Seroprevalence of HIV-1, Hepatitis B and C Viruses in Sickle Cell Disease Patients in Zaria, Nigeria

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Abstract

Introduction*: Transfusion of blood is an important and a frequent modality of treatment for either vaso-occlussive or haemolytic crisis in patients with sickle cell disease (SCD). Sickle cell disease patients are therefore at risk of transfusion transmissible infection,blood transfusion been a recognized route of transmission of HIV, Hepatitis Band C virus particularly in resource constraint settings lacking antigen detection techniques as well as an organized and effective blood transfusion services.*

Aim*: To determine the prevalence of HIV-1, Hepatitis B and C viral antibodies in patients with sickle cell disease.*

Patients and Method: *A cross sectional study of 208 consecutive SCD patients at steady state and 94 healthy non-matched controls were screened for HIV-1antibodies (parallel ELIZA Determine and Uni-Gold), Hepatitis B surface antigen (NOVA) and anti-HCV (NOVA) in 2006.*

Results*: Of the total number of 204 SCD patients screened, 102 (49%) were males and 106 (51%) were females .The mean age of the subjects was 22 ± 8 years. One hundred and nine patients (95.2%) were haemoglobin S homozygote's and 10 (4.8%) were compound heterozygote's for haemoglobin S and C. Ninety percent of the subjects reported less than 5 units of whole blood transfusion during their lifetime.Prevalence of HIV, Hepatitis B and C was 3.9%, 2.0% and 4.4% respectively.*

Conclusion*: Prevalence of HIV, Hepatitis B and C is low in our setting and this may not be unconnected withroutine screening of prospective donors. However increased public awareness, health education programs and better screening techniques will further reduce the spread of these viruses, as other routes of transmission may also play a role.*

Keywords: Blood Transfusion, Sickle cell disease, HIV, HBsAg, HCV

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Introduction

The burden of sickle cell disease (SCD) is highest in sub-Saharan Africa, especially in the West African country of Nigeria where more than 150,000 children are born with the disease annually and 4 million people are afflicted with the condition.[1,2] Homozygous SCD, sickle cell anaemia (SCA) is the commonest autosomal recessively inherited genetic disease and affects about 2% of Nigerians at birth.[3] The protean clinical features of SCD result from vaso-occlusion, chronic intravascular haemolysis, microvascular ischaemia and organ damage.[4] The management of SCD continues to be supportive and includes hydration, pain relief, blood transfusion and psychological support.[3] The majority of patients with SCD receive transfusion at some point in their life to reduce the complications of the disease.[4] Indications for acute simple transfusion include symptomatic anaemia, aplastic crisis, splenic or hepatic sequestration, acute chest syndrome, acute multi-organ failure with severe anaemia and preparation of patients with homozygous SCD for major surgery.[5] Exchange transfusions is indicated in SCD complications such as acute stroke, acute chest syndrome, acute multi-organ failure and possibly acute severe priapism.[6]

Therefore blood transfusion remains an essential component of care for SCD, but associated complications include iron overload, transfusion reactions, acute lung injury, pain crisis, stroke, immune-modulation, anaphylaxis, alloimmunization and most importantly in our setting infections such as Malaria, Human immunodeficiency virus (HIV), Hepatitis B and C viral infections.[5] The risk of transmission of these viruses depends on the incidence in the donor population as well as the existence of window period particularly in our setting lacking antigen detection techniques such as Nucleic acid test. Patients with SCD are thus at a high risk of been infected with these viruses largely because of the large number of blood transfusion required to control the debilitating complication associated with the disease. The aim of this study is to determine the prevalence of HIV-1, Hepatitis B and C viruses in sickle cell disease patients at the Adult sickle cell clinic of Ahmadu Bello University Teaching Hospital, Zaria.

Materials and Method

The study was approved by the National Heart Lung Blood Institute institutional Review Board and the Ethical and Scientific Committee of Ahmadu Bello University, Zaria, Nigeria. The research subjects were Nigerians 10 years and above of both genders who volunteered and provided written informed consent. For children <18years, a legally authorized representative provided written informed consent and assent of the child was also required.

Patients were recruited from the community but regional referrals were also accepted. Exclusion criteria included subjects unable to understand the investigational nature of the study or to give informed consent. Subjects under went complete history and physical examination and laboratory investigations. Haematological parameters were determined by multiparameter analyzer Sysmex XT 2000i.

Patients with SCD were required to have electrophoretic and or high pressure liquid chromatography documentation of SS, SC, Sb0, orSb1 thalassemia or other genotype. Viral screening for both the study group as well as the control subjects was carried out with respective screening kits, HIV-1antibodies by parallel ELIZA techniques (Determine and Uni-Gold), Hepatitis B surface antigen (NOVA) and anti-HCV (NOVA).The control group also had electrophoretic documentation of hemoglobin A or AS genotype. The study was conducted over three month period in 2006.

Results

Clinical characteristics of patients and controls

Two hundred and eight consecutive SCD subjects at steady state and 94 healthy non-matched controls were studied in Nigeria. The age range of the patients was 10–52 years. The mean age of the sickle cell subjects was 22 ±8years while that of the control was 33 ±12years. Of the 208 sickle cell subjects 106 (51%) are females while of the 94 controls 29 (31.2%) were females. One hundred and ninety eight SCD subjects were haemoglobin S homozygote (SCA) and 10 were compound heterozygote for haemoglobins S and C (HbSC). Ninety percent of SCD subjects reported less than five units of whole blood transfused in their life time. All the controls were haemoglobin A homozygote (HbAA). No history of previous blood transfusion in the control subjects.

Table 1. Haematological and study parameters

Variable	Sickle cell disease Subjects		Control Subjects		P value
PCV (%)	25.5± 4.5	n 204	41.4± 5.1	n 94	<0.001
RETICS (%)	11.1 ± 6.3	n 128	1.7± 1.1	n 93	<0.001
WBC x 10^9/l	13.2 ± 9.3	n 204	7.5± 9.5	n 94	<0.001
HIV +	8 (3.9%)	n 204	0 (0.0%)	n 94	0.060
HBSAg +	4 (2.0%)	n 204	2 (2.1%)	n 94	1.00
HCV +	9 (4.4%)	n 204	4 (4.3%)	n 94	1.00

Discussion

Although this study showed a prevalence of 3.9% and 0% in the SCD and control subjects respectively, this was statistically not significant p 0.06. This difference may suggest that despite over 90% having had about 5 units of blood transfused in their lifetime, HIV prevalence remains low among the SCD subjects going by the reported prevalence of 5.0% in Nigeria in 2004.[7,8,9] This may also be attributed to the use of third generation screening kits (double ELIZA) of all prospective donors, thus reducing the window period. However this incidence is higher than 2.8% reported among blood donors in Kaduna between 2000 to 2004 by Hassan *et al*.[10] Therefore it is important to consider other routes of transmission apart from blood transfusion such as heterosexual route, since a large number of the SCD subjects are in the sexually active age group. In USA a similar study of 116 transfused SCD patients in Howard university showed a 0% prevalence of HIV antibodies despite 88 of them having received a mean of 18.6 transfusions of red blood cells between 1978 and 1985.[11] It is also noted in some studies that there is amelioration of retroviral disease in SCA patients by host factors of which absence of splenic function prior to HIV-1 infection may be one.[12]The spleen and lymph nodes are major sites of HIV-1 replication, mutation, and genetic variation in vivo. In most adults with SCA the spleen is non-functionalor otherwise is unavailable for invasion by the HIV-1 virus due to recurrent episodes of micro-infarction.[12]Our finding also agrees with a low Seropositivity of 1.8% reported in our centre in the paediatric age group by Ogunrinde *et al*.[13].

This study also showed a similarly low seropositivity for HBSAg of 2.0% and 2.1%among the SCD and control subjects respectively. This agrees with the seroprevalence

of 2.4% of HBSAg reported among voluntary blood donors in Yola, Nigeria by Olokoba *et al*.[14] Although no sociocultural practice was found to have an influence on Hepatitis B transmission, a high prevalence of 8.1% was however reported by Emechebe *et al*[15] in Enugu among children with sickle cell anaemia. The same study also reported 0% prevalence in infants thus emphasizing on the horizontal mode of transmission.[15]

We also obtained a low seropositivity for HCV antibodies of 4.4% and 4.3% among the SCD and control subjects respectively. This is lower than that reported by Ejiofor *et al*[16] in Enugu SE Nigeria who recorded a prevalence rate of 6.6% of HCV antibodies among blood transfused SCA patients and 5.3% in the control group. Our finding is also lower than reports from Lagos (5%)[17] and Ilorin (5%)[18]. Higher rates of 10% have being reported in USA.[19]The similarity in the prevalence of both HBSAg as well as antibodies to HCV among the transfused SCD subjects and non-transfused control group confirm the view that these infections can be acquired via the heterosexual route however other modes of transmission should also be considered. High prevalence of HBSAg is associated with low socioeconomic status, overcrowding, clustering, cultural practices like ritual marks, scarification marks and ear piercing.[20] Reports from South Africa and Canada showed that tattooing increased Hepatitis B transmission.[21] Similarly the Center for Disease control (CDC) reported that piercing and cutting for various reasons is a risk factor for Hepatitis B transmission.[22]

However studies by Emechebe *et al*[23] in Enugu, Chukwuka *et al*[24] in Nnewi, and Angyo *et al* in Jos reported that demographic and sociocultural factors such as circumcision, ear piercing and scarification did not influence the prevalence of Hepatitis B among children with Sickle cell anaemia.

Conclusion

HIV, Hepatitis B and C are not uncommon in the multiply transfused sickle cell disease patients. Although transfusion of contaminated blood is one of the important cause of its spread other routes of transmission also plays a role. To control further spread of these viruses' public awareness and health education programs as well as selection of healthy blood donors is mandatory.

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