

Sickle Cell Trait (HbAS) is Associated with Increased Expression of Erythrocyte Complement Regulatory Proteins CR1 and CD55 Levels in Children

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Abstract

Erythrocyte complement regulatory proteins, complement receptor 1 (CR1) and decay accelerating factor (CD55) protect red blood cells (RBCs) from complement mediated damage by controlling complement activation cascade and potentially protect RBCs from complement mediated damage that may occur when immune complexes are formed following malaria infection. Given the important role of RBCs in regulation of complement activation, we considered the competence of sickle cell trait RBCs in these functions. Methods: Children (age 0-192 months; n=116) were enrolled in a nested case controlled study conducted in Kombewa Division, Kisumu west District between October and December 2004. Based on hemoglobin (Hb) type, children were stratified into those with HbAS (n=47) and HbAA (n=69). The 47 HbAS individuals were matched to the 69 HbAA individuals of similar age (± 2 months or ± 24 months for those below or more than 192 months, respectively) at a ratio of 1:1 or 1:2. Circulating CR1 levels and CD levels were quantified using a FACScan cytometer under normal and reduced oxygen saturation. Results: The mean CR1 copy numbers per RBC was comparable in the two groups. However, between the ages of 49-192 months, the mean CR1 copy numbers per erythrocyte was significantly higher in children who had HbAS compared to those with HbAA (P=0.0332). The mean CD55 levels were comparable between the two groups but after deoxygenation, the mean CD levels in RBCs of individuals with HbAS was significantly higher than in the HbAA (P=0.011). Conclusion: The mean CR1 and CD55 copy numbers per RBC were comparable between the two groups under normal and reduced oxygen saturation. Beyond the age of 49 months, the CR1 copy numbers was higher in the HbAS compared to HbAA and this was also true for CD55 levels under deoxygenated conditions. Taken together, these results demonstrate that in the younger age groups, the protection afforded by HbAS against severe manifestations of malaria may be due to other factors other than complement regulatory proteins but beyond the age of 49 months, this protection may be partly due to the high CR1 copy numbers in the HbAS individuals.