

Review Article: What to Expect When Expecting ?

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Citation of this Article: Dr. Megha Chopra, Dr. Surabhi Duggal, Dr. Ankita Pal, Dr. Polysmita Ojah, Dr. Shailesh Jain, “Review Article: What to Expect When Expecting...?”, IJDSIR- May - 2020, Vol. – 3, Issue -3, P. No. 501 – 508.

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Type of Publication: Review Article

Conflicts of Interest: Nil

Abstract

Oral and dental health problems in pregnancy are of special importance. Pregnant women believe that dental treatment during pregnancy affects pregnancy negatively, and they usually delay the treatment. Physiologic changes occur in the cardiovascular, gastrointestinal, haematologic, genitourinary, endocrine and orofacial system. The changes that occur are a result increasing maternal and fetal requirements for growth of the fetus and the preparation of mother for delivery. These changes collectively may pose various challenges in providing dental care to the pregnant patient. Dental treatment during pregnancy includes the safe and elective use of

radiographs, plaque removal, treatment of periodontitis, local anesthesia and restorations. Medical prescription of any kind should be performed after consultation with the general practitioner or obstetrician.

This article presents some of the physiologic changes and oral conditions that are associated with pregnancy and the effect of these on the dental treatment of the patient in accordance with the current recommendations and guidelines.

Keywords: Pregnancy, FDA category, Oral Care, Teratology

Introduction

Pregnancy is a dynamic physiological state which is evidenced by several transient changes. It causes profound and remarkable changes in all organ systems. Old wives tales have linked pregnancy and poor dental health. For example: “You lose a tooth for each child”; calcium for the baby is not “borrowed” or “stolen” from the mother’s bones and teeth. However, recent research has shown that pregnancy does cause changes in the mouth that may put the oral health at risk. Most pregnant patients are generally healthy and need not be denied dental treatment solely because they are pregnant. The storm of hormones which is induced during pregnancy causes changes in the mother’s body and the oral cavity is no exception. An increase in the secretion of the female sex hormones, estrogen by tenfold and progesterone by 30 fold, is important for the normal progression of a pregnancy. The increased hormonal secretion and foetal growth induce changes in the cardiovascular, respiratory and gastrointestinal systems, as well as changes in the oral cavity and increased susceptibility to oral infections^{1, 2}. Maintaining the expectant mother’s oral health is important both for her own health and for that of the foetus. The present paper discusses the alteration in the physiology during pregnancy, points out the safety of drugs used in the dental treatment, common dental procedures and recommendations for maintaining oral health.³

Physiologic Changes Associated With Pregnancy

Cardiovascular System

The pregnancy-induced changes in the cardiovascular system develop primarily to meet the increased metabolic demands of the mother and fetus. Despite the increased workload of the heart during gestation and labor, the healthy woman has no impairment of cardiac reserve. Blood Volume increases progressively from 6-8 weeks

gestation (pregnancy) and reaches a maximum at approximately 32-34 weeks with little change thereafter (Fig.1). The increase in plasma volume (40-50%) is relatively greater than that of red cell mass (20-30%) resulting in hemodilution and a decrease in haemoglobin concentration. Intake of supplemental iron and folic acid is necessary to restore hemoglobin levels to normal (12 g/dl). In addition, as a result of vasomotor instability, pregnant patients are susceptible to postural hypotension.⁴ Consequently, changes in dental chair position from reclining to upright should be performed very slowly. There is an increase in the size of uterus, which causes pressure on the vena cava and aorta resulting in decrease in cardiac output, venous return and utero placental blood flow. Autocaval compression, which occurs specifically in supine position, leads to supine hypotensive syndrome, which is characterized by symptoms such and signs such as lightheadedness, weakness, sweating, restlessness, tinnitus, pallor, decrease in blood pressure, syncope and in severe cases unconsciousness and convulsions. This condition can be corrected by placing a pillow to elevate the right hip and buttock by about 15°. This lifts the uterus off the vena cava and re-establishes aortocaval patency.¹

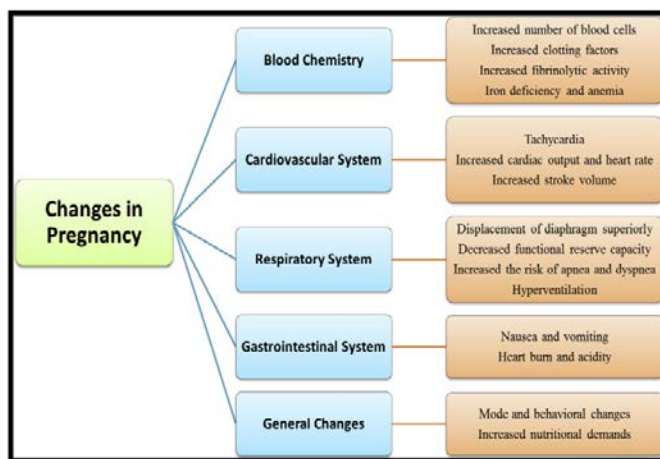


Fig 1: Physiological changes observed in various body systems during pregnancy

Respiratory System

The respiratory system undergoes changes at all anatomic levels in pregnant women. Diaphragm is displaced upwards by 4 cm. Rib cage expands to accommodate the outward expansion of the lungs and uterus. There is an increased estrogen production causing the capillaries in the mucosa of the nasopharynx to become engorged, which results in edema, nasal congestion and predisposition to epistaxis.² There is a difficulty in breathing at night which often results in mouth breathing and snoring. If xerostomia subsequently develops, patients lose the protection against dental decay afforded by saliva. In high caries index patient, early caries control should be done to minimize the deleterious effects. Other symptoms include shortness of breath as the fundus expands upwards and displaces the diaphragm and persistent cough. Patients who are experiencing these problems should maintain an upright posture and avoid excessive activity.^{5,6}

Gastrointestinal System

Nausea and vomiting are very common complaints in pregnancy, affecting 50–90% of pregnancies. This might be an adaptive mechanism of pregnancy, aiming at preventing pregnant women from consuming potentially teratogenic substances such as strong-tasting fruits and vegetables. The exact underlying mechanism is not clear but pregnancy-associated hormones such as human chorionic gonadotropin (HCG), estrogen and progesterone could to be involved in the etiology. The combined effects of hormonal and mechanical changes in the gastrointestinal system and greater sensitivity of the gag reflex also increases the risk of gastric acid reflux. As pregnancy progresses, mechanical changes in the alimentary tract also occur, caused by the growing uterus. The stomach is increasingly displaced upwards, leading to an altered axis and increased intra-gastric pressure. The oesophageal sphincter tone is also decreased and these

factors may predispose to symptoms of reflux, as well as nausea and vomiting (Fig.1). The displacement of stomach superiorly as the uterus increases in size, increases the intragastric pressure. Consequently, the chair position should be kept as upright as possible during dental treatment to relieve abdominal pressure and keep the patient comfortable.^{7,8}

Ptyalism (excessive secretion of saliva) is a complication of pregnancy. It frequently affects women in the early stages of pregnancy. This is especially likely if you are also suffering from frequent or severe nausea and vomiting. The symptoms can be eased by taking some measures such as, trying to eat smaller but more frequent meals, brushing your teeth and using mouthwash several times a day, chewing sugarless gum or sucking on hard sweets and/or taking frequent, small sips of water, reducing the consumption of complex carbohydrates.⁹

Dental And Facial Alterations During Pregnancy

Some striking pathological changes have been made in the oral cavity in women during the pregnancy. Most commonly seen oral changes during pregnancy are pyogenic granuloma and gingival hyperplasia, and salivary changes (Fig.2). Increased facial pigmentation is also seen. Facial changes as “mask of pregnancy”, appearing as bilateral brown patches in the mid-face begin during the first trimester and are seen in up to 73% of pregnant women. Melasma usually resolves after parturition.²

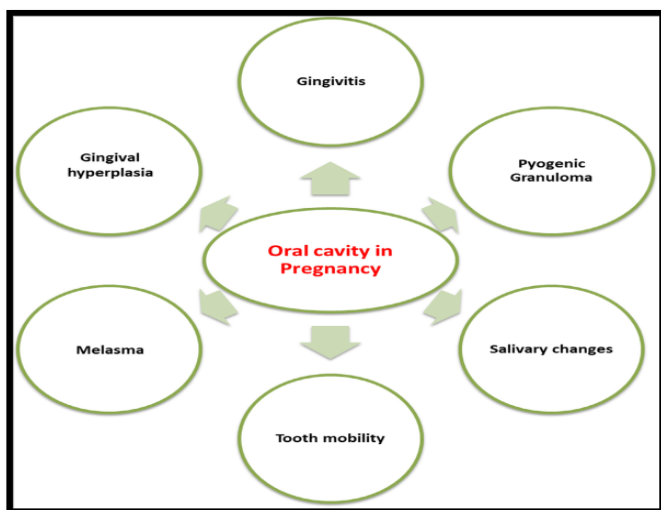


Fig 2: Oral Changes in Pregnancy

Elevated levels of estrogen cause an increased capillary permeability, predisposing the pregnant women to gingivitis and gingival hyperplasia. In some patients, the condition will progress locally to become a “pyogenic granuloma” or “pregnancy tumor” which is most commonly seen on the labial surface of the papilla (Fig.3). If the lesion is small it responds well to local debridement, chlorhexidine rinses along with improved hygiene measures, large lesions need deep excision. Another sign of periodontal disease is tooth mobility caused by mineral changes in the lamina dura and disturbances in the periodontal ligament attachments. The deficiency of vitamin C also contributes to this problem. The treatment for this involves removal of local gingival irritants, therapeutic doses of vitamin C and delivery.⁷ Maternal oral health has significant implications for birth outcomes and infant oral health. Maternal periodontal disease, that is, a chronic infection of the gingiva and the supporting structures, has been associated with preterm birth, development of preeclampsia, and delivery of a small for-gestational age infant. Periodontal disease in pregnancy is associated with gram-negative anaerobic infection of these structures. The mechanisms underlying this destructive process involves both direct tissue damage resulting from

plaque bacterial products, and indirect damage through bacterial induction of the host inflammatory and immune responses.¹⁰

Pregnant women are more prone to tooth decay due to an upturn in the acidic environment of oral cavity, increased consumption of sugary diet and carelessness towards oral health.¹¹



Fig 3: Pyogenic Granuloma

High-Risk Patients

Consultation from the obstetrician is usually not required before initiating the dental treatment for normal, healthy, pregnant patients. However, consultation is often required for patients at risk for pregnancy complications such as gestational diabetes, pregnancy induced hypertension, threat of spontaneous abortion or history of premature labor. There is an increase in thyroxine, steroids and insulin levels. About 45% of pregnant women are unable to produce sufficient amounts of insulin to overcome the antagonistic action of estrogen and progesterone, and as a result develop gestational diabetes. A good medical history and a questionnaire often helps in knowing about the course and nature of pregnancy. Careful recording of the vital signs are required before any invasive procedure, including administration of a local anesthetic.⁷

Pharmacotherapy In Pregnancy

Certain physiological changes during pregnancy have implications for drug therapy, and may affect any of the four basic kinetic processes of absorption, distribution, metabolism and elimination or excretion. Therefore, the following aspects could alter the way in which drug molecules are handled by the body, i.e. alter their pharmacokinetic profile. Such dynamics contribute to an easy access of boundless drugs through placenta, therefore compromising the health of the foetus.¹² These drugs may further have teratogenic effects leading to miscarriage. Therefore, during this phase, the use of drugs is not recommended, especially during the first 13 weeks i.e. the first trimester. To avoid the potential adverse effects of drugs Food and Drug Administration (FDA), USA has categorized drugs based on their risk factors during pregnancy.¹³ (Table 1).

Category	Definition
A	Controlled studies in women fail to demonstrate a risk to the fetus in the first trimester (and there is no evidence of risk in later trimesters), and the possibility of fetal harm appears remote.
B	Either animal reproduction studies have not demonstrated a fetal risk but there are no controlled studies in pregnant women or animal reproduction studies have shown an adverse effect (other than a decrease in fertility) that was not confirmed in controlled studies in women in the first trimester (and there is no evidence of risk in later trimesters).
C	Either studies in animals have revealed adverse effects on the fetus (teratogenic, embryocidal, or other) and there are no controlled studies in women or studies in women and animals are not available. Drugs should be given only if the potential benefit justifies the potential risk to the fetus.
D	There is positive evidence of human fetal risk, but the benefits of use in pregnant women may be acceptable despite the risk (for example, if the drug is needed in a life-threatening situation or for a serious disease for which safer drugs cannot be used or are ineffective).
X	Studies in animals or human beings have demonstrated fetal abnormalities or there is evidence of fetal risk based on human experience, or both, and the risk of the use of the drug in pregnant women clearly outweighs any possible benefit. The drug is contraindicated in women who are or may become pregnant.

Table 1: FDA risk categories of drugs used during pregnancy

Analgesics

Analgesics are used for short span to treat and minimize the pain. Acetaminophen is the safest analgesic used in pregnancy, categorized in group B by the FDA classification. The various strengths and preparations available have a potential for liver toxicity. The recommended dosage in pregnant women should not exceed 4 grams per day. Ibuprofen sorted in category B classification can be used in first and second trimester,

changes to category D in the third trimester as it has an association lower amniotic fluid, premature heart valve closure and limit the vaginal opening during labor. Dentist should recommend acetaminophen with codeine or oxycodone but prolonged use may result is neonatal depression¹⁴ (Table 2).

Antibiotics

Antibiotics prescribed mostly fall in the category B drugs, with the exception of tetracycline and its derivatives that are category D drugs (effect the developing teeth and bones). Ciprofloxacin, broad spectrum antibiotic, commonly prescribed in periodontal diseases associated with actinobacillus, has been restricted because of arthropathy and adverse effects on cartilage development. Metronidazole classified in group B is prohibited to be used in first trimester as the drug has teratogenic effects.¹⁵

Local anesthetics

Local anesthetics are relatively safe when administered properly in the correct amounts. Anesthetics such as lidocaine and prilocaine are categorized in class B, whereas mepivacaine, epinephrine in class C category. Lidocaine is the most commonly used local anesthetic. The proportion of free lidocaine is relatively high, so the amount of lidocaine transferred from the mother to the fetus is also relatively high. As a result, lidocaine has a relatively high fetal-to-maternal ratio. Vasoconstrictors are added to lidocaine to reduce the absorption of the local anesthetic, reduce toxicity, and increase the analgesic effects. Epinephrine is the choice of vasoconstrictor added with lidocaine contained in a dental cartridge. Vasoconstriction induced by epinephrine delays the absorption of local anesthetics by the mother, allowing the absorption of lidocaine to gradually occur in the maternal systemic circulation, while also allowing blood levels of lidocaine to gradually increase. The local anesthetic is transferred to the fetus slowly, and its margin of safety is

also increased. Considering how local anesthetics have small direct effects on the fetus even at submaximal doses, lidocaine may be considered relatively safe for use in pregnant women^{16,17} (Table 2).

Oral and Dental Management Guidelines During Pregnancy

During pregnancy, the dentist's role is to prevent oral health problems, to inform, and to provide dental care to the pregnant woman throughout the pregnancy period at any time. The changes associated with mother and fetus, following the implantation of a fertilized egg on the uterine wall, undergoes various stages of development as gestational age increases. Organs develop in the early pregnancy period, and the formed organs and tissues undergo volumetric growth in the middle and late stages of pregnancy. Therefore, an identical drug may have different effects on the fetus and the mother depending on gestational age.

To conclude, pregnant women should receive adequate information from her obstetrician so as to visit the dentist early in pregnancy. She should look after her oral health and consequently, the oral health of her newborn baby.¹⁸

First trimester

In this phase, the patients should be scheduled to assess their current dental health. During the first trimester, organogenesis takes place and has a risk of exposure to teratogens. It is not recommended that the procedures may be done at this time. The concern about doing the dental procedures at this time is two folds. The developing fetus is at greatest risk which is posed by teratogens during organogenesis, and the other, it is known that as many as one in five pregnancies undergo spontaneous abortions.^{19, 20}

The current recommendations are

1. Educate the patients about maternal oral changes taking place.

2. Instructing the patient to maintain oral hygiene and maintain plaque control.
3. Periodontal prophylaxis and emergency treatments only can be performed in this period.
4. Routine radiographs should be avoided.

Second trimester

By the second trimester, the organogenesis is complete, and the risk to the fetus is low. The mother by this time has adjusted to the pregnancy, and the fetus has not grown to a potentially uncomfortable size, that would make it difficult for the mother. The positioning of the mother is important in this phase. In this trimester, procedures such as emergent dento-alveolar and other elective procedures are safe to perform.²⁰

The current recommendations are

1. It is safe to perform oral prophylaxis.
2. Active oral diseases can be controlled.
3. Elective dental care such as root canals, extractions and restorations.
4. Radiographs can be done when they are needed.

Third trimester

Short dental procedures can be performed as there is no significant risk to the fetus. In this trimester, aortocaval compression in the supine position is even more likely to occur because of the enlarged uterus. By placing a cushion on one side of the back to support the lateral position, symptoms, including hypotension and light-headedness, that may occur when lying in the supine position can be alleviated.²²

The current recommendations are

1. Oral prophylaxis and plaque control
2. Scaling, polishing and curettage may be performed
3. Elective dental procedures should be avoided during the second half of the third trimester.
4. Routine radiographs should be avoided. They can be used selectively when needed.

Radiographs, pregnancy and foetus

Depending on the amount of radiation and the stages of pregnancy, a damage to fetal cells may result in miscarriages, birth defects or mental impairment. The embryo and the fetus are more radiosensitive than the adult counterpart, so adverse effects can result from the exposure. Special precautions should be taken for pregnant women (e.g. thyroid collar, lead apron and speed films). The maximal safe radiation to the fetus is 10 rad. The risk from the X-rays (diagnostic) is very low. The experts however, recommend delaying exposure to radiations until birth.^{7, 23}

Teratology

A teratogen is defined as an agent that causes permanent alterations in the form or function of offspring upon exposure to the fetus. Teratogens include irradiation, chemicals (drugs), and infectious agents. Potential teratogenic medications include alcohol, tobacco, cocaine, thalidomide, methyl mercury, anticonvulsant medications, warfarin compounds, ACE inhibitors, certain antimicrobials and retinoids. The period that is considered to be most prone to teratogens is the embryonic period (first trimester).¹³

Conclusion

Good oral health of a pregnant woman is a prerequisite to her health and that of the fetus. Pregnancy should not be considered as an absolute reason to defer required dental care. Pregnant women should be instructed about the importance of maintaining good oral hygiene, the expected orofacial changes and routine dental visits. Dentists must be aware of the current health maintenance recommendations and this should be brought into consideration in referral and consultation with the patient’s gynecologist or physician. Drug therapies should be limited and carried out carefully. Radiography and elective surgeries should be avoided. Female patients of

childbearing age or expecting females should be screened for caries and oral diseases for timely management.

Drugs	Use in Pregnancy	Use in Lactation	Remarks
Antibiotics			
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	
Analgesics			
Acetaminophen Morphine Meperidine	Yes	Yes	Postpartum hemorrhage with aspirin. Respiratory depression with morphine.
Oxycodone Pentazocine	With caution	With caution	
Aspirin Ibuprofen Naproxen	Not in 3 rd trimester	No	
Local Anesthetics			
Lidocaine Prilocaine Etidocaine	Yes	Yes	Fetal bradycardia with Mepivacaine & Bupivacaine
Mepivacaine Bupivacaine	With caution	Yes	
Corticosteroids			
Prednisolone	Yes	Yes	

Table 2: Medications in Pregnancy

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