

# Pregnancy

## Oral Health in Pregnancy

### Common oral problems in pregnancy

#### Caries

There is much debate about whether the risk for dental caries is increased in pregnancy. Some changes in caries risk behaviour may occur, but they would need to be substantial and maintained over a long period to have an impact on dental caries rates. Behaviours that may occur and may impact on caries risk are craving for and eating sugary foods and frequent ingestion or use of carbonated drinks to alleviate nausea.

#### Gingivitis

Clinical studies have shown that the accumulation of hormones in gingival tissues (Vitek et al. 1982; Christoffers et al. 2003) affects gingival vasculature, the local immune system and its reaction to dental plaque. Immunological changes during pregnancy are associated with decreased neutrophil chemotaxis and phagocytosis, altered lymphocyte response and depressed antibody production (Zeeman et al. 2001). The accumulation of dental plaque may result in gingivitis, characteristically beginning in the 2nd month of pregnancy and increasing up to the 8th month, after which it declines (Løe 1965).

The prevalence of gingivitis during pregnancy varies among studies from 30% to 100% (Leiff et al. 2004). The effect of these changes on the periodontal tissues results in increased gingival swelling. Increased bleeding on probing may be seen in clinical examinations during pregnancy (Laine 2002).

#### Periodontitis

Periodontitis is a multifactorial disease, with microbial dental plaque being the initiator (Kinane et al. 2008). The initiation and progress of periodontal disease depend on the immunological response of the individual to the infection.

The most important risk factors for development of periodontal disease are cigarette smoking (Do et al. 2008), cannabis smoking (Thomson et al. 2008), age, stress (Genco et al. 1999; Ng et al. 2006), diabetes mellitus (Taylor et al. 1996) and high plaque levels (Pihlstrom et al. 2005).

Pregnancy, the period from conception to birth, is characterised by profound hormonal changes. Fluctuation in hormones, particularly female steroid hormones (oestrogens and progesterone), influences many tissues in the body. The tissues supporting the teeth, including the periodontium and especially the gingiva, are also affected. There are several reasons why dental professionals should focus on oral health in pregnant women.

The United States Surgeon General suggested (US Department of Health and Human Services 2000) that oral health treatment during pregnancy was an important strategy to:

- maintain good oral health
- prevent the development of inflammatory diseases (gingivitis and periodontitis) and thus minimise any possible link to pre-term low birthweight infants, pre-eclampsia and gestational diabetes
- decrease oral bacteria colonisation, thus minimising transmission of bacteria to the child and decreasing the prevalence of Early Childhood Caries.

### Oral physiological changes in pregnancy

Folk wisdom has linked oral health with pregnancy for years, perpetuated in the proverb 'a tooth for a child' and known otherwise as 'maternal depletion syndrome'. This idea reflected the belief that pregnancy causes the loss of calcium from the teeth and bones. While this myth of weakening of teeth and subsequent dental caries has been put to rest, there is new evidence about the influence of pregnancy on dental health.

Pregnancy is not infrequently associated with nausea and vomiting (usually during the 4th to 12th weeks). Adaptation to the physiological changes of pregnancy can include dietary changes such as increased craving for particular foods and a higher frequency of snacks between meals. To maintain good oral health during pregnancy, dental care and special home management is required.

### References

- Abbott P 2000. Are dental radiographs safe? Australian Dental Journal 45:208–13.
- Agueda A, Echeverría A & Manau C 2008. Association between periodontitis in pregnancy and preterm or low birth weight: Review of the literature. Medicina Oral, Patología Oral y Cirugía Bucal 13:E609–15.
- Australian Research Centre for Population Oral Health (ARCPHO) 2006. The use of fluorides in Australia: guidelines. Australian Dental Journal 51:195–9.
- Bishara SE, Warren JJ, Broffitt B & Levy SM 2006. Changes in the prevalence of non-nutritive sucking patterns in the first 8 years of life. American Journal of Orthodontics and Dentofacial Orthopedics 130:31–6.
- Bogges KA 2008. Maternal oral health in pregnancy. Obstetrics and Gynecology 111:976–86.
- Bogges KA, Lief S, Murtha AP, Moss K, Beck J & Offenbacher S 2003. Maternal periodontal disease is associated with an increased risk for preeclampsia. Obstetrics and Gynecology 101:227–31.
- Christoffers AB, Kreisler M & Willershausen B 2003. Effect of estradiol and progesterone on the proliferation of human gingival fibroblasts. European Journal of Medical Research 8:535–42.
- Contreras A, Herrera JA, Soto JE, Arce RM, Jaramillo A & Bolero JE 2006. Periodontitis is associated with preeclampsia in pregnant women. Journal of Periodontology 77:182–8.
- Daniels JL, Rowland AS, Longnecker MP, Crawford P & Golding J, ALSPAC Study Team 2007. Maternal dental history, child's birth outcome and early cognitive development. Paediatric and Perinatal Epidemiology 21:448–57.
- Dasanayake AP, Chhun N, Tanner AC, Craig RG, Lee MJ, Moore AF & Norman RG 2008. Periodontal pathogens and gestational diabetes mellitus. Journal of Dental Research 87(4):328–33.
- da Silva CM, Ramos MM, Carrara CF & Dalben Gda S 2008. Oral characteristics of newborns. Journal of Dentistry for Children (Chicago, Ill.) 75:4–6. Review.
- Do LG, Slade GD, Roberts-Thomson KF & Sanders AE 2008. Smoking-attributable periodontal disease in the Australian adult population. Journal of Clinical Periodontology 35(5):398–404.
- Duncan K, McNamara C, Ireland AJ & Sandy JR 2008. Sucking habits in childhood and the effects on the primary dentition: findings of the Avon longitudinal Study of Pregnancy and Childhood. International Journal of Paediatric Dentistry 18:178–88.
- Ercan E, Dulgergil CT, Yildirim I & Dalli M 2007. Prevention of maternal bacterial transmission on children's dental caries development: 4-year results of a pilot study in a rural-child population. Archives of Oral Biology 52:48–52.
- Genco RJ, Ho AW, Grossi SG, Dunford RG & Tedesco LA 1999. Relationship of stress, distress and inadequate coping behaviors to periodontal disease. Journal of Periodontology 70(7):711–23.
- Griffin SO, Regnier E, Griffin PH & Huntley V 2007. Effectiveness of fluoride in preventing caries in adults. Journal of Dental Research 86:410–15.
- Harris R, Nicoll AD, Adair PM & Pine CM 2004. Risk factors for dental caries in young children: a systematic review of the literature. Community Dental Health 21(1 Suppl):71–85. Review.
- Holbrook WP, Oskarsdottir A, Fridjonsson T, Einarsson H, Hauksson A & Geirsson RT 2004. No link between low-grade periodontal disease and preterm birth: a pilot study in a healthy Caucasian population. Acta Odontologica Scandinavica 62:177–9.
- Jared H, Bogges KA, Moss K, Bose C, Aulen R, Beck J & Offenbacher S 2009. Fetal exposure to oral pathogens and subsequent risk for neonatal intensive care admission. Journal of Periodontology 80:878–83.
- Jeffcoat MK, Geurs NC, Reddy MS, Goldenberg RL & Hauth JC 2001. Current evidence regarding periodontal disease as a risk factor in preterm birth. Annals of Periodontology 6:183–8. Review.
- Jeffcoat MK, Hauth JC, Geurs NC, Reddy MS, Cliver SP, Hodgkins PM & Goldenberg RL 2003. Periodontal disease and preterm birth: results of a pilot intervention study. Journal of Periodontology 74:1214–8.
- Khader YS, Jibreal M, Al-Omiri M & Amarin Z 2006. Lack of association between periodontal parameters and preeclampsia. Journal of Periodontology 77:1661–7.
- Kinane D & Bouchard P, Group E of European Workshop on Periodontology 2008. Periodontal diseases and health: Consensus Report of the Sixth European Workshop on Periodontology. Journal of Clinical Periodontology 35(8 Suppl):333–7.
- Laine MA 2002. Effect of pregnancy on periodontal and dental health. Acta Odontologica Scandinavica 60:257–64. Review.
- Law V, Seow WK & Townsend G 2007. Factors influencing oral colonization of mutans streptococci in young children. Australian Dental Journal 52:93–100.
- Lief S, Bogges KA, Murtha AP, Jared H, Madianos PN, Moss K, Beck J & Offenbacher S 2004. The oral conditions and pregnancy study: periodontal status of a cohort of pregnant women. Journal of Periodontology 75:116–26.
- Løe H 1965. Periodontal changes in pregnancy. Journal of Periodontology 36:209–17.
- Lopez NJ, Da Silva I, Ipinza J & Gutierrez J 2002. Higher risk of preterm birth and low birth weight in women with periodontal disease. Journal of Dental Research 81:58–63.
- Louik C, Hernandez-Diaz S, Werler MM & Mitchell AA 2006. Nausea and vomiting in pregnancy: maternal characteristics and risk factors. Paediatric and Perinatal Epidemiology 20:270–8.
- Michalowicz BS, DiAngelis AJ, Novak MJ, Buchanan W et al. 2008. Examining the safety of dental treatment in pregnant women. Journal of the American Dental Association 139:685–95.
- Michalowicz BS, Hodges JS, DiAngelis AJ, Lupo VR, Novak MJ, Ferguson JE et al. 2006. Treatment of periodontal disease and the risk of preterm birth. The New England Journal of Medicine 16:1885–94.
- Moore S, Ide M, Coward PY, Randhawa M, Borkowska E, Bayliss R et al. 2004. A prospective study to investigate the relationship between periodontal disease and adverse pregnancy outcome. British Dental Journal 197:251–8.
- Moss KL, Beck JD & Offenbacher S 2005. Clinical risk factors associated with incidence and progression of periodontal conditions in pregnant women. Journal of Clinical Periodontology 32:492–8.
- Moss KL, Ruvo AT, Offenbacher S, Beck JD, Mauriello SM & White RP Jr. 2007. Third molars and progression of periodontal pathology during pregnancy. Journal of Oral and Maxillofacial Surgery 65:1065–9.
- National Health and Medical Research Council (NHMRC) 1987. Code of practice for radiation protection in dentistry. Canberra: Australian Government Publishing Service.
- National Health and Medical Research Council (NHMRC) 1999. Dental amalgam and mercury in dentistry. Canberra: Australian Government Publishing Service.
- Ng SK & Keung Leung W 2006. A community study on the relationship between stress, coping, affective dispositions and periodontal attachment loss. Community Dentistry and Oral Epidemiology 34:252–66.
- Offenbacher S & Beck J 2007. Has periodontal treatment failed to reduce adverse pregnancy outcomes? The answer may be premature. Journal of Periodontology 78:195–7.
- Offenbacher S, Bogges K, Murtha AP, Jared HL, Lief S, McKaig RG et al. 2006. Progressive periodontal disease and risk of very preterm delivery. Obstetrics and Gynecology 107:29–36.
- Pihlstrom BL, Michalowicz BS & Johnson NW 2005. Periodontal diseases. Lancet 366(9499):1809–20. Review.
- Power ML, Holzman GB & Schulkin J 2001. A survey on the management of nausea and vomiting in pregnancy by obstetrician/gynecologists. Primary Care Update for Ob/Gyns 8:69–72.
- Ruma M, Bogges K, Moss K, Jared H, Murtha A, Beck J & Offenbacher S 2008. Maternal periodontal disease, systemic inflammation, and risk for preeclampsia. American Journal of Obstetrics and Gynecology 198:389.e1–5.
- Sexton S & Natale R 2009. Risks and benefits of pacifiers. American Family Physician 79:681–5.
- Silk H, Douglass AB, Douglass JM & Silk L 2008. Oral health during pregnancy. American Family Physician 77:1139–44.
- Taylor GW, Burt BA, Becker MP et al. 1996. Severe periodontitis and risk of poor glycaemic control in subjects with non-insulin dependent diabetes mellitus. Journal of Periodontology 67:1085–90.
- Thomson WM, Poulton R, Broadbent JM, Moffitt TE, Caspi A, Beck JD, Welch D & Hancox RJ 2008. Cannabis smoking and periodontal disease among young adults. Journal of the American Medical Association 299:525–31.
- US Department of Health and Human Services 2000. Oral health in America: a report of the Surgeon General. Rockville, MD: US Department of Health and Human Health, National Institutes of Health, National Institute of Dental and Craniofacial Research.
- Vitek J, Hernandez MR, Wenk EJ, Rappaport SC & Southern AL 1982. Specific estrogen receptors in human gingiva. Journal of Clinical Endocrinology and Metabolism 54:608–12.
- Warren JJ, Slayton RL, Bishara SE, Levy SM, Yonezu T & Kanellis MJ 2005. Effects of nonnutritive sucking habits on occlusal characteristics in the mixed dentition. Pediatric Dentistry 27:445–50.
- Xiong X, Buekens P, Vastardis S & Pridjian G 2006. Periodontal disease and gestational diabetes mellitus. American Journal of Obstetrics and Gynecology 195:1086–9.
- Yeung CA 2007. Fluoride prevents caries among adults of all ages. Evidence-based Dentistry 3:72–3.
- Zeeman GG, Veth EO & Dennison DK 2001. Focus on primary care. Periodontal disease: implication for women's health. Obstetrical and Gynecological Survey 56:43–9.

have non-nutritive sucking habits at some time (Bishara et al. 2006; Duncan et al. 2008). There is no detrimental effect on the dentition if the use of the dummy or digit lasts less than 12 months. Prolonged non-nutritive sucking habits may result in detrimental effects on the occlusion on late deciduous dentition with anterior open bite when used for 36 months or more, with a Class II canine relationship being more common than in 'non-suckers'. In contrast, a posterior cross bite was more common where a dummy was used for 36 months or more, and an excess overjet more common with a digit habit of 60 months or more (Warren et al. 2005).

Most children cease the sucking habit by 4 years of age. Breaking the habit is easier with a dummy than with a digit. If a dummy is used it should not be dipped in anything sweet.

### Conclusions

Awareness about the importance of oral health during pregnancy is fundamental in the protection of the mother's and the child's oral health. A mother's access to dental care, especially before and during pregnancy, and her dental care habits influence not only her own oral and general health but the health of her child as well.

Recent studies suggest that periodontitis could be an independent risk factor for pre-term birth. However, association does not necessarily mean causation. The mechanism by which maternal infection and immune protection mediate pregnancy risk is not fully understood (Offenbacher & Beck 2007). All authors call for more studies with larger cohorts of subjects and better designs. Dental treatment during pregnancy is safe, improves periodontal health and prevents progression of periodontal disease. In some cases it has reduced the rate of pre-term delivery by decreasing both the periodontal pathogen load and the inflammatory serum markers.

Pregnancy in general is a period of increased perception and motivation towards health information, including the preventive aspects. To equip the expectant mother with the knowledge of how to improve or at least maintain her own oral health will benefit both mother and child.

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### Further information

can be obtained from the

Dental Practice Education Research Unit  
ARCPHO, School of Dentistry  
The University of Adelaide, Australia 5005  
Phone (08) 8303 4045 toll-free 1800 805 738  
fax (08) 8303 4858  
email dperu@dentistry.adelaide.edu.au  
www.arcoph.adelaide.edu.au/dperu

## **Progression of periodontal disease**

There is some evidence that periodontal disease may progress during pregnancy. Moss et al. (2005, 2007) found that about one-quarter (26%, 2005; 34%, 2007) of a population of pregnant women demonstrated periodontal progression (defined as an increase of at least 2mm in sites with a probing depth of 4 mm or more).

A US study of a cohort of women (Lieff et al. 2004) during pregnancy found an increase in the proportion of women with periodontal pocketing of 4 mm or more, and an increase in the number of sites with attachment loss. Among the pregnant women, about 23% developed new periodontal disease (new sites or worsening of existing sites) during their pregnancy. Those most at risk were African-American, smokers and those on public assistance. However, whether the disease improved after delivery is not known. One encouraging finding was that oral hygiene practices and the number of people with healthy gums increased during pregnancy.

## **Pyogenic granuloma**

Occasionally, localised gingival inflammatory enlargement, known as the pregnancy tumour, or pyogenic granuloma, can be found in up to 5% of pregnant women (Silk et al. 2008). Pyogenic granulomas bleed easily due to their highly vascular nature, and may be painful. Smaller lesions sometimes regress with extra oral hygiene measures such as scaling and meticulous cleaning. However, if the lesion is causing problems due to size or discomfort, as long as there is no medical contraindication it can be excised. However, the patient would need to be warned of the risk of recurrence during the rest of the pregnancy – again, meticulous oral hygiene would reduce the risk.

## **Erosion**

Nausea and vomiting are the commonest symptoms consistently experienced in early pregnancy. Surveys report that nausea with or without vomiting affects about two-thirds of pregnant women (Louik et al. 2006), with up to 80% of these experiencing some nausea, 9.2% experiencing nausea and vomiting for most of the pregnancy, and 2.4% being hospitalised for vomiting (Power et al. 2001). Persistent vomiting may have an erosive effect on tooth structure, and pregnant women should be advised to have a drink of milk or water following a vomiting episode and not to brush their teeth immediately after vomiting.

## **Oral health and general health in pregnancy: emerging issues**

### **Pre-term birth and/or low birthweight babies**

Pregnant women with severe periodontal disease may have an increased risk for having low birthweight or pre-term (born before 37 weeks) babies. Periodontal disease results in the presence of inflammatory markers in the bloodstream which are also thought to have a role in the onset of labour.

(Jeffcoat et al. 2001; Offenbacher et al. 2006). However, some studies have found no association (Holbrook et al. 2004; Moore et al. 2004), and the ‘strength’ of the association varies across studies based on study design and outcome. Some explanations for the different findings are that there is no standard definition of periodontal disease, the studies were conducted among different populations, and control of potential confounders varied among studies (Boggess 2008). Agueda (2008) suggests that more studies with better methodological quality will be necessary to confirm that periodontitis in pregnant women is an independent risk factor for adverse pregnancy outcomes.

To complicate the story further, some studies have found that treating periodontal disease in pregnancy can reduce the likelihood of pre-term birth (Lopez et al. 2002; Jeffcoat et al. 2003; Offenbacher et al. 2006), while others have not found any such reduction for births at less than 37 weeks but have suggested that there is evidence of a benefit for births before 32 weeks (Michalowicz et al. 2006). To date there is not sufficient evidence that treating periodontal disease decreases the rate of adverse pregnancy outcomes (Kinane et al. 2008) – larger and better designed clinical trials are needed (Offenbacher & Beck 2007).

### **Pre-eclampsia**

Pre-eclampsia is a set of symptoms including hypertension and proteinuria that affects 5–10% of pregnant women. There are multiple risk factors for pre-eclampsia including pre-existing diabetes and first pregnancy. However, damage to the endothelium seems to be present frequently.

Studies by Boggess et al. (2003), Contreras et al. (2006) and Ruma et al. (2008) found that women were at higher risk of pre-eclampsia if they had severe periodontal disease or progression of periodontal disease during pregnancy. It was hypothesised that periodontal disease contributes to placental inflammation. It is unclear whether the relationship between periodontal disease and pre-eclampsia is an association that is due to factors related to both conditions independently, or whether there is a causal linkage. Other studies have not found this relationship (Khader et al. 2006).

### **Gestational diabetes**

Recent studies by Xiong et al. (2006) and Dasanayake et al. (2008) have found an association between periodontal disease and gestational diabetes. Their work also suggested that those with gestational diabetes had a greater risk of developing more severe periodontal disease during pregnancy than those without gestational diabetes.

### **Neonatal health**

A recent study (Jared et al. 2009) suggests that in-utero exposure to oral pathogens increases the risk for admission to a neonatal intensive care unit. This is a single study and further research is awaited.

These associations between oral health and general health in pregnant women support the notion that pregnant women should undergo full dental examinations to detect periodontal disease. It must be emphasised that an association between periodontal disease and adverse pregnancy outcomes does not indicate a causal relationship. It is possible that both are caused by the same, as yet unknown, factor. Hence, further studies are needed.

## **Prevention of oral disease in pregnancy**

Standard preventive measures such as drinking of fluoridated water, twice daily use of fluoridated toothpaste and a low-sugar diet should be recommended for pregnant women (Griffin et al. 2007; Yeung 2007). Fluoride supplements are not recommended in pregnancy as there is no evidence of effectiveness (ARCPH 2006).

A visit to the dentist is recommended for all pregnant women to check on periodontal conditions, as well as to minimise cariogenic oral flora through treatment of existing dental caries and advice on oral hygiene habits.

Plaque control through meticulous oral hygiene is suggested for minimisation of gingivitis and to reduce the load of oral bacteria.

Smoking cessation advice should be part of a preventive strategy for periodontal disease and for the range of conditions with which periodontal disease has been associated.

## **Dental treatment in pregnancy**

Oral treatment during pregnancy is an important strategy to improve both maternal and infant oral health. However, dentists may be reluctant to provide dental treatment for a pregnant woman for a number of reasons, including concern about tetragenicity of various medications such as anaesthetics and antibiotics. Concerns about treatment in early pregnancy because of the possibility of spontaneous abortion and premature labour in later pregnancy may be barriers to effective care. A recent clinical trial by Michalowicz et al. (2008) found that providing dental treatment between 13 and 21 weeks’ gestation was not associated with any adverse pregnancy outcomes. The treatment provided included scaling and root planing with local anaesthesia, and emergency dental treatment including restorative and surgical care.

This supports work by Daniels et al. (2007), who found that dental care during pregnancy, including amalgam fillings, was not associated with birth outcomes or language development. This is somewhat in contrast to the precautionary recommendation from the National Health and Medical Research Council (NHMRC) (1999) that ‘During pregnancy it is prudent to minimise exposure to all foreign substances including materials used in dental restorations. This indicates that placement or replacement of dental amalgam restorations should be avoided, especially during the first trimester’.

Routine dental treatment can be undertaken quite safely in the second trimester. Pregnant women may be uncomfortable lying on their backs for long periods in the third trimester. Emergency treatment can be undertaken at any time with appropriate precautions.

### **Radiography in pregnancy**

The NHMRC (1987) stated that if collimation and appropriate shielding is used, including the use of a lead apron, there is no need to defer the use of radiographs for pregnant women. Certainly, with appropriate precautions, the taking of a radiograph in an emergency situation at any stage during pregnancy is indicated (Abbott 2000).

## **Oral issues of newborn babies**

### **Natal teeth, cysts**

Occasionally, infants are born with tooth-like structures or develop them soon after birth (natal or neonatal teeth). These are usually in the mandible and are rare, occurring in 1 in 1,000 births (da Silva et al. 2008). Gingival cysts may also be present at birth and may occur in the midpalatal raphe (Epstein pearls), above the gum pads and especially in the maxilla (Bohn nodules), or on the alveolar crest (dental lamina cysts).

### **Prevention of transmission of Streptococcus mutans to the young baby**

Early colonisation of the oral cavity with strep mutans bacteria has been associated with high rates of dental caries (Harris et al. 2004; Law 2007). Reduction in maternal strep mutans through restorative and preventive regimens has been shown to reduce the caries levels in their young children (Ercan et al. 2007).

This risk can be further reduced with a low-sugar diet, good oral hygiene and appropriate fluoride exposure. However, parents should be advised to minimise the transfer of saliva from parent to child, and to ensure that their own oral care and oral health is as good as possible to reduce this risk factor in young children.

### **Use of dummies/pacifiers and finger sucking**

There are general health benefits in the use of dummies, including analgesic effects, shorter hospital stays for pre-term babies and reduced risk of sudden infant death syndrome. However, prolonged use may have negative consequences such as dental malocclusion and otitis media (Sexton et al. 2009).

Non-nutritive sucking on a dummy, finger or thumb either very actively or for a long period can produce changes in the oral cavity. Duncan et al. (2008) have found that dummy-sucking habits have a greater effect on the developing occlusion than that of a finger or thumb. However, a sucking habit with a dummy may be easier to break than with a finger or thumb. The majority of children