Genome-wide survival analysis of dental caries incidence

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Objectives: The incidence of dental caries can be influenced by multiple factors including behavioral, environmental and genetic components. The aim of this study was to use survival analysis to identify the potential risk factors and genetic variants associated with dental caries incidence in a birth cohort.

Methods: The Center for Oral Health Research in Appalachia, cohort 2 (COHRA2) recruited and prospectively followed pregnant women and their children starting in 2011. A total of 911 children were included in this study; each was followed annually from birth with 7 years being the longest follow-up to date in this ongoing study. Annual intra-oral examinations were performed to assess dental caries experience, including the approximate time to first carious lesion. Cox hazards models were used to assess the associations of time to event with self-reported risk factors and 4.9 million genetic variants ascertained using a genome-wide SNP array.

Results: A total of 196 children (21.5%) had their first primary tooth caries event during the follow-up period. The average survival time was 3.23 years. Household income, home water source, mother's educational attainment, mother's tooth brushing frequency, mother's dental caries experience, breastfeeding status, and breastfeeding duration were individually associated with dental caries hazard in univariate models, while only household income, home water source, and mother's educational attainment were significantly associated in the multivariate model of all potential risk factors simultaneously. The heritability (i.e., proportion of variance explained by genetics) of the time to event trait was 54.4% (P<0.0001). There were 3 suggestive loci (P<1e-6), however, no specific genetic variations were associated at the genome-wide significance level (P<5e-8).

Conclusions: Our findings indicate that household income, mother's educational attainment, and home water source may be independently-operating risk factors for dental caries incidence, and that the time to event of first carious lesion is heritable. We nominate several suggestive loci for further investigation.