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POSTER ABSTRACTS

114.SICKLE CELL DISEASE, SICKLE CELL TRAIT AND OTHER HEMOGLOBINOPATHIES, EXCLUDING THALASSEMIAS: CLINICAL AND EPIDEMIOLOGICAL

Socioeconomic and Inflammatory Correlates of Plasma Cortisol Among Individuals with Sickle Cell Disease

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Introduction: Cortisol plays a critical role in the biological link between stress and health outcomes. It is frequently investigated in the association between socioeconomic stress and morbidity, and the hypothesized biological mechanism by which socioeconomic stress and cortisol impact health is through chronically elevated systemic inflammation. This research is relevant to individuals with sickle cell disease (SCD) for several reasons. First, up to 40% of children and adolescents with SCD are impacted by neighborhood poverty. Furthermore, individuals with SCD are faced with significant disease-related morbidities, such as chronic and acute pain, renal injury, and cerebrovascular disease that are further complicated by elevated inflammatory markers. Finally, cortisol is heavily understudied in this population, with no research investigating socioeconomic or inflammatory correlates. The purpose of this study was to investigate plasma cortisol and its association with neighborhood-level socioeconomic factors (income and poverty) and immunomodulatory cytokines (IL-6, IL-10), among individuals with SCD.
Method: Plasma from individuals with SCD within Children's Hospital of Philadelphia (CHOP) and University of Pennsylvania School of Medicine (Penn Medicine) BioBanks were identified. A cortisol radioimmunoassay was used to determine plasma cortisol levels. The Olink immune response panel was used to measure plasma levels of 92 proteins involved in inflammatory pathways. Home address collected from electronic health records was used to determine neighborhood census tract geoid, which was then used to collect data on median neighborhood income and percentage of families living in poverty from the 2020 American Census Survey. Bivariate and multivariate analyses were conducted across 4 subgroups in the total sample: pediatric patients, adult patients, SCA (HbSS/HbSß ^{0}), and other SCD genotypes (HbSC/HbSß $^{+}$). Control samples (healthy and sickle cell trait; $n = 22$) without neighborhood information were also available for comparison.
Results: Fifty-four independent outpatient samples were identified after excluding duplicates and siblings. Twenty-seven samples were from children and adolescents receiving pediatric care at CHOP (Range $_{age}$ = .8 to 21; M_{age}= 13.6, SD = 5.3; 51.9% female, 74.1% SCA) and 27 samples were from adults receiving care at Penn Medicine (Range $_{age}$ = 19 to 56; M_{age}= 35.8, SD = 10.1; 51.9% female, 51.9% SCA). There were no significant differences in cortisol levels across each subgroup (M_{peds}= 16.6, SD_{peds} = 6.2; M_{adult}= 13.4, SD_{adult} = 6.9; M_{SCA}= 15.1, SD_{SCA} = 7.1; M_{SCD}= 14.9, SD_{SCD} = 6.3).
Neighborhood income and poverty did not differ across pediatric and adult patients, and income did not differ across SCD types. However, neighborhood poverty was lower among patients with SCA (M = 13.9; SD = 11.9) relative to other SCD genotypes (M = 21.7; SD = 13.5; p = .041). Bivariate Spearman analyses found that neighborhood variables were not correlated with cortisol or cytokines in the total sample or subgroups. Yet, multivariate analyses controlling for sex and time of blood draw showed a positive main effect for patient age (p = .019) and a significant age by poverty interaction (p = .041) predicting cortisol among pediatric patients. Cortisol levels were higher with age, yet the association among poverty and cortisol was strongest in younger patients. Analyses also showed a sex*poverty interaction among pediatric patients that approached significance (p = .081), such that poverty only predicted cortisol in male patients.

There were no significant differences for immunomodulatory cytokines across each SCD subgroups; however, IL-6 and IL-10 were elevated in patients with SCA relative to healthy controls ($p_{IL6} = .021$; $p_{IL10} = .003$). Bivariate Spearman correlations showed that cortisol was positively related to IL-6 (rho [ρ]= .38, $p = .027$) and IL-10 (ρ= .34, $p = .048$) among patients with SCA. There were no additional significant bivariate or multivariate effects.

Conclusion: Neighborhood factors likely have downstream effects on the biological stress response and inflammation in SCD. Further research must be conducted to elucidate concurrent and prospective associations among neighborhood socioeconomic factors, stress-related cortisol response, and inflammatory outcomes when extending this work to investigate the impact of stress on SCD morbidity and mortality.

Disclosures No relevant conflicts of interest to declare.

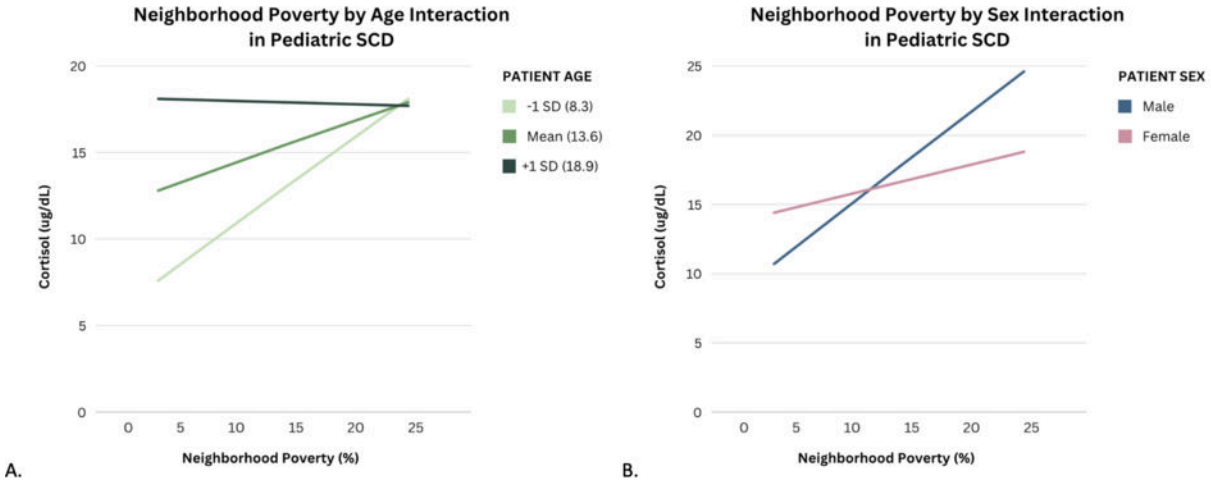

Figure 1. A. Age by poverty interaction graph showing the simple slopes for pediatric patients 1 SD below the mean age (B = .44, $p = .003$), at the mean age (B = .21, $p = .091$), and 1 *SD* above the mean age (B = -.02, $p = .922$). **B.** Sex by poverty interaction graph showing the simple slopes for pediatric male patients (B = .59, $p = .007$) and pediatric female patients (B = .19, $p = .170$).

Figure 1

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