

Short Communication

No link between low-grade periodontal disease and preterm birth: a pilot study in a healthy Caucasian population

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Several case-control and randomized, prospective, intervention studies have now indicated a link between the presence of periodontal disease and the subsequent birth of preterm, low-birthweight babies (1–4). Other studies, however, have failed to find such a link (5, 6). It has been postulated that this link, if present, could be causal, since preterm birth might be provoked by an inflammatory response to infection by the Gram-negative anaerobic bacterial flora in the periodontium leading to production of cytokines and prostaglandins and the subsequent onset of labor contractions (7). It is not clear, however, if the results from these studies can be extrapolated into other populations. Nor is it known how the presence of putative gingival pathogens links with other established risk factors for preterm delivery, such as bacterial vaginosis, which is itself another aberrant bacterial situation (8, 9), or smoking.

The aim of this pilot study was to investigate a potential association of oral and vaginal bacterial deviation with preterm births in a healthy Caucasian population enjoying access to a high standard of health care. A secondary objective was to assess the concordance between abnormal oral and vaginal bacterial flora and a relation to smoking as another adverse factor linked to earlier delivery.

Pregnant women attending the Antenatal Care Centre (Miðstöð Mæðraverndar) in Reykjavík for a routine visit at about 28–30 weeks' gestation were invited to take part in the investigation. A total of 96 healthy but otherwise non-selected women were recruited consecutively at the beginning of the third trimester. All were of Nordic Caucasian origin, except one originating from South-East Asia, and all gave informed consent following an interview with the obstetrician in charge of the clinic. Ethical approval for the study was given by the relevant national and local ethics committees.

All the women were assessed for the presence of bacterial vaginosis by the Amsell criteria (10). A high vaginal swab was also taken for culture. Periodontal examination was done in all the women and pocket depth was measured around the Ramfjord teeth as an indicator of periodontal health (11). Pocket depths of ≥ 4 mm were taken to indicate periodontal disease. Pooled paper point samples from the gingival crevice of three teeth were

cultured to test for the presence of putative periodontal pathogens.

Length of gestation was uniformly assessed from the calculated mean fetal biometry values, an 18–19 week routine ultrasound scan and birthweight recorded to the nearest 5-g value. The use of antibiotics during pregnancy was recorded and the women completed a questionnaire about previous pregnancies, previous preterm births, and smoking at the initial interview. Other obstetric data were extracted from the women's maternity records following delivery. Correlation coefficients were calculated to compare gingival and vaginal microbiological findings and relate these to clinical findings.

Of the women, 43 (45%) were primiparous. The average length of gestation at inclusion was 30.6 weeks SD (s 3.0) and at birth 39.6 weeks (s 1.4). Six (6%) women gave birth to a preterm baby (< 37 weeks) and one of these was of low birthweight (< 2500 g). Average birthweight was 3697 g (s 480.7). Almost a quarter (23%) continued to smoke throughout their pregnancy.

Isolation of yeasts from the gingival crevice sample was made from 30% of women and 54% harbored at least one of the putative periodontal pathogens *Actinobacillus actinomycetemcomitans* and the Gram-negative anaerobic bacteria *Porphyromonas gingivalis* and *Prevotella* spp. Vaginal cultures were dominated by lactobacilli in most cases, but *Candida* species were isolated from 25.8% of these cultures. Disruption of the vaginal flora, for example the absence of lactobacilli (in 21%) or the culture of yeasts or coliforms, did not correlate with a corresponding disruption in the oral flora.

Periodontal examination revealed that 86 women (89%) had at least one periodontal pocket up to 4 mm deep and 20 (21%) had ≥ 7 pockets 4 mm deep but no deeper pockets were found.

No women were diagnosed as having bacterial vaginosis on the basis of fulfilling all Amsell criteria, but 32 (33%) were positive for two or more markers. Current smoking was significantly correlated with the presence of oral anaerobic putative periodontal pathogens (correlation coefficient 0.290; $P < 0.05$); oral yeasts (correlation coefficient 0.309; $P < 0.05$) and vaginal yeasts (correlation coefficient 0.312; $P < 0.05$). All the women who delivered

a preterm baby had at least two of the four Amsell criteria positive. None of the women with ≥ 4 gingival pockets of depth ≥ 4 mm delivered preterm.

This study failed to support a proposed link between periodontal disease in pregnant women and preterm delivery. Such a link has attracted considerable interest in recent years (1–5). The potential mechanism might be the stimulation of a cytokine cascade and prostaglandin production caused by interaction of the largely Gram-negative anaerobic periodontal microflora with the immune system of the mother and perhaps the fetus (6). The relation between poor periodontal health and preterm or low-birthweight babies has, however, predominantly been described in African-American (13) or Hispanic-Caucasian women, although a similar investigation in New York (6) failed to find any such link in young African-American and Hispanic women of low socio-economic status. Similarly, Davenport et al. (5) failed to find a link between periodontal disease and preterm birth in a group of subjects of Asiatic (mainly Bangladeshi) origin living in a deprived area of East London.

The women studied here were a Caucasian population of generally high socio-economic status enjoying good health care and the periodontal disease present was only of low grade. Prevalence of preterm birth in the present study was 6%, which is similar to what is found in the Icelandic, and other north European populations in general but considerably lower than the 14–16% prevalence reported in studies among African-Americans (1, 3, 14). The reason for the higher rates in the North American studies may relate to population differences, but could also reflect a lower standard of general health and lesser access to comprehensive health care. Lifestyle factors related to diet, smoking habits, or other environmental issues could also explain such a difference, which again would be reflected in a worse oral health situation and possibly more bacterial vaginosis, known to be more common in these women (14).

The lack of consistency between reported studies suggests that susceptibility to periodontal pathogens among pregnant women leading to preterm delivery could be racially or lifestyle linked. Bacterial vaginosis has been suggested as one of the most important risk factors for preterm birth (8, 9, 14, 15). In this study, all preterm births occurred in women fulfilling at least two of the diagnostic criteria for bacterial vaginosis.

Women in this study had a relatively high prevalence of smoking, which is known to be one of the most important risk factors for periodontal disease (16) and this related to the high prevalence of putative periodontal pathogens isolated from the gingival crevice in this study. Periodontal examinations were performed using the Ramfjord teeth because of limitations of time and resources to perform a more detailed mouth assessment. This probably underestimated the amount of periodontal disease present in our sample (17). The prevalence of *Candida* spp. in gingival specimens was similar to that reported by Dahlén and co-workers (18). Recovery of *Candida* from gingival and vaginal samples was signifi-

cantly correlated with current or previous smoking. This has not been described before.

One of the results of current research into periodontal disease and preterm birth has been the setting up of intervention studies to see if programs of periodontal therapy among pregnant women could reduce the prevalence of preterm birth. Two recent intervention studies have indicated the benefit of antenatal treatment of periodontal disease (2, 4). The Icelandic population has access to subsidised dental care until the age of 17 years. It is possible that this may have had some beneficial effect in reducing periodontal disease and thus the risk of preterm birth. The high prevalence of known periodontal disease risk factors and of the risk for preterm delivery associated with bacterial vaginosis and smoking suggests that more research is necessary to determine if an association exists between periodontal disease in pregnant women and a subsequent preterm delivery in Caucasian populations. It is possible that patients with periodontal disease may reflect a subset of the pregnant population at increased risk of preterm delivery, similar to what has been described for bacterial vaginosis, but this could not be verified in the present study. Moreover, we were not able to demonstrate an association between a perturbed vaginal flora and the presence of putative periodontal pathogens in the gingivae.

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