearing away of the enamel can easily be controlled by advising the patients to rinse their mouths completely after vomiting, with a solution that contains sodium bicarbonate. The main salivary changes in pregnancy involve its flow, composition (decrease in the sodium concentration and pH, and an increase in the potassium, protein, and the oestrogen levels) and hormone levels (higher oestrogen levels).<sup>12,13,14,15</sup>

### Pregnancy Gingivitis

- One of the most common findings during pregnancy, affecting 60% to 75% of all pregnant women.
- Characterized by erythema of the gingiva, edema, hyperplasia, and increased bleeding.
- Observed in the second or third month of pregnancy.

- These gingival inflammatory changes persist or increase during the second trimester, and then decrease in the last month of pregnancy, eventually regressing after parturition.
- The underlying mechanism for this enhanced inflammatory response during pregnancy is elevated levels of progesterone and estrogen.
- The severity of the response is directly attributed to the levels of these hormones.
- Sex hormones depress neutrophil chemotaxis and phagocytosis, as well as T-cell and antibody responses.
- Specific estrogen receptors have been identified in gingival tissues. Estrogen can increase cellular proliferation of gingival blood vessels, decreased gingival keratinization, and increased epithelial glycogen. These changes diminish the epithelial barrier function of the gingiva.
- Progesterone increases vascular membrane permeability, edema of the gingival tissues, gingival bleeding, and increased gingival crevicular fluid flow. Progesterone also reduces the fibroblast proliferation rate and alters the rate and pattern of collagen production, reducing the ability of the gingiva to repair.
- Sex hormones can also affect gingival health during pregnancy by allowing an increase in the anaerobic-to-aerobic subgingival plaque ratio, leading to a higher concentration of periodontopathic bacteria. A 55-fold increase in the level of *Prevotella intermedia* has been shown in pregnant women in comparison with nonpregnant women.
- The breakdown of folate, a requirement for maintaining healthy oral mucosa, is increased in the presence of higher levels of sex hormones. The subsequent relative folate deficiency increases the inflammatory destruction of the oral tissue by inhibiting its repair.
- Histologically there are no differences between pregnancy gingivitis and other forms, but pregnancy gingivitis is characterized by an exaggerated response to local irritants, including bacterial plaque and calculus.
- Generalized supragingival and/or subgingival periodontal therapies should be initiated in women with gingivitis to eliminate plaque buildup, as should intensive education on oral hygiene.<sup>16</sup>

### Pregnancy Tumor (Epulis Gravidarum)

- Pyogenic granuloma is a nonneoplastic mass of excess granulation tissue that occurs in response to stimuli such as hormonal factors, traumatic injury, or local irritants.
- Pyogenic granulomas that arise during pregnancy are referred to as pregnancy tumors, epulis gravidarum, or pregnancy granuloma.

3. The surge in estrogen and progesterone level in circulating blood during pregnancy exerts proliferative effect on the endothelium. Role of sex hormones in pyogenic granuloma is summarised in Table:1

Hormone	Cell and Effect	Mediators
Estrogen	Fibroblast Proliferation Macrophage Activation Endothelial-Proliferation Keratinocytes- Proliferation	- Fibroblast Growth Factor Transforming Growth Factor Beta 1 Nerve Growth Factor Vascular Endothelial Growth Factor Granulocyte Macrophage Colony Stimulation Factor
Progesterone	Acute Inflammatory Cells Suppression Chronic Inflammatory Cells – Proliferation	- ..... .....

**Table 1: Role of sex hormones in pyogenic granuloma**

4. The histologic appearance is a pyogenic granuloma observed in 0.2% to 9.6% of pregnant patients, usually during the second or third trimester.
5. Lesion occurs most frequently in an area of inflammatory gingivitis or other areas of recurrent irritation, or as a result of trauma.
6. It often grows rapidly, although it seldom becomes larger than 2 cm in diameter.
7. Poor oral hygiene is variably present, and often there are deposits of plaque and calculus on the teeth adjacent to the lesion.
8. The gingiva enlarges in a nodular fashion to give rise to the clinical mass.
9. The fully developed pregnancy epulis is a sessile or pedunculated lesion that is usually painless.
10. The color varies from purplish red to deep blue, depending on the vascularity of the lesion and the degree of venous stasis.
11. The surface of the lesion may be ulcerated and covered by yellowish exudate, and gentle manipulation of the mass easily induces hemorrhage.
12. Bone destruction is rarely observed around pregnancy granulomas.<sup>17,18,19</sup>

### Dental caries

The relationship between dental caries and pregnancy is not well defined. Changes in salivary composition in late pregnancy and during lactation may temporarily predispose to erosion as well as dental caries. Pregnant women are more prone to tooth decay due to upturn in the acidic environment of oral cavity, increased consumption of sugary diet and carelessness toward oral health. Recurrent vomiting becomes common in pregnancy that enhances acidic environment leading to progress of carious pathogens and an increased demineralization making teeth prone to caries. Untreated carious lesions increase the incidence of abscess and cellulitis.<sup>20,21,22</sup>

### Tooth erosion

Tooth erosion, another unwanted dental problem is considered to be caused by pregnancy induced vomiting. It is understood that dental erosion can be effectively controlled with the use of a solution containing sodium bicarbonate that neutralizes the acid and prevents damages. Hyperemesis gravidarum, a severe form of nausea and vomiting that occurs in 0.3% to 2% of pregnant women, can lead to loss of surface enamel (perimyolysis) primarily through acid induced erosion. It is advised to consult patient's physician and gastroenterologist to control the related medical conditions.

### Tooth mobility

Due to hormonal rush mineral changes in lamina dura and disturbance in the periodontal ligament attachment, affect mobility of teeth leading to periodontal diseases. This condition can be made reversible if given therapeutic doses of vitamin C along with removal of local gingival irritants.<sup>23</sup>

### Teratogenesis

A teratogen is defined as an agent that causes permanent alterations in the form or function of offspring upon exposure to the fetus. Drugs and maternal teratogens and possible undesired effects are listed in Table:2

### Pregnancy and Dental radiations

Current evidence suggests that 'dental radiography' is measured as harmless in child bearing women. The safety directly rests upon the type and amount of radiations to which the patients is exposed. Special precautionary measures should be guaranteed for pregnant women (e.g. thyroid collar, lead apron, and high speed films) because the risk to the growing fetus is directly connected to rise in exposure. Fetus radiation exposure over 10 rads is considered to be hazardous and may contribute to mutation, mental retardation and abnormalities of the eyes.<sup>23</sup>

<b>Drugs teratogens</b>	
Alcohol	Cranio-facial abnormalities, fetal alcoholic syndrome
Tobacco	Brain damage, cleft lip and palate
Cocaine	Placental abruption, cognitive delay
Thalidomide	Malformation of extremities of new born
Methyl mercury	Brain damage, microcephaly
ACE inhibitors	Cranio-facial abnormalities
Valproic acid	Mental retardation, neural tube effects
Tetracycline	Maternal toxicity and discoloration of tooth
Phenytoin	Hypoplastic nails, typical facies
Warfarin	Facial dysmorphism, chondrodysplasia
Benzodiazepines/ barbiturates	Cleft lip and palate deformities
<b>Maternal teratogens</b>	
Toxoplasmosis	Spinal abnormalities, brain dysfunction
Chlamydia	Conjunctivitis, pneumonia
Hepatitis B	Liver damage
Parvovirus	Anemia
Chicken pox	Eyes damage

**Table 2:** Drugs and maternal teratogens and possible undesired effects**Drugs aimed pregnancy**

Drugs are absorbed easily during a pregnancy, as the serum concentration for drug binding is lower than that in the nonpregnant state. There is also a higher volume of drug distribution, a lower maximum plasma concentration, a lower plasma half-life, higher lipid solubility, and a higher clearance of the drugs. All these factors allow an easy transfer of an unbound drug across the placenta, thus exposing the foetus to the drugs. Certain drugs are known to cause miscarriage, teratogenicity, and low birth weight of the foetus. Therefore, caution should be exercised when drugs are prescribed to pregnant women.<sup>24</sup> The FDA has categorized teratogenic drugs which cause birth defects and provided the definitive guidelines for prescribing drugs during pregnancy.(Table:3)

Category	Evidence
A	Controlled human studies indicate no apparent risk to the fetus. The possibility of risk to the fetus is remote.
B	Animal studies do not indicate fetal risk. Well-controlled human studies have failed to demonstrate a risk.
C	Animal studies show an adverse effect on the fetus but there are no controlled studies in humans. The benefits from use of such drugs may be acceptable.
D	Evidence of human risk, but in certain circumstances the use of such a drug may be acceptable in pregnant women despite its potential risk.
X	Risk of use in pregnant women clearly outweighs possible benefits.

**Table 3: Pregnancy Risk Categories for Pharmacologic Agents.**

Understanding the safety aspects of commonly used and prescribed medications minimizes adverse outcomes are summarized in Table:4.<sup>25</sup>

Drugs	Use in Pregnancy	Use in Lactation	Remarks
<b>Antibiotics</b>			
Amoxicillin Metronidazole Erythromycin Penicillin Cephalosporins	yes	yes	Fetal ototoxicity with gentamycin. Discoloration of teeth with tetracycline. Maternal toxicity/ fetal death with chloramphenicol
Gentamycin Clindamycin	yes	yes	
Tetracycline Chloramphenicol	No	No	
<b>Analgesics</b>			
Acetaminophen Morphine Meperidine	yes	yes	Postpartum hemorrhage Associated with aspirin. Respiratory depression with morphine.
Oxycodone Hydrocodone Propoxyphene Pentazocine	With caution	With caution	
Aspirin Ibuprofen Naproxen	Not in 3rd trimester	No	
<b>Antifungals</b>			
Clotrimazole Nystatin	yes	yes	Fetal toxicity with ketoconazole.
Fluconazole Ketoconazole	With caution	With caution	
<b>Local Anesthetics</b>			
Lidocaine Prilocaine Etidocaine	yes	yes	Fetal bradycardia with Mepivacaine & Bupivacaine
Mepivacaine Bupivacaine	With caution	yes	
<b>Corticosteroids</b>			
Prednisolone	yes	yes	
<b>Sedative/Hypnotic</b>			
Nitrous oxide	Not in 1st trimester ++ Because of neonatal respiratory depression	yes	Spontaneous abortions with Nitrous oxide. Cleft lip/palate with Benzodiazepines
Barbiturate Benzodiazepines	No	No	

**Table 4: Common Drugs used in Dental Therapies with its Limitations and Remarks**

### Patient comfort during dental management

To preserve and promote oral health; scaling, polishing and root planning are recommended at any stage of pregnancy. However, it is strictly advised to perform general dentistry procedures (i.e. routine restorations, endodontic therapy and elective extractions) after fetal organogenesis has taken place (i.e. in second and third trimester). Extensive and prolonged dental procedures should be postponed till after delivery.

When performing chair side procedures it is of great importance to make sure that the pregnant patients are seated in the correct and safe to avoid any complication such as supine hypotensive syndrome in the dental chair. If a pregnant lady is seated in the supine position, there are great chances of progression to medium hypoxemia and an abnormal arterial oxygen gradient.

Similarly there is a risk of compression of the vena cava and aorta due to the gravid uterus which may lead to postural hypotension.

Patient should be sit in the right position; i.e. either seated with her right hip elevated 10–12 cm so that the pressure on the vena cava is reduced or by placing the patient in a 5–15% tilt on her left side. In case the hypotension is not relieved, the patient should be asked to acquire a full left lateral position. These modifications are however recommended during the third trimester.<sup>23</sup>

### Oral health care during pregnancy

#### Educating women about oral health care

Educating women about how their own oral health can affect their child's is a powerful tool. A survey of pregnant Minnesota women with public and private insurance showed a preference for infant-specific educational information over education on topics that concerned both mother and infant. In addition, 68% of the women preferred receiving oral health information by mail, compared with 34.4% who favored face-to-face delivery. How information is presented in person is critical. Behavioral approaches that determine readiness for change are more appropriate than simply telling a patient what to do. When selecting health education materials for pregnant women, characteristics of the dental practice and the community it serves are important. Having materials that are appropriate to the literacy level, language, and culture of the patient is critical to reinforcing the verbal message.

#### Recommended oral hygiene during pregnancy

Pregnant women should also be advised to adhere to the following oral hygiene regimen at home:

1. Brush teeth with fluoridated toothpaste twice daily, and clean between teeth daily with floss or an interdental cleaner.
2. Rinse daily with an over-the-counter fluoridated, alcohol-free mouth rinse. After eating, chew xylitol-containing gum or use other products, such as mints,

with xylitol to help reduce bacteria that can cause decay.

3. After vomiting, rinse the mouth with 1 teaspoon of baking soda dissolved in a cup of water to stop acid from attacking teeth.
4. Eat healthy foods and minimize sugar consumption.<sup>16</sup>

### Conclusion

Dental health (also called oral health) is the health of gums and teeth. It's an important part of overall health. Dental care doesn't stop just because of pregnancy. In fact, it's even more important to keep oral health in check: when pregnant, patient at higher risk of developing tooth decay, gum disease and other issues. Leaving tooth decay, gum disease and other oral health problems untreated during pregnancy can be harmful. Dental health of pregnant women has a big impact on overall health, which means it can have a big influence on her baby too.

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