

Major Gene Effect and Additive Familial Pattern of Inheritance of Asthma Exist among Families of Proband with Sickle Cell Anemia and Asthma

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Abstract

In the United States, sickle cell anemia (SCA) affects approximately 1 in 350 African American newborns each year. Acute episodes of pain and acute chest syndrome (ACS) are the principal complications of SCA and the two leading causes of hospitalization. A relationship between a diagnosis of asthma and the incidence of pain and ACS has been established. We tested the hypothesis that a familial pattern of inheritance of asthma exists among first degree relatives of probands with SCA and asthma. Segregation analysis was performed in 104 families ascertained with an affected proband. Modes of inheritance were tested using Pedigree Analysis Package (PAP) parameterized for the discrete trait of asthma affection status. The additive mode of inheritance was the most parsimonious, while the residual heritability was non-detectable or negligible. A major effect was present and significant. Further tests were performed, to determine whether the major effect followed Mendelian expectations. The tests showed a major gene effect was present and the environmental model was rejected. Our results support the hypothesis that a familial pattern of inheritance of asthma exists among first degree relatives of probands with SCA and asthma, suggesting that asthma is a significant co-morbid condition rather than those children with SCA have a lung disease phenotype mimicking asthma.