The Association of Periodontitis, Pregnancy, and Two Single Nucleotide Polymorphisms (SNP) in the Vitamin D Receptor: NHANES III, 1988-1994

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Background: Several studies have shown a positive association between maternal periodontal disease, an anaerobic inflammatory condition, and adverse reproductive outcomes.

Objective: To evaluate the impact of pregnancy on the association of genetic variants in inflammatory/metabolic-related genes and periodontitis among reproductive aged women in the Third National Health and Nutrition Examination Survey (NHANES III).

Study Design: The CDC/NCI NHANES III Collaborative Genomics Project Data genotyped a total of 50 genes/90 SNPs from the DNA of 7,159 NHANES III participants. We examined the effect of 25 SNPs from 13 inflammatory or metabolic genes on periodontal disease among women ages 17-54 years old (n= 2,103). The prevalence of moderate and severe periodontitis (MSP) among the women was estimated using the CDC definition of periodontitis and pregnancy status was classified as never been pregnant and ever been pregnant. Multivariate logistic regression was used to evaluate associations with periodontitis using an additive model adjusted for age, race/ethnicity, education, smoking status, last dental visit, self-reported diabetes, poverty income ratio and interactions with race/ethnicity and pregnancy.

Results: The prevalence of MSP is approximately 3% among the U.S. reproductive-aged women. Of the 25 SNPs evaluated, two SNPs in the vitamin D receptor (VDR) gene, TaqI (rs731236) and rs2239185, were found to be associated with MSP (TaqI - Odds Ratio (OR) = 1.8; 95% Confidence Intervals (CI), 1.1-2.8 and rs2239185 OR = 0.5; 95% CI, 0.3 – 0.8) in the univariate analysis. In the multivariate analysis, women who were ever pregnant and who have the TaqI VDR SNP were more likely to have MSP (OR = 5.7; 95% CI, 1.6-20.5) compared to women with the TaqI VDR SNP and who had never been pregnant. In contrast, women with the VDR rs2239185 were less likely to have MSP (OR = 0.2; 95% CI, 0.1-0.6). Furthermore, VDR rs2239185 did not interact with pregnancy status, but did interact with race/ethnicity. Non-Hispanic black women (OR = 3.4; 95% CI, 1.1-10.4) and Mexican-American women (OR = 4.8; 95% CI, 1.3-17.1) with this polymorphism were more likely to have MSP compared to non-Hispanic white women.

Conclusions: These results are consistent with reports from other studies that found the VDR TaqI SNP to be associated with periodontal disease. Our studies confirm these results TaqI in a subpopulation of reproductive age women and further show that pregnancy can positively impact the association of this SNP with periodontitis. The association between adverse pregnancy outcomes (e.g. preterm birth, low birth weight) and periodontal disease is thought to be via an immune/inflammatory pathway. Polymorphisms in VDR have also been associated with immune/inflammatory diseases such as asthma and osteoarthritis. It is not clear whether individuals with VDR polymorphisms at-risk for early periodontitis might also be at-risk for poor reproductive outcomes. Future population-based studies should further evaluate the effect of VDR polymorphisms on reproductive outcomes.