School Attendance and Academic Performance in Pediatric Sickle Cell Patients in Kampala, Uganda
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A. STUDY PROPOSAL AND RATIONALE

Children with sickle cell anemia (SCA) are at high risk of neurologic and cognitive complications stemming from disease-associated overt strokes and neurologically "silent" cerebral infarcts. These complications contribute to high disease burden for children with SCA. These neurologic and cognitive complications affect many aspects of the child's life, especially in academic settings. However, the studies on academic achievement in children with SCA show conflicting results and there is no clear consensus on overall academic achievement and school attendance. The majority of these studies are conducted in the United States and there is a paucity of information on children in sub-Saharan Africa, where the prevalence of SCA is highest in the world. There are emerging studies in Nigeria focused on this topic, but no current literature in Uganda.

Dr. Nancy Green currently has NIH-funded research in collaboration with a team of clinical research experts at Makerere University School of Medicine in Kampala, Uganda titled Burden and Risk of Neurological and Cognitive Impairment in Pediatric Sickle Cell Anemia in Uganda ("BRAIN SAFE"). The goal of this study is to determine the burden of neurological and cognitive impairment of children diagnosed with the most common and severe form of SCA in Uganda, HbSS or HbSB0 thalassemia, ages 1-12 years. Initial review of the data show that among the entire sample, 30% of the children demonstrated impairment.

The goal of my project is to work with this population with this known high prevalence of cognitive impairment and determine what role school attendance may have in academic performance and cognitive testing in pediatric patients with SCA in Kampala, Uganda when compared to healthy siblings. Specific aims of my proposed study are to examine whether:

1) Pediatric patients with SCA in Kampala, Uganda ages 6-12 years have reduced or absent school enrollment and attendance compared to a sex- and closely age-matched sibling; and
2) If a correlation exists between decreased school attendance and reduced academic achievement or cognitive function.

B. STUDY DESIGN

This is a cross-sectional study where 100 patients ages 6-12 years old will be enrolled at the Mulago Hospital Sickle Cell Disease Clinic in Kampala, Uganda. The clinic is affiliated with Makerere University School of Medicine. Enrollment criteria includes a hemoglobinopathy diagnosed as HbSS or HbSB0 thalassemia, no current or recent acute illness, no history of developmental delay beginning early in infancy (to exclude children

with non-SCA related dysfunction). For controls on the school assessment, siblings without SCA will be recruited to focus on disease-related effects and control for other enrollment characteristics. Siblings will be sex-matched and of similar ages.

Education in Kampala, Uganda is closely linked to multiple socioeconomic variables. Prior studies from the Ugandan research team data demonstrated a relationship between cognitive function and socioeconomic status, maternal education, and malnutrition. Socioeconomic status will take into account household income, parental occupation, living density, access to clean water and electricity. Questionnaires will be utilized to obtain this demographic information.

School enrollment and attendance: Parental consent will be obtained to request access to school attendance records for the previous year. School attendance will be calculated as the number of school days attended out of the number of total possible school days in the previous academic year in the respective school district. This approach has been previously used for assessing school attendance in pediatric samples with other medical conditions.

Academic achievement: Families will be asked to bring report cards to clinic in order to evaluate grades achieved in school. A point system will be developed to assign certain points for grades and the sum of all the subjects will be assigned to a patient as their academic achievement score.

C. STATISTICAL ANALYSIS

We will examine the data for an association between school enrollment and school attendance, the latter as either a continuous or categorical variable. Adjustments will be made via univariate and multivariate analyses for school exposure in siblings, socioeconomic status, and maternal education.

Two Wilcoxon signed-rank tests of the sibling pairs will be used to determine if a correlation exists between children with SCA and school attendance and with academic achievement. In order to determine if a correlation exists between school attendance and academic achievement, we will then only analyze sibling pairs that had no difference in school attendance and utilize a Wilcoxon signed-rank test to see if a correlation exists between children with SCA and academic achievement. If there is no correlation, then one can presume that school attendance is directly contributing to academic achievement.

D. STUDY PROCEDURE

This is a cross-sectional study of patients attending the Mulago Hospital for Sickle Cell Disease in Kampala, Uganda. There are no procedures or interventions in this study.

E. STUDY SUBJECTS

This study includes patients aged 6-12 years with SCA at the Mulago Hospital for Sickle Cell Disease in Kampala, Uganda and sibling controls in similar age range without SCA Patients will be enrolled over a 6-week period from February 2019 to March 2019.

F. RECRUITMENT AND CONSENT

Appropriate parental informed consent will be obtained for access to school records and participation in the study. Families will be approached as they wait for their clinic visit.

G. CONFIDENTIALITY OF DATA

Data will be placed into a spreadsheet with identifying data removed and each patient will be assigned a unique identifier. A separate password protected file will correlate the patient identifiers to the unique study ID numbers used in the spreadsheet. Only the study team will have access to the password-protected information

H. POTENTIAL RISKS

The only risk is the possibility of a breach of confidentiality, which will be minimized as detailed above.

I. POTENTIAL BENEFITS

The patients will not directly benefit from this study, but the information collected will further knowledge about factors that affect cognition in the sickle cell population in Kampala, Uganda.

J. ALTERNATIVES

Not applicable to this study.

K. REFERENCES

1.Piel FB, Patil AP, Howes RE, Nyangiri OA, Gething PW, Dewi M, Temperley WH, Williams TN, Weatherall DJ, Hay SI. Global epidemiology of sickle haemoglobin in neonates: a contemporary geostatistical model-based map and population estimates. Lancet. 2013 Jan 12;381(9861):142-51.

2.John CC, Bangirana P, Byarugaba J, Opoka RO, Idro R, Jurek AM, Wu B, Boivin MJ. Cerebral malaria in children is associated with long-term cognitive impairment. Pediatrics. 2008 Jul;122(1):e92-9.

3.Olatunya OS, Oke OJ, Kuti BP, Ajayi IA, Olajuyin O, Omotosho-Olagoke O, Taiwo AB, Faboya OA, Ajibola A. Factors Influencing the Academic Performance of Children

with Sickle Cell Anaemia in Ekiti, South West Nigeria. Journal of Tropical Pediatrics. 2018 May;64(1):67-74

4.Green NS, Munube D, Idro R, et al. Manuscript in preparation

5.Boivin MJ, Bangirana P, Byarugaba J, Opoka RO, Idro R, Jurek AM, John CC. Cognitive impairment after cerebral malaria in children: a prospective study. Pediatrics. 2007 Feb;119(2):e360-6.

6.WHO.int/childgrowth/standards/Technical_report.pdf, 2006.

7.Bangirana P, Menk J, John CC, Boivin MJ, Hodges JS. The association between cognition and academic performance in Ugandan children surviving malaria with neurological involvement PLoS One. 2013;8(2):e55653

8.DeBaun MR, Kirkham FJ. Central nervous system complications and management in sickle cell disease. Blood. 2016 Feb 18;127(7):829-38.

9.Kawadler JM, Clayden JD, Clark CA, Kirkham FJ. Intelligence quotient in paediatric sickle cell disease: a systematic review and meta-analysis. Dev Med Child Neurol. 2016 Jul;58(7):672-9.

10.King AA, Strouse JJ, Rodeghier MJ, Compas BE, Casella JF, McKinstry RC, Noetzel MJ, Quinn CT, Ichord R, Dowling MM, Miller JP, Debaun MR. Parent education and biologic factors influence on cognition in sickle cell anemia. Am J Hematol. 2014 Feb;89(2):162-7