

# Dental Considerations in Pregnancy-A Critical Review on the Oral Care

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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 patients health, perceptions and interactions with others in the environment. The patients may not always understand the relevance of the adaptations of their bodies to the health of their foetuses. A gestational woman requires various levels of support throughout this time, such as medical monitoring or intervention, preventive care and physical and emotional assistance.

The dental management of pregnant patients requires special attention. Dentists, for example, may delay certain elective proce-

dures so that they coincide with the periods of pregnancy which are devoted to maturation versus organogenesis. At other times, the dental care professionals need to alter their normal pharmacological armamentarium to address the patients' needs versus the foetal demands. Applying the basics of preventive dentistry at the primary level will broaden the scope of the prenatal care. Dentists should encourage all the patients of the childbearing ages to seek oral health counseling and examinations as soon as they learn that they are pregnant.

This article has reviewed 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 considerations, FDA category, Oral care, Drug safety, Teratogenicity

## INTRODUCTION

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, oestrogen by 10 fold and progesterone by 30 fold, is important for the normal progression of a pregnancy [1]. 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. The local physical changes occur in different parts of the body, which include the oral cavity. These collective changes may pose various challenges in providing dental care for pregnant patients. Therefore, understanding the physiologic changes of the body and the effects of the dental radiation and the medications which are used in dentistry for the pregnant women, lactating mothers and the foetuses, is essential for the management of the pregnant and nursing mothers [2].

## PHYSIOLOGY

During pregnancy, women may experience systemic disorders such as respiratory alterations: dyspnoea (in 60-70% of all the pregnant women), hyperventilation, snoring, an upper ribcage breathing pattern and chest widening and rhinitis; haemodynamic alterations: elevation of the coagulation factors V, VII, VIII, X and XII, and reduction of the factors XI and XIII, with an increased fibrinolytic activity to compensate for the increased clotting tendency; gastrointestinal alterations: an increased intragastric pressure and a reduction in the lower oesophageal sphincter tone which is secondary to inhibition of the production of the motilin peptide hormone due to a rise in progesterone concentrations which are

observed in this period – which give rise to heartburn (acidity) in 30-70% of all the pregnant women and an almost two-fold prolongation of the gastric emptying time as compared to those in non-pregnant women [3,4]. Nausea and vomiting are experienced by 66% of all the pregnant women, starting approximately 5 weeks after the last menstrual period, and reaching a maximum prevalence after 8-12 weeks. In this context, the morning dental appointments are to be avoided by pregnant women with an increased vomiting tendency due to pregnancy; renal alterations: an increased renal perfusion, particularly during the second half of the pregnancy, which gives rise to an increased drug excretion in the urine. Drug dosing adjustments are thus commonly required in such patients. Endocrine alterations are also observed in pregnant women: gestational diabetes is observed in 45% of all the pregnant women. On the other hand, the decubitus hypotension syndrome or the vena cava syndrome is observed in the final stage of the pregnancy in approximately 8% of all the cases, as a result of a difficulty in the venous return to the heart, which is caused by compression of the inferior vena cava by the gravid uterus. This condition manifests as a sudden drop in the blood pressure, with nausea, dizziness and fainting, when the patient is in the horizontal position [5]. In order to prevent this problem, pregnant women should keep their right hips slightly raised (10-12 cm) or inclined to the left, while they are seated on the dental chair. At the oral level, there may be an increased risk of caries, periodontal disease and pyogenic granulomas [6].

## ORAL AND FACIAL CHANGES

The storm of hormones which is induced during pregnancy causes changes in the mother's body, and the oral cavity is no exception. Pregnancy gingivitis is a well-recognized entity. The oral changes which are seen in pregnancy include gingivitis, gin-

gival 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 [7]. Pregnancy gingivitis usually affects the marginal and the interdental papilla and it is related to the preexisting gingivitis. Good oral hygiene can help in preventing or reducing the severity of the hormone mediated inflammatory oral changes.

Pregnancy does not cause periodontal disease but it does worsen an existing condition [8]. 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 [9]. It occurs mainly on the labial aspect of the interdental papilla. It can happen at any time during a pregnancy, but it is reported to be most common in the first pregnancies, during the first and the second trimesters and it may regress after the child's birth. Although it is uncommon, it is known that the tooth mobility may increase during a late pregnancy. 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 [10]. Morning sickness is a common problem which is encountered by women, early in their pregnancies. The increased gonadotropins in the first trimester, are associated with nausea and vomiting. Increased levels of progesterone, by a central-acting mechanism, slow the gastric emptying. The gastric acids which are present in the emesis, erode the enamel on the inner surface of the teeth, most commonly the front teeth. This is a concern only in the cases with frequent vomiting, for example, in bulimics and in patients with hyperemesis gravidum [11]. Erosion of the enamel can easily be controlled by advising the patients to rinse their mouths thoroughly after vomiting, with a solution that contains sodium bicarbonate. Sodium bicarbonate neutralizes the acids and it prevents the damage which is caused by the residue which remains on the teeth. Erosion of the teeth which are on the lingual and palatal surfaces of the incisors was mentioned in a case report, but as per our knowledge, there is no clinical study which is available to support this finding [12, 13].

It has been said that the mother "loses a tooth for every baby". There is no medical literature to support this statement. The loss of a tooth by a pregnant woman most likely reflects a continuation of her current state of dental health. It is possible that pregnancy gingivitis may sufficiently irritate the gums to make brushing and the routine dental care uncomfortable, and this may hasten the tooth decay. This tooth decay does not occur in most of the patients [14]. The main salivary changes in pregnancy involve its flow, composition, pH and hormone levels. Cross sectional studies have shown a reduced, whole stimulated salivary flow rate in pregnant women, but longitudinal studies have shown that there was no change in the whole stimulated salivary flow rate. The changes in the composition of the saliva include a decrease in the sodium concentration and pH, and an increase in the potassium, protein, and the oestrogen levels. Checking the salivary oestrogen level has been suggested as a screening test to detect the risk potential for a preterm labour [15]. The salivary oestrogen levels are higher in the women who are destined to have preterm

babies than in women who have normal term deliveries. The salivary oestrogen increases the proliferation and desquamation of the oral mucosa and also an increase in the subgingival crevicular fluid levels. The desquamating cells provide a suitable environment for bacterial growth by providing nutrition, thus predisposing the pregnant women to dental caries [16].

There is an increase in the facial pigmentation, which is called 'melasma' or the "mask of pregnancy", which appears as bilateral brown patches in the mid-face. These facial changes begin during the first trimester and are seen in up to 73% of the pregnant women. The aetiology of this condition is unknown, but it is believed to be related to an increase in the serum levels of oestrogen and progesterone. The melasma usually resolves after parturition [17]. The recent studies have suggested a link between periodontal disease and preterm low birth weight. As per an investigation which was done on 400 women who had gingivitis and periodontal disease, a positive correlation was found between periodontal disease and low birth weight. The periodontal disease seemed to be independent of a good oral hygiene and a periodontal treatment. Although a positive correlation between periodontal diseases and low birth weight has been reported, a causal explanation has not been found in several animal and human case – control studies [18].

## DENTAL MANAGEMENT GUIDELINES DURING PREGNANCY

### For the first trimester (1-12 weeks)

During the first trimester, it is recommended that the patients be scheduled to assess their current dental health, to inform them of the changes that they should expect during their pregnancies, and to discuss on how to avoid maternal dental problems that may arise from these changes. It is not recommended that the procedures may be done at this time. The concern about doing procedures during the first trimester is twofold. First, the developing child is at a greatest risk which is posed by teratogens during organogenesis, and second, during the first trimester, it is known that as many as one in five pregnancies undergo spontaneous abortions. Dental procedures which are performed near the time of a spontaneous abortion may be assumed to be the cause, which lead to concerns for both the patient and the practitioner, as to whether this could have been avoided [16, 19].

### The current recommendations are

1. To educate the patients about the maternal oral changes which occur during pregnancy.
2. To emphasize strict oral hygiene instructions and thereby, plaque control.
3. To limit the dental treatment to a periodontal prophylaxis and emergency treatments only.
4. To avoid routine radiographs. They should be used selectively and only whenever they are needed.

### For the second trimester (13-24 weeks)

By the second trimester, the organogenesis is complete, and the risk to the foetus is low. The mother has also had time to adjust to her pregnancy, and the foetus has not grown to a potentially uncomfortable size that would make it difficult for the mother to remain still for long periods. The positioning of the pregnant patients is important, especially during the third trimester. As the uterus expands with the growing foetus and the placenta,

it comes to lie directly over the inferior vena cava, the femoral vessels, and the aorta. If the mother is positioned supine for the procedures, the weight of the gravid uterus could apply enough pressure to impede a blood flow through these major vessels and to cause a condition which is called supine hypotension. In this condition, the blood pressure drops secondary to the impeded blood flow, which causes an asyncope or a near-syncope episode. This situation is easily remedied by a proper positioning of the patient on her left side and elevating the head of the chair, to avoid compression of the major blood vessels. The dental practitioner should not hesitate to consult the patient's obstetrician, should any question arise about the safety of a procedure, particularly if there are special circumstances which are associated with the pregnancy [19, 20].

#### The current recommendations are:

1. Oral hygiene, instructions and plaque control.
2. Scaling, polishing and curettage may be performed if they are necessary.
3. The control of active oral diseases, if any.
4. An elective dental care is safe
5. Avoid routine radiographs. Use selectively and when they are needed.

#### For the third trimester (25-40 weeks)

The foetal growth continues and the focus of the concern now, is the risk to the upcoming birth process and the safety and comfort of the pregnant woman (e.g the chair positioning and the avoidance of drugs that affect the bleeding time). It is safe to perform a routine dental treatment in the early part of the 3rd trimester, but from the middle of the 3rd trimester, routine dental treatments are avoided.

#### The current recommendations are:

1. Oral hygiene, instructions and plaque control.
2. Scaling, polishing and curettage may be performed if they are necessary.
3. Avoid an elective dental care during the 2nd half of the third trimester.
4. Avoid routine radiographs. Use selectively and when they are needed.

#### Radiographs, pregnancy and the foetus

X-rays are a type of electromagnetic radiation that have the ability to ionize the material through which it passes. Ionizing living matter results in a damage to the cells or the DNA. Depending on the amount of radiation and the stages of pregnancy, a damage to the foetal cells may result in miscarriages, birth defects or mental impairment. However the dental radiation exposure of the foetus is negligible [21]. The embryo and the foetus, being much more radiosensitive than the adult counterpart, are susceptible to adverse effects which result from the radiography exposure. During the first 2 weeks after the conception, the patient may have no knowledge of being pregnant, thus making it prudent for the physician to inquire about the last menstrual period before obtaining a radiographic image. Because a general questioning does not give a definitive diagnosis about the pregnancy status, a lead shielding should be used for all the women who are in their childbearing years. The frequency of mutations and adverse effects is directly related to the dose, and the exposure is augmented when higher

than necessary radiation exposures are used to compensate for the inadequate processing quality. The exposure can also be increased, depending on the view which is taken. The radiations from the maxillary anterior views may pass through the abdominal area, with penetration from the primary beam, as well as from the scatter /radiation. Depending on the head position, a similar exposure could also occur with the posterior views [19-21]. Several precautions can be taken to avoid the foetal exposure when radiographs need to be taken. Using a lead shield over the patient's abdomen, using a properly collimated beam, and using a high-speed film, can reduce the foetal exposure. The teratogenicity of the radiation depends on the foetal age and the dose of the radiation. The greatest risk to the foetus for teratogenicity and death, is during the first 10 days after the conception. The most critical period of the foetal development is between 4-18 weeks after the conception. The National Commission for Radiation Protective (NCRP) recommends that the cumulative foetal exposure to radiation should not exceed more than 0.20 Gy, which can cause microcephaly and mental retardation [22].

CT is quite useful for localizing deep-seated infections and it is the modality of choice for viewing the lateral pharyngeal infections. The definition of the internal anatomy is superior to the plain film radiographs, and the bony changes are seen quite well. The CT doses are higher than those of plain radiography, but they are lower than the multiple slices for polytomography. The CT doses depend on a variety of factors, which include the scanner type, the scanning technique, the exposure settings, the number of slices, and the slice thicknesses. The skin doses from CT can range from 0.4 to 4.7 rads, with most of the machines delivering in the 2.5 – rad range.22 The combined axial and coronal images require from 3.5 to 5.0 rads. However, the gonadal dose has been shown to be less for a total scan, and it ranges from 0.1 to 0.3mrads. These doses to the foetus can be kept to a minimum by carefully using the shielding devices. Moreover, if the diagnostic irradiation provides crucial information for the maintenance of the maternal and foetal viabilities, the benefits outweigh the risks of the exposure [22]. MRI may be an alternative to CT when the foetal irradiation is considered. MRI has a greater soft tissue sensitivity and contrast as compared to CT, and thus it may help even more in the difficult cases of infections. MRI uses a magnetic field-assisted nuclear alignment in creating images and it provides no ionizing radiation. However, the risks of the foetal exposure to the strong magnetic fields are not completely known [22] [Table/Fig-1].

## TERATOGENESIS

A teratogen is any agent, that when exposed to the foetus, causes permanent alterations in the function or form of the offspring. There are many proven and probably even more unproven teratogens to the foetus, which include the following: alcohol, aminopterin, androgens, angiotensin converting enzyme inhibitors, busulfan, carbamazepine, chlorobiphenyls, coumarin, cyclophosphamide, danazol, diethylstilbesterol, etretinate, isotretinoin, lithium, methimazole, pencillamine, phenytoin, tetracycline, trimethadione and valproic acid [23]. An important concept of teratology, is the idea that the organ or structures which are formed during the time of exposure, are at a risk for damage.

#### For practical purposes, a pregnancy can be divided into three periods:

1. Ovum - from fertilization to implantation.

2. Embryonic period- from the 2<sup>nd</sup> through the 8<sup>th</sup> week.
3. Foetal period - after the eighth week until term.

The embryonic period is the most important for teratogenesis, because this is the time of organogenesis. A teratogenic exposure after the development of the vulnerable structures usually does not result in alterations. There are a few exceptions, which include tetracycline, which if taken during the second half of the pregnancy, causes a yellow-brown discolouration of the deciduous teeth [Table/Fig-2] [16, 24].

Source of Radiation	Dose (mrad)
Skull	<0.01
Cervical spine	<0.01
Thoracic spine	0.6
Chest	0.06
Upper GI	48
KUV	263
IVP	814
Pelvis	194
Computed tomography (Gonad dose for a total scan)	0.1
Daily (cosmic) background radiation	0.01

Abbreviations: GI-gastrointestinal, KUB-kidney, ureter and bladder, IVP- Intravenous Pyelogram.

**[Table/Fig-1]:** Comparison between various radiologic exposures and Estimated embryonic or fetal dose

Category	Risk factors
A	Controlled studies showed no risk to the fetus. This group is limited to multivitamins and prenatal vitamins.
B	Either animal studies have shown no fetal risk, but there are no controlled human studies during pregnancy, or animal studies have shown adverse effect that was not confirmed in controlled studies during the first trimester. penicillins are in this family.
C	There are no adequate studies or animal studies have shown adverse effects, but controlled studies in women are not available. Potential benefit must be greater than the risk to the fetus if these medications are used.
D	Evidence of fetal risk is proven, but potential benefit must be thought to outweigh the risks
x	Proven fetal risks clearly outweighs any potential benefits

**[Table/Fig-2]:** FDA categories: Teratogenic risks of drugs

### The Medications which are Considered Safe During 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 [25]. 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 a pregnant women. Most of the drugs are excreted in breast milk, thus exposing the newborn to the drugs. The neonatal toxicity depends on the chemical properties, dose, frequency, duration of exposure to the drugs, and the amount of milk which is consumed [26] [Table/Fig-3] [16, 25, 26], [Table/Fig-4] [27, 28].

Drugs	FDA category	Use in pregnancy	Use in nursing	Possible side effects
<b>Analgesics</b>				
Acetaminophen	B	Yes	Yes	Not reported
Aspirin	C	Not in 3 <sup>rd</sup> trimester	No	Postpartum haemorrhage
Ibuprofen	B	Not in 3 <sup>rd</sup> trimester	Yes	Delayed labour
aproxen	B/D**	Not in 2 <sup>nd</sup> ½ of pregnancy	Yes	Delayed labour
Codeine	C	With caution	Yes	Multiple birth defects
Oxycodone	B	With caution	With Caution	NRD
Hydrocodone	C/D*	With caution	With Caution	NRD
Morphine	B	Yes	Yes	Respiratory depression
Propoxyphene	C	With caution	Yes	Not reported
Meperidine	B	Yes	Yes	Not reported
Pentazocine	C	With caution	With Caution	Not reported
<b>Antibiotics</b>				
Amoxicillin	B	Yes	Yes	Not reported
Metronidazole	B	Yes	Yes	Not reported
Erythromycin	B	Yes	Yes	Not reported
Penicillin v	B	Yes	Yes	Not reported
Cephalosporins	B	Yes	Yes	Not reported
Gentamycin	C	Yes	Yes	Fetal ototoxicity
Clindamycin	B	Yes	Yes	Not reported
Tetracycline	D	No	No	Maternal toxicity/
<b>Fetal death</b>				
Chloramphenicol	X	No	No	Not reported
Chlorhexidine	B	No data	No data	Fetal toxicity
Antifungals				
Nystatin	B	Yes	Yes	Not reported
Clotrimazole	B	Yes	Yes	Not reported
Fluconazole	C	With Caution	With Caution	Not reported
Ketoconazole	C	With Caution	No	Fetal Bradycardia
<b>Local Anesthetics</b>				
Lidocaine	B	Yes	Yes	Not reported
Mepivacaine	C	With Caution	Yes	Fetal Bradycardia
Prilocaine	B	Yes	Yes	Not reported
Bupivacanine	C	With Caution	Yes	Fetal Bradycardia
Etidocaine	B	Yes	Yes	Not reported
Corticosteroids				
Prednisolone	B	Yes	Yes	Not reported
<b>Sedative/Hypnotics</b>				
Nitrous oxide	Not assigned	Not in 1 <sup>st</sup> trimester (**)	Yes	Spontaneous abortions
Barbiturate	D	Avoid	No	NRD
Benzodiazepines	D	No	No	Cleft lip/palate

\* D- indicates caution, if used for prolonged period of time or high doses.

\*\* NRD- Neonatal Respiratory Depression.

**[Table/Fig-3]:** Medication considered safe during pregnancy

Drug	Effect
Alcohol	Fetal alcohol syndrome
Androgens	Virilization; multiple congenital defects
Antineoplastic agents, (e.g. methotrexate)	Multiple congenital defects
Carbimazole	Aplasia cutis
Corticosteroids (high dosages)	Cleft palate
Cyproterone	Feminization of male fetus
Diethylstilbestrol	Vaginal adenosis and adenocarcinoma in daughters
Distigmine	Increases uterine tone
Ergotamine	Increase uterine tone
Misoprostol	Increase uterine tone
Fibrinolytic drugs (e.g. streptokinase)	Placental separation
Tetracyclines	Yellow discoloration of teeth, inhibition of bone growth
Valproate	Neural tube defects
Vitamin A analogues (etretinate etc.)	Congenital defects
Warfarin	Multiple congenital defects
Drugs with a high risk of causing abnormalities (known teratogens) or of inducing abortion.	

**[Table/Fig-4]:** Adverse effects of drugs on the fetus during the later stages of pregnancy

## CONCLUSION

Pregnancy is a unique period with various physiologic changes that support the formation and maturation of a new life. Every gestational women should be encouraged to seek medical and dental care during pregnancy, as a failure in treating the developing problems affects the health of both the mother and the unborn child. The dental care professionals must gain a basic understanding of the underlying physiological changes of pregnancy, the influences which are related to the use of medications during gestation, and how these may interact with the delivery of dental care. This understanding aids the development of the treatment plan and the delivery of the necessary medical, nutritional and dental care, as well as it prepares the professionals for counseling their pregnant patients.

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