

Perinatal oral health: focus on the mother

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ABSTRACT

In this paper we focus on the perinatal period, that is the time from the beginning of pregnancy to two months after birth.

Indication for oral care providers are supplied about pregnancy-related oral conditions as well as recommendations about healthy approaches to diet and oral care to expecting mothers, which should be established since infancy and childhood, with the aim of preventing tooth decay and negative effects on general health.

Introduction

The definition of “perinatal period” may vary in different settings, depending on the country, on the scientific report, public health services. In this paper, perinatal period means the time from the beginning of pregnancy to two months after birth.

The link between poor oral health and pregnancy dates back to the origin of the old wives’ tale “gain a child, lose a tooth”. The evidence from scientific studies has changed what this link was thought to be, however, oral health problems continue to affect pregnant women. This means we are still lacking public knowledge.

An alteration of the immune system occurs during pregnancy due to changes and increases in sexual hormones. There is an inhibition of T cell activity (Taylor et al., 2012), reduction in chemotaxis and phagocytosis of neutrophils, alteration in lymphocyte response and decrease in antibody production.

Regarding oral health, estrogen and progesterone receptors in the gingiva would explain, among other factors, the increased gingival response to plaque during pregnancy. Furthermore, the high progesterone levels affect bacterial composition promoting the development of *Prevotella Intermedia*, one of periodontal disease-causing bacteria. Indeed, the host inflammatory and immune responses play a major role in periodontal disease [González et al., 2017].

If pregnancy can affect oral health, oral health can also effect pregnancy.

Research continues to show

correlations between periodontal disease and adverse outcomes in pregnancy including pre-term deliveries, underweight babies, and preeclampsia. How exactly periodontal disease influences pregnancy outcomes is still unknown, but different hypotheses have been put forward [Varadan et al., 2015]. The first hypothesis is based on the spread of oral bacteria through the systemic circulation [Wellinghausen et al., 2001] to the amniotic fluid crossing the placenta and causing chorioamniotic infections. Analysis of the amniotic fluid shows the presence of periodontal pathogens like *Eikenella*, *F. nucleatum*, and *P. gingivalis* that would cause an inflammatory uterine response which induces pre-term labour.

A case report of a stillbirth caused by *F. nucleatum* from the mother’s mouth highlights the fact that an oral periodontal pathogen can—through the bloodstream—colonise the placenta and cause foetal complications [Han et al., 2010].

The second proposed theory is related to the production of cytokines (PGE-2, TNF- α , IL-6, IL-1 β) secreted due to periodontal inflammation; the inflammatory process and the mediators are responsible for pre-term birth. Labour, in fact, is induced by the contraction of uterine smooth muscles, where PGE-2 plays an important role.

The third hypothesis regards the synergy between immune and inflammatory response. This increases the risk of pre-term birth. The polymorphism of the gene coding

KEYWORDS Breastfeeding; Oral health and pregnancy; Perinatal period.

for pro-inflammatory cytokines like TNF- α , IL-1 β , IL-6, and the resulting hyper-inflammatory reaction, may have a consequence like pre-term delivery. It should be underscored that in this case, genetic predisposition plays an important role.

The mothers' oral health during and around pregnancy is also correlated with her child's future oral health. It is well known that *Streptococcus Mutans* is one of the main pathogenic microorganisms involved in dental decay. When the mother has poor oral hygiene, the concentration of *Streptococcus Mutans* is higher. In these cases, the bacteria could be transmitted from mother to child by using the same cutlery or the pacifier in contact with the mother's saliva.

Mothers' bacteria in children's mouths increase the likelihood of developing tooth decay in infants, called Early Childhood Caries -ECC.

Having good oral hygiene during pregnancy certainly helps to reduce the chance of transmitting the *Streptococcus Mutans*. Determining these high-risk mothers transferring cariogenic bacteria to their children increase the opportunities for preventive intervention [Perinatal and Infant Oral Health Care, 2017].

Pregnancy is also an ideal time for behavioural treatment, as women are more receptive to positive health-related changes in anticipation of the impact on themselves as well as the baby. Finally, many uninsured women gain health insurance coverage under programmes like Medicaid in the US when they become pregnant. All these reasons emphasise the unique needs and opportunities for oral health intervention during pregnancy [Astha et al., 2013].

Recommendation for oral care providers

Pregnancy is not a reason to defer dental care or treatment. It is to be noted that oral health is the key to the overall health and well-being; it is essential for dental professionals to provide pregnant women with appropriate and timely oral healthcare, including oral health education. Moreover, ignoring dental problems could be more dangerous for the baby and the mother than any possible risks that might be related to dental treatment during pregnancy. In case of a pregnant woman, the oral

health provider should collect her medical history and assess risk factors, including smoking habit.

The dental hygienist should look for plaque accumulation, and the presence of gingival inflammatory status (bleeding on probing). After assessment of the periodontal status specific measures should be implemented, if needed.

Healthy status

Training in plaque removal practices and motivation in periodontal self-assessment are keys to oral health education, especially in healthy pregnant women. The increase in vascularity, the higher risk of bleeding and gingival enlargement make it highly important that mums-to-be are aware of the periodontal events that could happen when pregnant.

During the later stages of pregnancy, women should be given an oral re-evaluation.

Gingivitis

As we have seen, gingivitis is one of the most frequent oral disease in pregnancy affecting about 35–100% of pregnant women. The risk is higher during the second and the third trimesters.

Following healthcare advice and undergoing professional oral hygiene intervention to remove dental biofilm and calculus from tooth surfaces are crucial. All preventive, diagnostic and therapeutic oral procedures are not just safe throughout the pregnancy, but are also effective in promoting and maintaining oral health. Dental professionals should re-evaluate the efficacy of such professional interventions. Clinical changes during pregnancy are reversible and pregnancy gingivitis does not lead to a future chronic disease.

Periodontitis

Additional professional intervention should aim at reducing the subgingival biofilm and calculus by means of standard non-surgical periodontal therapy. This should be preferably done during the second trimester.

If possible, extensive traumatic interventions (periodontal surgery) should be avoided during pregnancy.

Pregnancy epulis

Occasionally, pregnant women will develop a localised swelling on the gum, known as a pregnancy epulis

or pregnancy granuloma. Normally, epulis appears on the frontal part of the maxilla during the third trimester, but it can be found on the tongue, palate and cheek's mucosa. This condition occurs in about 5% of women and can be caused by greater neo-angiogenesis due to a higher hormonal concentration or to a stronger inflammatory response to bacteria or trauma.

In the case of pregnancy epulis, surgical measures should be postponed until after delivery; however, plaque removal demonstration and professional plaque removal should be done as soon as possible, even during pregnancy, and then re-evaluated post-partum.

Pregnancy chloasma

"Chloasma" or "mask of pregnancy" is a hypermelanosis of sun-exposed areas occurring during pregnancy, which affect 50–70% of pregnant women. It arises as symmetric darkened patches on the face; the most common locations are the cheeks, upper lip, chin and forehead. The exact mechanism by which pregnancy affects the process of melanogenesis is unknown, but it could be that estrogen and progesterone stimulate the production of melanin. Generally spontaneous regression occurs after the baby's birth. In any case, the duration of the treatment should be as short as possible and be aimed at preventing, eliminating or reducing any complication that may also occur later in pregnancy.

Drugs and medications

Regarding drugs and medications generally used in dentistry, like anaesthetics, antibiotics or pain-relieving agents, the safety is linked to different factors, such as drug class, type of medication, dosage, duration of the therapy and phase of stage of pregnancy. Nowadays, during pregnancy or breastfeeding, higher drug concentrations get to the baby; however, there is no clear evidence that all low-risk medications used in pregnancy (Table 1) are equally safe; it is possible that lipid-soluble drugs can be secreted in the mother's milk.

The attending gynecologist should always be consulted for drugs and medications to be prescribed to pregnant women.

GESTATIONAL AGE	RADIOGRAPHS	ANALGESICS (with FDA Category Ratings*)	LOCAL ANAESTHETICS (with FDA Category Ratings*)	RELATIVE ANALGESIA with O2/N2O	ANTIBIOTICS (with FDA Category Ratings*)
	Radiographs with thyroid collar and abdominal apron are highly beneficial and could be taken during pregnancy with no additional fetal or maternal risk when compared to the risk of not providing care	Paracetamol (B) Paracetamol + Codeine (C) Codeine (C) Meperidine (B) Morphine (B) Aspirin (C) (for short durations; avoid in the 1st and 3rd trimesters; avoid if breastfeeding) Ibuprofen (B) or Naproxen (B) (for short durations; avoid in the 1st and 3rd trimesters; do not use for >48-72 hours; compatible with breastfeeding)	Lidocaine with epinephrine (2%) (B) No restriction in pregnancy Mepivacaine (3%) (C) Attention: only to be used when benefits outweigh the possible fetal risks. Articaine (3%) (C) Attention: only to be used when benefits outweigh the possible fetal risks. Avoid if breastfeeding)	Nitrous Oxide can be used in base line when anesthetics are inadequate. Pregnant women require lower concentrations of N2O2 for the relative analgesia	Amoxicillin (B) (avoid clavulanic acid) Cephalosporins (B) Clindamycin (B) Erythromycin (no estolate) (B) Quinolones (C) (Avoid during pregnancy and lactation due to toxicity to developing cartilage in animal studies) Clarithromycin (C) (Alternative antibiotics are recommended because number of cases of pregnancy exposure is too small to conclude no risk)
FIRST TRIMESTER (1-13 w)	It is advisable to wait until the second trimester for performing elective dentistry treatment, due to the risk of miscarriages				AVOID: Tetracycline (D) Metronidazole (B) Erythromycin estolate (B)
SECOND TRIMESTER (13-27 w)					AVOID: Tetracycline (D) Erythromycin estolate (B)
THIRD TRIMESTER (28-40 w)	Do not prescribe NSAIDs.				AVOID: Tetracycline (D) Sulphonamides (C) Erythromycin estolate (B)
BREASTFEEDING PERIOD	The risk involved in drugs administration is present when the baby is breastfed only, especially during the first two months or in preterm newborns. When the baby is older than 2 months, the toxicological risk has no longer clinical relevance.				

*FDA Category Ratings: A = Controlled studies show no risk; adequate, well-controlled studies in pregnant women failed to demonstrate risk to fetus. B = No evidence of risk in humans; either animal studies show risk but human findings do not or, if no adequate human studies have been done, animal findings are negative. C = Human studies lacking and animal studies are either positive for fetal risk or lacking as well. However, potential benefits may justify the potential risk. D = Positive evidence of risk; investigational or post-marketing data show risk to fetus. Nevertheless, potential benefits may outweigh risks, such as some anticonvulsive medications.

TABLE 1 Drugs and dental treatments acceptable and unacceptable during pregnancy (Italian Ministry of Health, 2014).

Nutrition

Nutrition affects women’s health, pregnancy and babies’ nourishment from the moment of conception and it also might influence the future growth of the newborn. Ideal conditions are the mother being normal-weight (BMI

18.5–24.9) at the beginning of the gestation and maintains her weight for the first three months. The last six months, the mums’ weight could increase of up to 11.5 to 16.0 kg. Important steps to a healthy pregnancy include eating a balanced diet, enjoying regular physical

activity, taking vitamins and mineral supplements if recommended by a physician, and avoiding alcohol, tobacco and other harmful substances. A balanced eating plan with a variety of food includes the following.

- Fruits and vegetables (without added sugars or salt—fruits

naturally contain sugars!).

- Whole grains.
- Dairy (Better low-fat or fat-free dairy foods).
- Lean proteins (lean beef, skinless poultry and fish. Protein choices should be varied and include eggs, beans, peas and legumes).
- Healthy fats (from food like avocados, nuts and seeds as well as vegetable oils).

In addition to maintaining a healthy diet, mums-to-be should resist the urge to snack constantly. While it is normal for pregnant women to have the desire to eat more, frequent snacking can be a possible cause of tooth decay. Recommended foods that are nutritious for both the mum and the baby are raw fruits and vegetables, yogurt, or cheese. The dental professional should make sure the patients is following the physician's advice regarding her diet.

Patients should pay attention to "micronutrients", which means vitamins and minerals, that during pregnancy do not provide substantial energy and this can lead to nutritional imbalance. Attention should be paid to the following.

- Folic acid: this important vitamin reduces the risk of birth defects that affect the spinal cord. Natural food sources of folate include legumes, green leafy vegetables and citrus fruits.
- Iron: Maternal iron deficiency is the most common nutritional deficiency during pregnancy.
- Calcium: During pregnancy, calcium is needed for the healthy development of the baby's teeth, bones, heart, nerves and muscles.

Especially in the last trimester, it is suggested to have a light snack after dinner, distributing a full day's supply of energy in six smaller meals in order to reduce the discomfort after main meals.

Breastfeeding and baby formula

According to the WHO, exclusive breastfeeding for 6 months is the optimal way of feeding infants. Thereafter infants should receive complementary foods with continued breastfeeding up to 2 years of age or beyond.

Breast milk promotes sensory and cognitive development and protects the infant against infectious

and chronic diseases. Exclusive breastfeeding reduces infant mortality due to common childhood illnesses such as diarrhoea or pneumonia and helps for a quicker recovery during illness.

Moreover, nursing mums may lower their risk of developing breast and ovarian cancer.

Regarding oral health, some recent studies reported that breastfeeding for the first 6 months reduces the risk of developing malocclusions such as open bites, crossbites and overbites, unlike those who were breastfed for a shorter period or not at all [Peres et al., 2015; Borrie 2018].

It is important for the oral care provider to inform mums of the risk of cavities from the moment the first tooth appears, since breast milk, just like formula, contains sugar. One liter of maternal milk contains 70 gr of lactose, consisting in glucose and galactose, sugars that increase the risk of caries.

Parents should regularly clean their baby's mouth every night starting at birth in order to remove residual milk and to help the baby learn how to brush and be accustomed to brushing when he/she grows up. Mums and dads can use a clean, moist gauze pad.

A recent research from various countries, shows that prolonged breastfeeding increases the risk of developing early dental caries. In fact, if breastfeeding on demand, especially during night, is not followed by correct oral hygiene, multiple dental cavities can occur. This oral disease is known as Early Childhood Caries (ECC) and might cause difficulties in sleeping, eating or speaking and can be an obstacle to children's growth and development. Studies have reported that children who suffer from cavitated dentin caries have been found to have lower body weight and height, compared with caries-free subjects [Li et al., 2015].

Preventive interventions for dental caries should be established as early as possible because breastfeeding is beneficial for the children's health [Peres et al., 2016].

Parents need to know that they have to brush their children's teeth twice a day as soon as their first tooth emerges. The amount of fluoride toothpaste to be used should be no more than the size of a grain of rice when the baby has no teeth; then it is

suggested to increase the amount of toothpaste to the size of a pea when teeth erupt.

Although breast milk is preferred, some mothers can't breastfeed their babies for several reasons like a low breast milk supply, use of medications which are not compatible with breastfeeding (chemotherapy drugs, antiretroviral medications, radioactive iodine or some sedatives), infectious diseases or addiction to substances.

A Chilean analysis [Brahm et al., 2017] claims that the use of baby formulas and bottles can increase the risk of oral diseases, such as mouth breathing, malocclusion, alteration of bite, and tooth decay. In addition, the intestinal microbiota, oxygenation, and thermoregulation of infants are negatively affected by their use. Also an Italian paper published in 2014 [Gianni et al., 2014] states that formula-fed infants show different body composition developments during the first 4 months of life, compared to breastfed infants, with higher fat-free mass content.

Recent research [Tan et al., 2016] demonstrates that the use of sucrose and glucose, which is sweeter than lactose (the sugar present in breast milk), in infant formulas emphasises the importance of new research on this topic due to the importance of this early period on growth and future obesity and metabolic risk [Paglia et al., 2019].

It is clear that oral health care must be more intense in those families, and the dental provider must underline the importance of daily oral care.

When tastes arise

The ability to taste starts during foetal life. The preference for sweet flavor is already developed in the fetus and the newborn is able to recognise sweet flavors early.

If the mum-to-be eats a varied diet during pregnancy, the baby will receive a varied taste stimulation which promotes a healthy curiosity about food. Then, when the baby is born, new flavours arrive by breastfeeding, which changes taste in relation to what the mother eats.

Parents who eat healthily are doing good for themselves and, also, they can be a good example for their children.

It should be underscored that consuming sugary drinks or food

	Tips for parents
0–6 months	Choose an anatomic silicone pacifier
	Never dip pacifiers in sugar or honey
	Use the pacifier as little as possible
	Wipe the baby’s gum with a clean, moist gauze pad or washcloth after every breastfeeding
	Take care of oral hygiene in order to not transmit bacteria through saliva to the baby
6–24 months-baby’s teeth eruption--	Start weaning after the 6th month
	Promote healthy nutrition for the baby, no candies or snacks!
	Discourage soft drink use (including fruit juices, sugared chamomiles or teas)
	Don’t give baby-bottles with milk or sugared drinks, especially before night
	Be aware that both mother’s milk and baby formulas contain sugar. Attention to the risk of caries!
	When the baby is 12 months, encourage them to drink from a cup and not from a baby bottle
	Start brushing the teeth as soon as the first tooth appears
	Brush the baby’s teeth after every meal or breastfeed
	Use a toothpaste with 500 ppm of fluoride
	Choose an anatomic rubber pacifier
	Discourage thumb sucking
	Parents use their own cutlery and the babies theirs
	When the first tooth appears, go to a paediatric dentist!

TABLE 2 Oral care tips for parents.

often during pregnancy increases the innate sweet taste preference in the baby, whereas, after weaning, giving a wide variety of fruits and vegetables can make them appealing to the child.

The recommendation is to avoid salt in the first years and to restrict its use when the children is older; in fact, a large amount of salt is linked to cardiovascular disease like hypertension.

Conclusion

according to the Italian Good Clinical Practice Recommendations for oral health in the perinatal period, prevention and treatment of gingivitis, periodontitis and dental cavities before, during and after gestation are the best way to protect and optimise oral health in mothers, newborns and their community.

The main measures (Table 2) that physicians, dentists, dental hygienists and also gynecologists and obstetricians need to suggest, promote and adopt are the following.

- Provide education and dental referrals for oral health care.

- Oral health education.
- Teaching and reinforcing information on oral hygiene at home.
- Nutrition education to prevent cavities in newborns; support a woman’s decision to breastfeed and have ready access to patient education resources. Address the topic by integrating it into regular patient education, such as saying “After breast or bottle feeding, be sure to wipe your baby’s gums” .
- Periodic oral checkups.
- Periodic professional oral hygiene examination by dental hygienists performing a comprehensive periodontal examination, which includes a periodontal probing depth recording.
- Newborns checkups of oral status before the 24th months of life by paediatricians or, better, by paediatric dentists, providing the mothers health education or anticipatory guidance about oral health practices for children in order to prevent early childhood caries.

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