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MATERNAL HEALTH

Promoting oral health during pregnancy: current evidence and implications for Australian midwives

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Aims and objectives. The aim of this paper is to examine current evidence supporting the promotion of oral health during pregnancy and proffer aspects of a potential role for Australian midwives.

Background. Research continues to show that poor oral health during pregnancy can have an impact on the health outcomes of the mother and baby. Poor maternal oral health increases the chances of infants developing early caries and is strongly associated with adverse pregnancy outcomes such as preterm and low birth-weight babies. Unfortunately in Australia, no preventive strategies exist to maintain the oral health of pregnant women.

Design. Systematic review.

Method. This review examines all literature on oral health during pregnancy published to date in the English language and focuses on whether preventive oral health strategies during the prenatal period are warranted in Australia and if so, how they could be provided.

Results. Maintaining oral health is important during pregnancy and many developed countries have implemented preventive strategies to address this issue using non-dental professionals such as prenatal care providers. However, despite the positive international evidence, limited importance is being given to the oral health of pregnant women in Australia. It is also evident that the unique potential of prenatal care providers such as midwives to assess and improve maternal oral heath is not being thoroughly utilised. Compounding the issue in Australia, especially for pregnant women from socioeconomically disadvantaged backgrounds, is the limited access to public dental services and the high cost of private dental treatment.

Conclusion. Promoting and maintaining oral health during pregnancy is crucial, and preventive prenatal oral health services are needed in Australia to achieve this.

Relevance to clinical practice. Midwives have an excellent opportunity to offer preventive oral health services by providing oral health assessments, education and referrals for pregnant women attending antenatal clinics.

Key words: midwives, nurses, nursing, oral health, pregnancy, prenatal care

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Introduction

The promotion of oral health and the prevention and early identification of oral diseases is one of the main themes underpinning Australia's National Oral Health Plan (2004–2013) (National Advisory Committee on Oral Health 2004). Poor oral health during pregnancy can have a significant impact on the health of the mother and the baby (Silk *et al.* 2008). Poor maternal oral health increases the risk of babies developing early caries and is strongly linked with adverse pregnancy outcomes such as preterm and birth of low birthweight babies (López *et al.* 2002, Yost & Li 2008). Although debate continues over the causal link between poor oral health and pregnancy outcomes, various countries have implemented preventive strategies to maintain the oral health of mothers during pregnancy. However, in Australia no such strategies have been put into practice. Pregnant women in Australia, especially those from socioeconomically disadvantaged backgrounds, are particularly vulnerable to poor oral health. Limited access to public dental services and the high cost of private dental treatment remain problematic for many women. Considering these issues, a review of the current literature relating to preventive oral health services during the prenatal period was undertaken and the implications for midwives were identified.

Aims

This aim of this paper is to highlight the impact that poor oral health during pregnancy has on the mother and baby, justify the need for preventive oral health services during the prenatal period and provide recommendations for promoting maternal oral health in Australia through partnerships between dentists and midwives.

Method

To examine the evidence surrounding oral health during pregnancy, an extensive literature search was conducted. Initially, the OVID databases were searched to identify key words used in relevant titles and abstracts. The key words identified for the literature search were as follows: oral health, oral hygiene, dental care, dental advice, dental caries, childhood caries, dental plaque, periodontitis, gingivitis, pregnancy, prenatal care, antenatal care, risk factors, preterm birth, low birth weight, nursing, midwifery, nursing assessment, screening and health promotion. As each database had its own unique indexing terms, individual search strategies were developed for each database. During the development of the search strategies, the diverse terminology used and the spelling of key words were considered to aid in the identification of relevant literature. The combination of key words using 'Boolean' operators (or and and not), truncation, phrase searching and MeSH (Medical Subject Heading) key words were also used in the search strategies. The following databases were searched: MEDLINE (1966 – present); EMBASE (1980 – present); CINAHL (1982 – present); and, the Cochrane library up to and including 2009 Issue 4. In addition, a manual search of the references of all possible books and journals was performed. Unpublished trials were also sought from experts in the field. Relevant conference proceedings and grey literature were also reviewed, and key word searching of the internet was conducted. No restrictions were placed on the date of publications. World Wide Web sites presumed to provide reliable information like official websites from health organisations, research foundations and dental associations were also accessed. Only literature published in the English language was chosen for the review.

A total of 296 articles were identified from the search strategy. The majority of these articles were excluded after removing duplicates and reviewing the title and abstract of the citation against the focus of this paper. A total of 67 pivotal articles that captured the general direction of the literature were selected for the review. These articles are discussed under key heading areas that capture critical aspects of oral health and oral health outcomes and interventions or practice guidelines and policy directions.

Results

Maternal oral health during pregnancy

Various physiological changes occur in the mouth during pregnancy. Fluctuations in the pregnancy hormones progesterone and oestrogen can increase the permeability of the oral blood vessels and decrease the immune response, thereby increasing the susceptibility of pregnant women to oral infections (Gaffield *et al.* 2001, Mills & Moses 2002, Barak *et al.* 2003). The hormonal variations in combination with changes in the oral flora put pregnant women at a higher risk of suffering various dental problems, the most common being dental caries, gingivitis and periodontitis (Russell & Mayberry 2008, Silk *et al.* 2008).

Dental caries

One-fourth of women of reproductive age have dental caries (Silk *et al.* 2008). Pregnant women are particularly predisposed to dental caries owing to several reasons including sugary dietary cravings, increased acid in the mouth from vomiting, decreased salivary production and/or increased

acidity of the saliva and limited attention to oral health (Little *et al.* 1997, Hay-Hadavi 2002).

Gingivitis

Gingivitis is the most common oral disease in pregnancy affecting up to 75% of women (Russell & Mayberry 2008). Gingivitis causes the gums to redden, swell and bleed more easily. Almost half of all women with pre-existing gingivitis have significant exacerbations during pregnancy (Hay-Had avi 2002). In general, the increased gingivitis seen during pregnancy is a transient condition and in most cases, if proper oral hygiene is followed, the inflammation of the gingiva will subside after childbirth (Barak *et al.* 2003).

Periodontitis

Periodontitis is the more destructive condition of the oral tissues and is said to affect one in three women of the child-bearing age (Stefanac 2001). The condition is a direct consequence of untreated gingivitis (Boggess 2008). With time, bacterial plaque on the tooth surface infiltrates and spread below the gum line. Toxins produced by the bacteria stimulate a chronic inflammatory response that results in the breakdown of surrounding bones and tissues. The condition, if left untreated, culminates in tooth and bone loss (American Academy of Periodontology 2007, Boggess 2008).

Birth and infant outcomes of poor oral health during pregnancy

There is increasing evidence highlighting the potential impact of poor maternal oral health on birth and infant outcomes (Xiong *et al.* 2006, Silk *et al.* 2008, Polyzos *et al.* 2009). Evidence suggests that periodontal infection may be associated with adverse pregnancy outcomes. This suggestion is not a new idea. In 1931, Galloway identified that focal infection found in teeth, tonsils, sinuses and kidneys pose a risk to the developing foetus (Galloway 1931). To show the impact on humans, he studied the dental radiographs of 242 women presenting for prenatal care and identified those that had a dental infection (15%, $n = 57$). These women were then recommended to undergo dental treatment. Of those who were treated, none resulted in a miscarriage or stillbirth. Galloway (1931) concluded that removal of a known focal infection was more beneficial than allowing it to harbour throughout pregnancy.

More recently, studies have found that periodontal disease may be associated with adverse pregnancy outcomes such as low birth weight or premature birth, or both (Dasanayake 1998, López *et al.* 2002, Scannapieco *et al.* 2003, Offenbacher 2004, Vergnes & Sixou 2007). The strength of this association has ranged from twofold–sevenfold increase in risk (Boggess 2008, Jared & Boggess 2008). This increased risk suggests that periodontitis may be an independent risk factor for adverse pregnancy outcomes.

In 1996, Offenbacher *et al.* reported an association between maternal periodontal infection and birth of a preterm or low birth weight infant (Offenbacher *et al.* 1996). In this case–control study of 124 pregnant women, it was observed that women who gave birth at < 37 weeks gestation or an infant weighing < 2500 g had significantly worse periodontal infection than women in the control group. In a similar study by Dasanayake (1998), 55 women in Thailand who gave birth to full-term infant weighing < 2500 g were matched to women who gave birth to full-term infants weighing more than 2500 g. After controlling for potential confounders, it was found that poor periodontal health was an independent risk factor for giving birth to a low birth weight infant.

Two prospective cohort studies also found a link between periodontal infection and preterm birth. Jeffcoat *et al.* (2001), in their study of over 1300 pregnant women, found that the risk for preterm birth was increased among women with generalised periodontal infection; this risk inversely related to gestational age. The adjusted odds-ratio was 4·45 for preterm birth before 37 weeks gestation, 5·28 before 35 weeks and 7·07 before 32 weeks. In the second study, Offenbacher *et al.* studied the obstetric outcomes of over 1000 women who received both prenatal examination and postnatal periodontal examination (Offenbacher *et al.* 2006a). Compared to women with good periodontal health, the relative risk for spontaneous preterm birth < 37 weeks gestation was significantly higher for women with moderate–severe periodontal infection, adjusting for various risk factors including previous preterm delivery, race, smoking, social domain variables and other infections.

A recent Australian study also found an association between maternal periodontal disease and perinatal mortality (Shub *et al.* 2009). In this matched case–control study involving 53 women who had experienced a prenatal death and 111 controls, it was found that women with prenatal loss were more than twice as likely to have a periodontal disease and women with prenatal loss because of extreme prematurity were more than four times as likely to have periodontal disease, compared to women with a full-term, live born infant.

The pathophysiology of the relationship between periodontal infection and preterm low birth weight is thought to involve two possible pathways. One view is that periodontal disease may influence preterm birth directly by causing bacteremia which can lead to the seeding of the genital tract

with pathogens resulting in an infection (Dixon *et al.* 1994, Jeffcoat *et al.* 2001). This view is supported by the fact that the organisms involved in periodontitis such as Fusobacterium Nucleatum and Capnocytophaga species, are similar to, if not identical with, those associated with upper genital tract infections and it is biologically possible for these organisms to reach the placenta (Jeffcoat *et al.* 2001). Further, there is substantial data linking lower genital tract infections with premature labour, premature rupture of membranes and low birth weight (Kempe *et al.* 1992, Hay *et al.* 1994). Another view is that periodontal disease may influence preterm birth indirectly through the increased production of inflammatory mediators (Offenbacher *et al.* 1998, Jeffcoat *et al.* 2001, Mills & Moses 2002, Moore *et al.* 2004). Endotoxins from the periodontal infection trigger the production of inflammatory mediators such as cytokines and prostaglandin. Both these inflammatory mediators are also known to be associated with the onset of labour and preterm birth (Shub *et al.* 2009).

Although there is evidence suggesting an association between maternal periodontal infection and poor pregnancy outcomes, there are studies that have also failed to demonstrate this association. In one of the largest studies to date, Moore *et al.* examined multiple periodontal parameters and found no difference between women with preterm birth and without preterm birth. However, an association was found between maternal periodontal infection and spontaneous abortion between 12–24 weeks (Adj OR 2·5, 95% CI 1·2–5·4) (Moore *et al.* 2004). In a case–control study, Buduneli *et al.* (2005) found no differences in periodontal infection between women who gave birth preterm and those who gave birth at term. In a recent case–control study involving 542 postpartum women who were aged 30 , Vettore *et al.* (2008) found that periodontal disease levels were higher in control individuals than in cases and that the extent of periodontal diseases did not increase risk of preterm low birth weight.

Two recent meta-analyses of the association between maternal periodontal disease and preterm birth have been published. Vergnes & Sixou (2007) examined 17 studies and reported a pooled estimated odds ratio for preterm birth of 2·83 (95% CI 1·95–4·10, $p < 0·001$). Xiong *et al.* (2006) performed a systematic review and meta-analysis of 44 studies (26 case control, 13 cohort and five controlled trials) to examine the relationship between periodontal disease and adverse pregnancy outcome. The results of the analysis showed that periodontal treatment during pregnancy reduced the rate of preterm low birth weight infants as a group (pooled RR 0·53, 95% CI 0·30–0·95, $p < 0·05$) but not preterm or low birth weight individually.

Poor maternal oral health may also increase the risk of early childhood caries (Mills & Moses 2002). Early childhood caries is the single most common chronic childhood disease in the United States (Stevens *et al.* 2007). Studies show that the major mechanism by which children acquire cariogenic bacteria (bacteria causing tooth decay) is through the direct transmission of infected saliva as a result of untreated caries from mother to child (Davey & Rogers 1984, Berkowitz & Jones 1985, Yost & Li 2008). Mothers who have untreated dental caries are at a higher risk for passing on cariogenic bacteria to their children particularly if they engage in inappropriate feeding practices (Barber & Wilkins 2002, Berkowitz 2003, American Academy of Pediatric Dentistry 2004, Gussy *et al.* 2006). Consequently, many guidelines now recommend mothers to avoid saliva-sharing behaviours such as sharing a spoon when tasting baby food, cleaning a dropped pacifier by mouth or wiping the baby's mouth with saliva (New York State Department of Health 2006, NSW Health 2009).

Dental care during pregnancy

Despite controversy over the association between maternal periodontal infection and adverse pregnancy outcomes, most experts recommend professional plaque removal, regular dental follow-ups and daily oral hygiene practices to minimise gingivitis and periodontitis in pregnant women (Raber-Durlacher *et al.* 1994). In 2004, the American Academy of Periodontology released recommendations that 'all women who are pregnant or planning a pregnancy should undergo periodontal examination. Appropriate preventive or therapeutic services, if indicated, should be provided' (American Academy of Periodontology 2004). Yet, there is still hesitation among the dental community on whether to accept these recommendations as there is still inconclusive data on whether treating periodontal disease during pregnancy will improve pregnancy outcomes with some studies showing no improvement (Crowther *et al.* 2005, Michalowicz *et al.* 2006, Newnham *et al.* 2009). The most recent meta-analysis of all up-to-date randomised control trials has found that periodontal treatment during pregnancy reduces the rate of preterm birth and may reduce the rate of low birth weight infants (Polyzos *et al.* 2009).

Although there is inconclusive evidence to support treating periodontal disease for the sake of improving pregnancy outcomes, it is clear that providing such treatment does improve maternal oral health (Jeffcoat *et al.* 2003, Offenbacher *et al.* 2006b). Several studies of periodontal treatment during pregnancy have shown significant improvement in the oral health status of mothers after therapy (Michalowicz

et al. 2006, Offenbacher *et al.* 2006b). It is also evident that treating dental decay during pregnancy can significantly reduce the risk of infants developing early dental caries (Gussy *et al.* 2006). There is also no evidence to show that dental examination or treatment is harmful to the pregnant woman or her developing foetus (Boggess 2008). All these factors support the promotion of oral health during pregnancy and the provision of prompt dental treatment when required. Rather than waiting for conclusive data from ongoing trials, the New York State Department of Health (2006) has released guidelines for oral health during pregnancy. According to the guidelines, the most important message for pregnant women and health care professionals is that dental care is safe and effective during pregnancy and that needed care can be provided throughout a women's pregnancy. The guidelines also highlight that a delay in receiving necessary dental care could result in significant risk to the mother and/or foetus.

Barriers to maintaining oral health in pregnancy

Unfortunately, women often do not seek dental advice and treatment during pregnancy. Less than half the women in the USA consult a dentist during pregnancy, even when an oral problem exists (Gaffield *et al.* 2001, Dasanayake *et al.* 2008). Various underlying factors deter women from seeking dental care during pregnancy such as socioeconomic factors (U.S. Department of Health and Human Services 2000), socio-cultural factors (Machuca *et al.* 1999), lack of resources to pay for treatment, barriers to access care (Boggess & Edelstein 2006), lack of public awareness of the importance of oral health, persistent myths about the effects of pregnancy on dental health and, concerns for foetal safety during dental treatment (Wasylko *et al.* 1998). The situation is compounded by the lack of comprehensive clinical guidelines for the management of common oral conditions in pregnancy (Silk *et al.* 2008). In the absence of practice guidelines, health professionals including dentists are often hesitant in treating oral health issues during pregnancy (Stefanac 2001).

The difficulty in accessing dental care during pregnancy is particularly relevant in Australia. A recent review of dental services in New South Wales (NSW) found that because of the lengthy waiting times to access Public Dental Services, $<10\%$ of the population who are eligible for such services are able to access them (New South Wales Parliament 2006). Consulting private dentists is also not feasible for many because of the high treatment costs. Recent figures indicate that the average cost of private dental treatment in NSW is about $295 per hour, which is unaffordable for many Australian families, especially those without private dental insurance (New South Wales Parliament 2006).

Considering the various barriers to prenatal dental care in Australia, it is evident that the most practical and cost-effective way of maintaining oral health of mothers during this period is to focus on early interventions, one of the main themes highlighted in Australia's National Oral Health Plan (2004–2013) (National Advisory Committee on Oral Health 2004). To achieve this objective, one of the key areas of action advocated in the National Plan has been the need to build partnerships between the oral health sector and other human service providers to build capacity in non-dental staff in oral health and oral health promotion.

International and national oral health policy directions

The potential for non-dental professionals such as nurses and midwives to provide preventative oral health services has been widely recognised in recent years in various developed countries. In the USA, numerous national reports on oral health (U.S. Department of Health and Human Services 2000, 2003) have highlighted the need for partnerships between key stakeholders, including nurses and midwives. These recommendations have resulted in the development of practice guidelines for oral health care during pregnancy and early childhood for all health professionals including prenatal care providers (National Maternal and Child Oral health Resource Center 2008, American Academy of Pediatric Dentistry 2009). According to these guidelines, prenatal care health professionals such as midwives are encouraged to:

- Assess the pregnant women's oral health status;
- Advise pregnant women about needed oral health care; and,
- Improve access to oral health services.

Few antenatal programmes in the USA such as the Rochester Adolescent Maternity Program (RAMP) have already incorporated these oral health guidelines with the help of nurses and midwives (Stevens *et al.* 2007). The RAMP, which has been operational since 1969, provides prenatal care to pregnant adolescents in Rochester, New York and is overseen by nurses, midwives and nurse practitioners. In 2003, RAMP incorporated oral health guidelines focusing on education, assessment and referrals into its prenatal services. Currently, RAMP nursing and midwifery staff assess pregnant women for dental risk and subsequent needs at their initial prenatal visit. During this visit, midwives ask basic questions about any discomfort in the mouth and the use of professional dental services within the last six months. Based on the answers to these questions, pregnant women are referred to a dental professional.

Prenatal providers also evaluate dental care needs of the pregnant women at subsequent prenatal visits and reinforce education and prevention. No evaluation of midwives involvement in the RAMP has been reported to-date.

In the UK, all pregnant women are strongly advised by prenatal care providers to visit their dentist and seek treatment. Women are entitled to Maternity Exemption Certificates that allow them to receive free treatment with existing dental services under the National Health Service Scheme both during pregnancy and for the 12 months after giving birth (National Health Service 2008a,b,c).

In Australia, the potential for nurses to provide preventive oral health services is slowly being recognised by policy makers. NSW Health has acknowledged that nurses have greater opportunities to engage and influence new parents regarding oral health and have, in their Oral Health Implementation Plan (2005–2010), identified the need to increase oral health knowledge and skills of non-dental staff such as the Maternal and Child Health nurses (NSW Health 2007a). Through the recently introduced Early Childhood Oral Health (ECOH) programme in NSW (NSW Health 2007a, 2008) child health professionals such as the Child and Family Health and Community Nurses are being trained to undertake regular risk assessments of oral diseases in young children during home visits.

Discussion

It is evident from the literature that oral health is important during pregnancy. Pregnant women are prone to suffering poor oral health which in turn can potentially impact on birth and infant outcomes. Although causality has not been fully established between periodontal disease and pregnancy outcomes such as preterm and low birth weight, there is still sufficient evidence to suggest that a strong association does exist. It is also acknowledged that poor maternal oral health can increase the risk of infants developing dental decay. Regardless of whether treating periodontal disease improves pregnancy outcomes, the evidence highlights numerous other benefits of improving and maintaining the oral health of pregnant mothers. Promoting oral health during pregnancy can improve maternal oral health, reduce the risk of infants developing early dental decay and positively influence the oral health behaviours and attitudes of mothers and their children. Although some critics advocate the need for more conclusive evidence before promoting periodontal therapy, there is no evidence to suggest that receiving dental treatment is harmful to the pregnant women or the developing foetus. It is no surprise then that in recent years many developed countries have implemented various preventive oral health strategies during pregnancy. Both the USA and UK have acknowledged the concerns raised in the literature about the potential impact of poor maternal oral health and have formulated policies to ensure that pregnant women are adequately assessed and provided prompt dental treatment when required (National Health Service 2008a,b,c, National Maternal and Child Oral health Resource Center 2008, American Academy of Pediatric Dentistry 2009).

Interestingly, many of the preventive strategies to improve maternal oral health are being implemented using non-dental professionals such as midwives and nurses. There is mounting evidence showing that nursing and midwifery interventions are effective in promoting women's health and preventing disease (Todd *et al.* 2001, Rice & Stead 2004). There is a strong emphasis on increasing nursing awareness, knowledge and skill about the significance that oral health holds for women of all ages (Todd *et al.* 2001). According to the RAMP in the USA, nurses and midwives already provide oral health assessments and referrals to pregnant adolescents as part of their prenatal care (Stevens *et al.* 2007). Some nursing faculties in the United States have also included oral health curriculums in their nursing and midwifery programmes to integrate oral health care into everyday practice (Kerr *et al.* 2004, Spielman *et al.* 2005, Clemmens 2008).

Unfortunately, Australia has not followed the example of other developed countries in addressing the oral health of pregnant mothers. Currently, the initiatives to improve maternal and early childhood oral health such as the ECOH programme focus solely on the postnatal period particularly on early interventions for children. Apart from providing written information and advice on oral health, the ECOH programme does not evaluate the oral health of mothers during pregnancy (NSW Health 2007b, 2008). Even at the antenatal checks, which are often carried out by midwives, there is no evidence to indicate that oral health assessments are being conducted (The Royal Women's Hospital 2008). Similarly, no information or guidance about oral health during pregnancy is presented in the recent Australian College of Midwives National Midwifery Guidelines for Consultation and Referral (2nd edition) (Australian College of Midwives 2008).

It is clear that maintaining the oral health of mothers during pregnancy is not regarded as a priority in Australia despite the positive international evidence. Pregnant women, especially those from low socioeconomic backgrounds, have no system in place that can offer them regular oral assessment during the prenatal period and prompt dental treatment when required. It is also evident that the unique potential of midwives to assess and improve the oral health of mothers

during the prenatal period is not being thoroughly utilised. Compounding the issue in Australia is a lack of comprehensive guidelines on oral health care during pregnancy.

There is a need for greater emphasis on prenatal oral health in Australia. Policy makers and public health professionals need to revise existing policies and implement new preventative services that can improve the oral health of pregnant women. Like other developed countries, the potential of non-dental professional such as midwives to provide such services should also be fully explored. Further, considering the barriers pregnant women face trying to access dental services, measures need to be put in place that allow priority access for pregnant women needing dental treatment. Currently, public dental services in Australia provide priority access only to certain groups of the population that are at high risk of suffering poor oral health such as young children and people with chronic and complex conditions (Australian Government 2009a). There is no reason why pregnant women cannot be included in this priority list and there is sufficient evidence to support this inclusion. Dental care is presently high on the agenda of the Australian Government (2009b) and all efforts should be made to highlight the importance of maintaining the oral health of pregnant women.

A limitation of this review is that no quality assessment of the evidence has been undertaken and needs to be considered when interpreting the evidence. A systematic review focusing on perinatal outcomes and oral health, including quality assessment, is currently being completed by these investigators.

It is also important to consider the strength of the relationships between factors such as general health, socio economic status, smoking, ethnicity, presence of selected infections, maternal age and maternal obesity and its impact on oral health and pregnancy outcomes. Studies that have considered these relationships and adjusted for potential interactions and confounding variables provide strong evidence of the possible association between oral health and adverse pregnancy outcomes (Jeffcoat *et al.* 2003, Offenbacher *et al.* 2006a,b, Shub *et al.* 2009).

Relevance to clinical practice

Midwives have a unique role to promote and maintain the oral health of mothers during pregnancy in Australia. The close contact they have with women during pregnancy provides them with the opportunity to implement early interventions. Furthermore, pregnancy is an ideal period when women can be motivated to change their behaviours and life styles. Midwives can play a vital role in improving perinatal outcomes and maternal/foetal dental health through screening and education about risk factors and prevention, to the women and families they care for across various settings (Mills & Moses 2002, New South Wales Parliament 2006, Dasanayake *et al.* 2008).

One way of facilitating this new role for midwives is to incorporate oral health guidelines in the existing Australian midwifery care models. Guidelines have been introduced successfully in the USA under the RAMP. Oral health guidelines focusing on education, assessment and referrals to dentists can be incorporated into current midwifery practice in Australia. Midwives can assess pregnant women

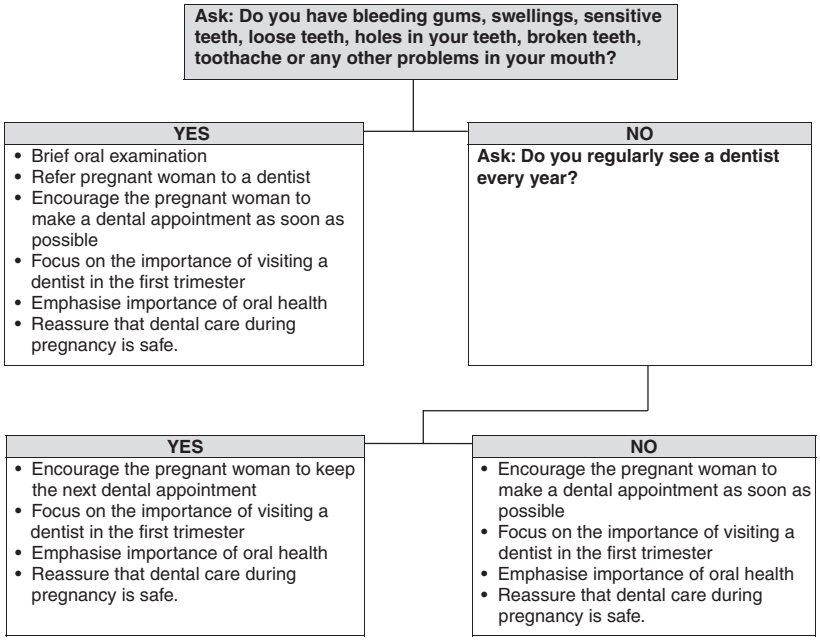

Figure 1 Questions that midwives could ask during the initial antenatal visit.

for oral health risk at their initial antenatal visit by asking two simple questions (see Fig. 1) – discomfort in the mouth and the use of professional dental services within the last six months – within the antenatal screening tool and where appropriate (based on the answers) refer them to a dental professional. Midwives can also reinforce oral health education and prevention strategies at subsequent visits. Expanding the role of midwives to include oral health care could be extremely beneficial in Australia especially in low socio-economic communities where mothers are at a higher risk of suffering poor maternal oral health.

In addition to incorporating oral health into midwifery practice, midwifery students in Australia could also be taught about the importance of maintaining oral health during pregnancy and be trained to conduct oral health assessments. Nursing and midwifery faculties in other countries have already implemented such changes into their courses (Kerr *et al.* 2004, Spielman *et al.* 2005, Clemmens 2008) and Australian universities could follow their example. Introducing such changes into the midwifery curriculum will ensure that oral health becomes an integral part of normal practice for future maternity care providers.

Incorporating oral health into midwifery practice has significant value as it will address the key strategies recommended in the NSW Oral Health Promotion Framework for Action 2010 (NSW Health 2006), provide evidence of the important role that midwives can play in improving and maintaining the oral health of mothers during the prenatal period and offer an effective intervention programme that can be delivered during the prenatal period by midwives using the existing systems (antenatal visits) that are in place. In addition, such a service will complement the existing ECOH programme (NSW Health 2007b, 2008) in improving the health and well-being of children in NSW. This service will also provide valuable data about the oral health status of mothers at various time-points across the prenatal period, and provide information that will assist in developing practice guidelines for oral health care during pregnancy for prenatal care providers in Australia.

Conclusion

Maintaining good oral health during the prenatal period improves the oral health outcomes of the mother and the baby and may potentially improve pregnancy outcomes. Midwives have an excellent opportunity to offer preventive oral services by providing oral health assessment, education and referrals for pregnant women attending antenatal clinics. Introducing such a service will change and expand the scope of practice for midwives, enabling them to acquire new skills and knowledge in this important and underdeveloped area of prenatal care.

Contributions

Study design: AG, MJ; data collection and analysis: AG and manuscript preparation: AG, MJ, AB, SE, SB, SA.

Conflict of interest

All authors declare that there is no conflict of interest.

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