Original Article

# Prevalence of Human Immunodeficiency Virus Transmission among Transfused Children with Sickle Cell Anemia in Enugu Nigeria

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## Abstract

**Background:** There are a number of routes for human immuno-defi ciency virus (HIV) transmission in children. Blood transfusion-related HIV is still common in developing countries like Nigeria especially among high risk children such as those who require repeated blood transfusions. **Aim:** The aim of this study was to find the prevalence of HIV among transfused children with sickle cell anemia in Enugu. **Subjects and Methods:** This is a descriptive cross-sectional study conducted at the Sickle Cell Clinic of the University of Nigeria Teaching Hospital, Enugu Sixty-nine transfused children with SCA were enrolled after obtaining consent from their caregivers and assent from older children. Non transfused children matched for age, sex, and social status with the subjects served as control. Voluntary counseling and testing were then provided. Relevant data were obtained using pretested questionnaire. Statistical Package for Social Science (SPSS) version 11 (Chicago, IL) was used for data analysis. The chi-square was used to test for significant association of categorical variables and a *P*-value of less than 0.05 accepted as significant. **Results**: HIV antibodies were found in 2.9% (2/69) of the subjects and in 1.6% (1/64) of the control ($P = 0.604$). All the infected individuals among the subjects were males, had only been transfused once and were from the lower socioeconomic class. The only infected child from the control group was a 7-year-old male and he probably acquired it through vertical transmission since the mother also tested positive to HIV antibody. **Conclusions:** Blood transfusion is still a risk factor for HIV transmission among children with sickle cell anemia in Nigeria. Strategies that will ensure improved blood transfusion safety at health facilities need to be strengthened.

**Keywords:** Blood transfusion, HIV infection, Sickle cell anemia

## Introduction

The first reported case of pediatric acquired immune deficiency syndrome (AIDS) in Nigeria was in 1986 in a 13-year-old female hawker in Calabar, Cross River State.[1,2] Children can be infected with the human immuno-deficiency virus (HIV) through mother-to-child-transmission (MTCT), transfusion with contaminated blood or its products, sexual contacts, and the use of nonsterile sharp objects such as needles, blades and knives.[1] The most common route of HIV infection in the pediatric population is the MTCT.[1-3] However, HIV infection through blood transfusion remains a risk especially in developing countries.[1,4] In countries where blood products are regularly screened and clean syringes and needles are widely available, it is virtually the only source in young children.[5] Despite recommendations that all blood donors should be voluntary and nonremunerated, replacement donors are common throughout sub-Saharan Africa.[6] Voluntary donors are generally recruited through centralized systems whereas replacement donors are recruited by families and donate through hospitals.[6] HIV prevalence is higher among remunerated and replacement donors. A study done in South-eastern Nigeria reported a 10.6% HIV prevalence among private and commercial (paid) blood donors.[7]

After screening, HIV-1 has been reported to be transmitted in approximately 1 out of 60,000 transfused units.[8,9] In sub-Saharan Africa, an estimated 5-15% of HIV transmission is

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still attributable to unsafe blood transfusions[6,10] Patients with sickle cell anemia are prone to repeated blood transfusions due to the inherent sickling phenomenon that can lead to hemolysis and vaso-oclusive crises.[8] Thus, transfusion of blood and/or its products can be lifesaving.[8] However, in developing countries like Nigeria where sero-prevalence of HIV is already high and blood and blood products are transfused very often,[1,4,10] the risk of sickle cell anemia (SCA) patients contracting the virus through blood transfusion may not be insignificant. In a study involving transfused sickle cell anemia children in Congo, the estimated risk of HIV infection through blood transfusion was 26 per 1000 blood units.[11]

This study, therefore, seeks to determine the sero-prevalence of the human immuno-deficiency virus among transfused sickle cell anemia patients.

## Subjects and Methods

### Study area and population

The study was carried out at the sickle cell clinic of the Department of Paediatrics, University of Nigeria Teaching Hospital, (UNTH), Enugu between May and October 2005. The study population was transfused sickle cell anemia patients aged 18 months to 18 years as at last birthday. (SCA was diagnosed by hemoglobin electrophoresis.) Nontransfused patients with sickle cell anemia matched for age, sex, and socioeconomic status served as control. The socioeconomic status of the clients was determined using Oyedeji classification.[12]

Questionnaires were completed for the children after informed consent from their caregivers and voluntary confidential counseling. Assent was also obtained from the older children. The authors had previous exposure on HIV counseling. The information obtained included biodata, history of blood transfusion with specific emphasis on the number of transfusions, place where blood was obtained, place of transfusion, and whether or not pretransfusion HIV screening was carried out as well as the sexual history (consensual sex or sexual abuse in the past).

### Procedure

This is a descriptive cross-sectional study. Sixty-nine subjects with SCA, and history of blood transfusion whose caregivers gave informed consent were consecutively recruited for the study, while 64 nontransfused children with SCA served as control. Aliquot of 2.5 ml of blood was obtained from each of the participants and tested for HIV antibodies using the HIV SPOT TEST.[13] This rapid test kit had a sensitivity of the test was 100% and specificity 99.9%.[13] HIV positive blood samples were further tested using Western blot analysis and there were no discordant sera.

### Ethical approval

Ethical approval was obtained from the UNTH Ethical Committee before this study was undertaken.

Sample size:

Olatunji *et al*.,[14] in Lagos recorded an HIV prevalence of 4.5% in sickle cell anemia patients who have had blood transfusion. Allowing for 5% margin of error and 95% confidence interval, the minimum sample needed to be studied is determined using the formula:

$$n = z^2 \frac{P(100 - P)}{d^2}$$

where n = Minimum Sample Size

z = Confidence interval (1.96)

*P* = Prevalence of HIV in a previous study (4.52%)

d = Standard error 5%.

Substitution of the formula gave a minimum sample size of 67.

### Data management and analysis

The retrieved information was transferred into a private computer and passworded. Hard copies of answered questionnaires were securely locked in a private locker and destroyed after the study. Data were anonymized and questionnaires did not require the names of the subjects but were serially labeled. The statistical package for social sciences (SPSS) version 11.5 (Chicago, IL) was used for data analysis. The Chi-square test was used to test statistical significance of categorical variables and a *P* value of less than 0.05 was accepted as significant.

## Results

Sixty-nine subjects were recruited; 40 were males while 29 were females giving a male:female ratio of 1.38:1. Sixty-four (64) nontransfused SCA patients matched for age, sex, and social status served as control giving a male:female ratio of 0.8:1. There was no statistically significant difference in the sex distribution of the subject and control groups ($P = 0.144$).

The age range of the subjects and controls were 18 months to 18 years and there was no statistically significant difference in the age structure of both the subjects and control ($P = 0.604$) as shown in Table 1. The mean (SD) age of the subjects was 12.41 (4.49) years and that of the control 11.28 (4.96) years. Also, there was no statistically significant difference in the socioeconomic status of the subjects and controls ($P = 0.630$). The transfused children received between 1 and 10 units of blood with a mean transfusion rate of 2.5. Twenty-nine children of the 69 subjects (42%) received only a single transfusion, (23.2%, 16/69) received two transfusions and the rest more than two transfusions as shown in Table 2.

Out of the 69 subjects studied, two tested positive to the HIV

antibodies giving a prevalence of 2.9% (2/69) as shown in Table 3. Only one tested positive from the control group of 64 SCA patients giving a prevalence of 1.6% (1/64). There was no statistically significant difference in HIV prevalence between the two groups ($P = 0.604$). The two positive results among the subjects were males aged 13 years. In contrast, the only positive individual among the control group was a 7-year-old boy. There was no statistically significant difference in the proportion of the subject and control groups that were HIV positive ($P = 0.604$).

The two positive results in the subject group were from the lower socioeconomic class. Similarly the only positive result from the control group was also from the lower socioeconomic class. Forty-three of 69 transfused patients (62.3%) received blood from paid donors (touts) while 26.1% (18/69) received from first-degree relatives as shown in Figure 1. These children were not sexually active.

Forty-five of the 69 subjects (65.2%) subjects sourced transfused blood from the UNTH blood bank alone. The others sourced from a varied combination of the UNTH blood bank, private hospitals, and private laboratories while three individuals could not remember the source of the blood they received as shown in Figure 2. One of the two HIV-positive subjects received a prescreened transfusion while the other subject did not know if the blood he received was prescreened or not before the transfusion. They have been transfused only once. One of them was transfused at UNTH while the other was transfused in a private hospital. The only positive result from the control group was a 7-year-old boy. He was not sexually active and his mother was also positive for HIV antibodies and enrolled at the adult HIV clinic of the UNTH.

**Table 1: Age distribution of the study groups**

| Age group (years at last birthday) | Subjects (%) | Controls (%) | Total (%) |
|---|---|---|---|
| 1–6 | 9 (13.0) | 12 (18.8) | 21(15.8) |
| 7–12 | 22 (31.9) | 21(32.8) | 43 (32.3) |
| 13–18 | 38 (55.1) | 31 (48.4) | 69 (51.9) |
| Total | 69 (100) | 64 (100) | 133 (100) |

$\chi^2 = 0.990$, df = 2, $P = 0.604$. The age distribution of the subjects and control groups

**Table 2: Number of blood transfusion received by the subjects**

| No of transfusions received | *n* | % |
|---|---|---|
| 1 | 29 | 42 |
| 2 | 16 | 23.2 |
| >2 | 24 | 34.8 |
| Total | 69 | 100 |

A table showing the number of blood units received by the subjects

**Table 3: Prevalence of HIV infection among the study groups**

| HIV status | Subjects *n* (%) | Control *n* (%) | Total *n* (%) |
|---|---|---|---|
| Negative | 67 (97.1) | 63 (98.7) | 130 (97.7) |
| Positive | 2 (2.9) | 1 (1.6) | 3 (2.3) |
| Total | 69 (100) | 64 (100) | 133 (100) |

$\chi^2 = 0.2992$, df = 1, $P = 0.604$. The documented prevalence of HIV among the subjects and the control groups

## Discussion

This study showed an HIV sero-prevalence of 2.9% among the transfused subjects with SCA in Enugu. The two HIV-infected children were males and aged 13 years. The sero-prevalence of 2.9% among the subjects in this study is lower than the 4.52% reported by Olatunji *et al.*,[14] in Lagos. This may be because majority (65.2%) of our subjects sourced the blood for transfusion at the UNTH blood bank alone where a higher standard of ensuring safe blood transfusions is expected. Sexually active adults were included in the Lagos study and this may mean an additional risk factor for HIV transmission through sex. In contrast, the 1.6% sero-prevalence among the control group in this study is higher than the zero prevalence documented in Lagos. All the infected children in this study were males similar to the finding by Olatunji *et al.*,[14] in Lagos.

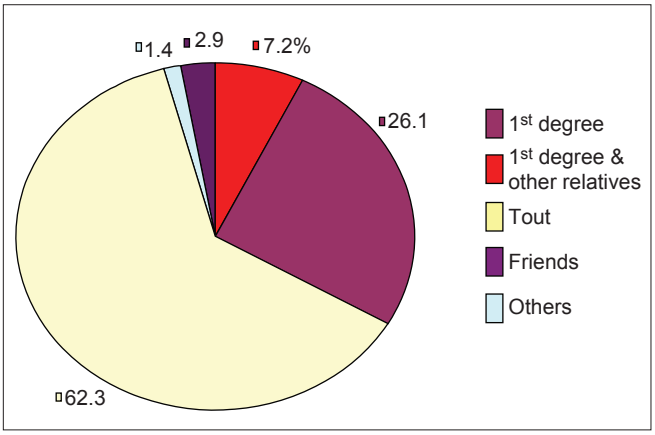


**Figure 1:** Donor source of the transfused blood. The sources of the donors of the various blood transfused to the subjects

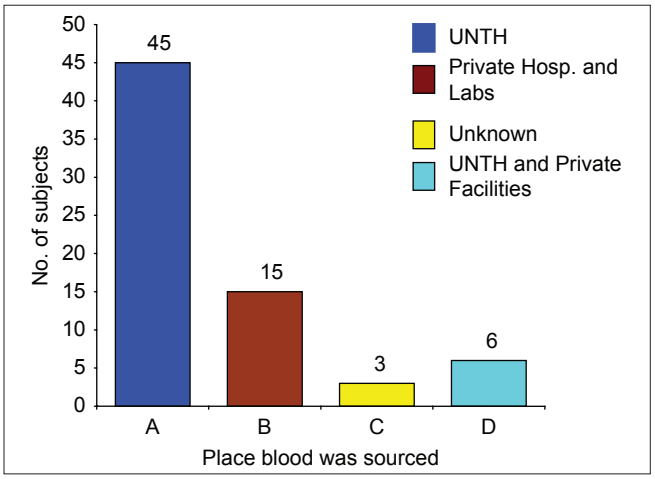


**Figure 2:** Source of transfused blood among the subjects, The health facilities where the transfused blood were obtained. A = UNTH; B = Private hospitals and laboratories; C = Unknown; D = A combination of UNTH and various private facilities

Blood transfusion remains a risk factor for HIV transmission among children in developing countries like Nigeria unlike in developed countries. This underscores the importance of low HIV prevalence in the general population from where donors are drawn and strict adherence to blood transfusion safety procedures in reducing transfusion related HIV infection. The noted prevalence in this study, however, is similar to the 1.6% documented by Al-Mahroos and Ebrahim[15] in Bahrain Island. However, there was a slight difference between their study population and the population in this study. They included children less than 18 months and individuals more than 18 years without excluding other routes of infections such as sexual intercourse. Furthermore, only HIV antibodies tests were used for even the children less than 18 months in their study. This means that HIV exposed but uninfected children may have been erroneously included in their study. These other routes of infection (sexual intercourse and MTCT) needed to have been explored because Bahrain has a very low HIV sero-positivity of 0.01% among its blood donors.[15,16]

The number of transfusions did not influence HIV prevalence in this study as the HIV-positive children had only been transfused once in the past. This is in contrast to the findings by Olatunji *et al.*,[14] in Lagos where all the infected individuals in their series had between four and six transfusions. It also contrasts with the findings by Al-Mahroos and Ebrahim in Bahrain[15] where the HIV-positive individuals in their series had higher mean number of transfusions (8.5) compared to 3.5 in the sero-negative individuals. The finding in this study highlights the importance of the transfusion of even a single unit of HIV tainted- blood in the transmission of HIV infection.

The transfused blood, among the HIV positive children in this study, was donated by paid donors otherwise known as "touts." This suggests that remunerated (commercial) donors are more likely to be infected with HIV than voluntary donors and agrees with findings documented in previous studies.[17-19] One of the positive individuals in this study received blood that was sourced and screened at the UNTH blood bank. This suggests that even in a tertiary care setting, blood transfusion may not be 100% safe especially since facilities such as antigen testing for detecting HIV early during the window period of infection are not universally available in our hospitals in Nigeria. This is similar to what Al-Mahroos and Ebrahim[15] found in Bahrain where one of their positive subjects received blood from a donor who tested negative for HIV at the time of blood donation but subsequently sero-converted to positive.

The HIV status of the donor in one of the HIV positive children in this study was unknown. Adejuyigbe *et al.*,[19] also found that 7 out of 12 caregivers of transfused HIV positive children in their study did not know the HIV status of the blood their wards received. This is a distressing reflection of the level of ignorance among our people. One of the positive individuals in this study was transfused at UNTH Enugu while the other one was transfused in a private hospital. In this study, therefore, the role of the place where transfusion took place in the etiology of infection is not clear when compared to the report of Adejuyigbe *et al.*,[19] who found that 11 out of 12 positive children who were transfused in their series were transfused in private hospitals.

The positive subjects in this study were not sexually active. None of the cited pieces of literature made efforts to exclude the possibility of HIV transmission through sex even among transfused older children. The only positive child in the control group was a 7-year-old boy. His mother also tested positive to HIV. It is possible; he contracted it through MTCT, though uncommon at his age. He might be one of the few that present later in the second peak of the bimodal peaks of AIDS manifestation following vertical transmission.[20-22]

## Conclusion

Blood transfusion is still a risk factor for HIV transmission among children with sickle cell anemia.

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