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Clinically driven analysis reveals gene-socioeconomic status interaction influencing periodontal disease in the electronic health record-linked Generation Scotland: Scottish Family Health Study (GS: SFHS) cohort.

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Introduction

Heritability (proportion of trait variation attributable to genetic factors) is not a fixed property. It can vary across different social settings and environments. Exploration of gene-environment interaction has been limited by lack of large sample sizes. Biobanks linked to electronic health records pose a solution to this sample size problem.

Objectives and Approach

Social inequalities in periodontal health have been well documented in the dental scientific literature. However, gene-socioeconomic status interaction has yet to be examined. We identified 2,192 cases and 11,525 controls from linked electronic periodontal treatment records within the Generation Scotland: Scottish Family Health Study (GS: SFHS) (www.generationscotland.org). The measure of socioeconomic status used was the Scottish Index of Multiple Deprivation. The objective of this study was to investigate the gene-socioeconomic status interaction within this data. A reaction norm model was used to evaluate the presence of a gene-socioeconomic status interaction in the statistical software ASReml.

Results

We estimated the heritability of periodontal disease at 10.42% (95% confidence interval 5.97-14.88%). Socioeconomic status modified the heritability of periodontal disease. The heritability of was 13.37%, 0.14% and 11.70% in areas of high, moderate and low deprivation respectively; indicating the occurrence of a gene-socioeconomic status interaction with periodontal disease. These results indicate that socioeconomic status explains a large portion of genetic variation in periodontal disease risk. This information suggests that effective intervention and prevention programs for periodontal disease should involve socioeconomic aspects in their planning, implementations and evaluation. For instance, interventions targeted to reduce smoking in more deprived subjects with a genetic predisposition to periodontal disease could enhance the effect of health promotion strategies in reducing risk.

Conclusion/Implications

This study presents contemporary evidence in a large population based cohort that gene-socioeconomic interaction leads to the progression of periodontal disease. This information may lead to the development of better preventative strategies for clinical dentistry.