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HIV SEROPOSITIVITY IN CHILDREN WITH SICKLE CELL DISEASE

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Key words: HIV, positivity, children, sickle cell disease

Abstract

Background: Blood transfusion forms an integral part of management of sickle cell disease. Blood transfusion is also established as a route of transmission of the Human Immunodeficiency Virus (HIV), especially in developing nations that are lacking in properly organized blood transfusion services.

Methods: A retrospective study of randomly selected sickle cell anaemia patients screened for HIV antibodies in the paediatric haematology clinic of A.B.U.T.H., Zaria, Nigeria.

Results: Twenty-nine (52.7%) males and 26 (47.3%) females were studied. Mean age (± 1 standard deviation) was 68.5 ±37.0 months. One (1.8%) of 55 patients was HIV-seropositive. The parents of this patient were HIV-seronegative. Twenty-five (45.5%) had positive history of blood transfusion and 22 (40.0%) had intramuscular injections outside the teaching hospital setting.

Conclusion: The HIV-seropositive rate in this study is well below national estimates but highlights the continued risks of inadequate blood banking systems.

Mots clés : VIH, positivité, enfants, drépanocytose.

Résumé

Fond : La transfusion sanguine fait partie intégrale du traitement de la drépanocytose. La transfusion sanguine est également établie comme voie de la transmission du virus d'immunodéficit humain (VIH), particulièrement dans les pays en voie de développement qui manquent les services de transfusion sanguine proprement organisés.

Méthode : Une étude rétrospective des malades drépanocytose aléatoirement choisis et interviewés pour des anticorps de VIH dans la clinique pédiatrique de hématologie d'A.B.U.T.H., Zaria, Nigéria.

Résultats : Vingt-neuf (52,7%) mâles et 26 (47,3%) femelles ont été étudiés. L'âge moyen (écart type de ± 1) était de 68,5 ±37,0 mois. Un (1,8%) de 55 malades était VIH-séropositif. Les parents de ces malades étaient VIH-séropositifs. Vingt-cinq (45,5%) ont eu l'histoire positive de la transfusion sanguine et 22 (40,0%) ont eu des injections intramusculaires à l'extérieur de l'hôpital d'enseignement.

Introduction

Sickle cell anaemia (SCA) affects about 2% of Nigerians at birth and it is the commonest genetic disorder in the country and elsewhere.[1,2] It is an autosomal recessively inherited disorder resulting in a chronic, and frequently a life-threatening, anaemia that often requires red cell transfusion in its management.[3]

Included in the well known complications of blood transfusion in individuals living with SCA are iron overload, red cell alloimmunization and transmission of infections such as malaria, hepatitis B, hepatitis C and Human Immunodeficiency Virus (HIV).[4] The risk of HIV transmission by blood is determined by the HIV incidence in the donor population, the problem of seroconversion window (where the donor is infectious but seronegative) and

the availability and affordability of sensitive diagnostic capabilities. The risk of post-transfusion HIV infection in the developed countries is presently extremely low.[3,5] The reverse may obtain in the Third World countries.[6] The national prevalence of HIV infection in Nigeria is currently estimated to be about 5%[6] and blood transfusion is reportedly responsible for about 10% of HIV transmission.[3] It is suggested that blood transfusion is a major mean of HIV spread in parts of Nigeria.[6] In many countries not all donated blood are screened for all major infectious agents transmissible by blood transfusion.[3,7]

Children with SCA constitute a group that requires blood frequently. This descriptive study was, therefore, designed to estimate the prevalence of HIV infection in children with SCA in the paediatric haematology clinic of Ahmadu Bello University Teaching Hospital (ABUTH), Zaria, Nigeria.

Materials and Methods

Using the national average HIV prevalence of 5%[6] and the fact that children generally constitute about 14% of the infected human pool[8] a prevalence of 0.7% was assumed in children with SCA. Using the following formula[9] a minimum sample size of just 11 was obtained.

$$n = \frac{Z^2_{\alpha/2} \times p \times (1-p)}{d^2}$$

($Z_{\alpha/2}$, standard random variable = 1.96 at 95% confidence interval; d, degree of precision around prevalence = 5%)

As a result of the low derived sample size the authors decided to recruit a minimum of 50 children with sickle cell anaemia. With the use of ballot paper five patients with confirmed homozygous sickle cell disease genotype were randomly selected weekly at the paediatric haematology clinic of the hospital. The number of children with SCD attending the clinic each week is approximately 30. Children under 18 months of age were not considered for the study to make allowance for any possibility of passively transferred maternal HIV antibodies.

A study proforma was used to extract pertinent information from the patients and caregivers. The information extracted included age or date of birth if known, history of blood transfusion, history of intramuscular injections, history of hospital admission, parents' socioeconomic parameters, and some clinical features. After a pre-test counseling done by one of the investigators (MIK) and after obtaining informed consent from the caregivers, the patients were screened for HIV antibodies. Where the patient proved HIV-seropositive the parents were screened after pre-test counseling.

Abbott determine™ HIV1/2 in-vitro test strips were used for screening the blood samples. Each test strip is an immunochromatographic rapid test based on qualitative immunoassay in-vitro detection of HIV 1/2 antibodies in human serum, plasma or whole blood. The presence of antibodies to HIV-1/2 elicits a red colour change at patient's window of the test strip. The finger-stick method was used to collect whole blood from each patient. Each patient's middle finger was thoroughly cleaned with methylated spirit and povodine iodine-soaked swabs and allowed to dry. With the palmar side up, the pulp of the middle finger was gently pierced with a clean new lancet. Gentle intermittent pressure was applied from the base of the finger distally. The first drop of blood was wiped away with sterile gauze and subsequent drops were collected using an EDTA capillary tube.

About 50 µl of blood was collected and then applied to the test strip pad. The blood was allowed to be absorbed into the pad and a drop of chase buffer was added to the pad. The result was read after 15 to 60 minutes as follows: The presence of red bars in both the control and patient's windows was interpreted as a positive result. The sample result was interpreted as negative if a red bar was present only at the control window of the test strip. Result was considered invalid if no red bar was observed at the control window, even if present at the patient's window. In the event that the screening test was positive, Immunocomb® ELISA HIV-1/2 kit was used to confirm the diagnosis and identify the virus, according to the manufacturer's instruction.

Results

A total of 55 patients with genotype SS or SS+F were studied. The mean age (± 1 standard deviation) was 68.5±37.0 months with a range of 18-146 months. There were 29 (52.7%) males and 26 (47.3%) females giving a male to female ratio of 1.1. Thirty-one (56.4%) of the subjects had fathers with either secondary or tertiary education while 19 (34.5%) had mothers with similar education. Seventeen (30.9%) had fathers and 5 (9.1%) had mothers who held white-collar jobs such as lecturing.

Thirty (54.5%) children had history of previous hospital admissions with 29 (52.7%) admitted in ABUTH. Three (10.3%) of the 29 admitted in ABUTH also had admissions in other medical centres. Nineteen (63.3%) of the 30 children previously admitted had only one hospital admission in the past, 5 (16.7%) had two admissions, 4 (13.3%) had three admissions, and 2 (6.7%) had five.

Out of the 55 patients screened for HIV infection only one (1.8%) child, a 5-year old boy, proved seropositive. He was confirmed to have HIV-1 infection by Immunocomb® ELISA test. The parents of the child were HIV-seronegative.

Twenty-five (45.5%) children have positive history of blood transfusion, with 19 (31.7%) having only one previous blood transfusion. Only one (4.0%) had up to five blood transfusions in the past. The HIV seropositive boy had 3 blood transfusions, one of which was outside the teaching hospital. There were 39 instances of blood transfusions; 28 (71.8%) took place in ABUTH while 5 (12.8%) occurred in other hospitals. Two (3.6%) children had six episodes (15.4%) of blood transfusions in both ABUTH and

another hospital. Twenty-six (66.7%) of blood transfusions took place in the year 2000 or later while 7 (19.7%) were prior to the year 2000. In 6 (15.4%) instances the year the blood transfusion occurred could not be determined.

Twenty-two (40.0%) children had intramuscular injections administered outside the teaching hospital, in such places as chemist shops, patent medicine stores, private clinics and hospital. Two (3.6%) children had injections administered at home.

Discussion

This study has revealed a low HIV seropositivity rate of 1.8% in children with SCA in Zaria when compared to the national median estimate of 5% in the general population. This low rate is, however, unacceptable as it may portend great risk in this group of children. The parents of the lone HIV-seropositive patient in this study were themselves HIV-seronegative. The child has a positive history of intramuscular injections outside the teaching hospital setting, and had multiple blood transfusions (3) both in our teaching hospital and outside of it.

In Senegal, a 0% seropositivity rate was found among 155 patients with 41% blood transfusion antecedents.[10] The blood transfusion rate in the present group of sickle cell patients was similar at 44.4%. In the developed nations of the world the risk of transfusion-transmissible viral infection is primarily due to failure of serologic screening tests to detect recently infected blood donors in the pre-seroconversion "window" phase of infection.[11] In order to reduce this "window" period nucleic acid testing (NAT) techniques are beginning to find applications in developed countries.[11] The NAT techniques are complex, labourious, and presently time-consuming tests, and may take a while before getting to third world countries where HIV infection is prevalent. As a result serologic testing will remain the mainstay of screening blood donors.

Blood donation and transfusion programmes in the developing countries are mainly non-voluntary, remunerated, and family or family-replacement dependent.[3] This situation may pose significant risk of blood-transmissible infections, especially to individuals like sickle cell patients who require blood as integral part of their management. In an effort to address this situation the Regional Strategy for Blood Safety of World Health Organization (WHO) Regional Committee for Africa is aiming that by the year 2012 at least 80% of blood donations in member countries would be benevolent, voluntary and non-remunerated.[3] A blood donation and transfusion programme coordinated at national or zonal levels as being advocated by WHO[3,12] would probably go a long way to ensure adequate availability and improved access to high quality blood and blood products, especially in resource-poor settings.

In the interim, standards and guidelines for the use of blood and blood products would need re-evaluation and streamlining to minimize unnecessary blood transfusion with its attendant risks. Also, alternatives to chronic blood transfusion in sickle cell patients, like the use of hydroxyurea, [4] may need consideration in our setting. The singular HIV-seropositive boy is being followed up at the paediatric HIV clinic of our hospital after post-test counseling.

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