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Epidemiology of Acquired Immunodeficiency Syndrome in Children in Kinshasa, Zaire

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The Acquired Immunodeficiency Syndrome (AIDS) has emerged in this decade as a major, global health problem. Although adults have been particularly implicated due to transmission by sexual activities, children have also been falling victim in increasing numbers due to maternal-fetal transmission, blood transfusions and infection by unsterilized needles and syringes.

The first case of pediatric AIDS from Zaire was verified on 13 December 1983 (1). This was an 11 year old girl who was admitted to the Department of Pediatrics, Mama Yemo Hospital, with severe weightloss, chronic diarrhea, mycotic dermatitis, oral moniliasis and bronchopneumonia. She had previously received six blood transfusions. Between December 1983 and March 1984 two more cases of symptomatic AIDS in children were diagnosed at this institution. Following the recognition of AIDS cases, the Department of Public Health created a National AIDS Research Program inviting American and Belgian participation.

From November 1984 to March 1985 an HIV seroprevalence study was carried out in children, 2 - 14 years old, admitted to the Department of Pediatrics at Mama Yemo Hospital (2). Of 368 children hospitalized, 11% were seropositive whereas only 1% of 92 healthy siblings from the patients' families were seropositive. All HIV ELISA positive cases were confirmed by Western Blot test. Three factors were associated with seropositivity among hospitalized children; receipt of a blood transfusion prior to the current hospitalization, previous hospitalization and receipt of numerous medical injections during the past year. Of the 40 seropositive children, 24 (60%) had a blood transfusion. It is noteworthy that childhood vaccination histories were not associated with HIV seropositivity.

A second seroprevalence study was conducted from June 4 to August 23, 1985 (3). This study included 258 hospitalized infants, 2 - 14 months old, 191 outpatient infants, 1 - 20 months old and the mothers of both groups. The sera were tested by ELISA and confirmed by Western Blot. The results showed HIV seropositivity in 8% of the mothers from both groups, in 12% (12/102) of the hospitalized infants, 9 - 14 months old, in 8% (11/136) of the outpatient infants under 9 months old, in 13% (20/156) of the hospitalized infants, 9 - 14 months old and in 2% (1/55) of the outpatient infants, 2 - 24 months old. Of the seropositive infants, 61% had seropositive mothers thus indicating a high rate of vertical transmission.

The predispositions associated with seropositivity among hospitalized infants with seronegative mothers were: male sex, receipt of multiple lifetime medical injections, previous blood transfusion or prior hospital admission. Among seropositive infants who had not previously been transfused or hospitalized, there had been a significantly higher number of medical injections received as compared to the seronegative patients (a median of 34.5 vs 14.5). Five out of 16 seropositive infants from seronegative mothers had received 50 or more injections, whereas only 15 out of 219 (7%) seronegative infants had received 50 or more injections.

Six seropositive infants under 9 months old from the outpatient group were followed up after 6 months. Two remained seropositive whereas 4 had become seronegative. This was the first report, to our knowledge, indicating the possibility that infants born to seropositive mothers could become seronegative after a lapse of time due to the disappearance of maternal HIV antibodies.

These two initial seroprevalence studies in infants 1 - 24 months old and in children 2 - 14 years old singles out three important modes of transmission of AIDS in children, namely vertical transmission, blood transfusions and receipt of 50 or more lifetime medical injections.

In 1985, a seroprevalence study was carried out at the blood bank of Mama Yemo Hospital during which sera was obtained from 864 (51%) of the total 1,691 blood donors (4). Of the donors, 96.4% were male with a mean age of 32.1 years (median age, 31 years, range 18 - 59). There were 3 categories of donors: 52% were paid donors, 43% were family donors and 5% were volunteer donors. Fifty-four donors (6.3%) were seropositive. Seropositivity was not significantly associated with sex, age, occupation, ABO group or RH factor. Family members were 5.2% and paid donors 7.5% seropositive. This study revealed that the risk of HIV infection associated with blood transfusion is significantly higher in Zaire (25 - 37 times) than in the United States and has been the cause of HIV infection in approximately half of our hospitalized seropositive children.

Maternal-fetal transmission of AIDS has been subject to an epidemiological study among 8264 pregnant women attending two large maternities in Kinshasa (5). Seroprevalence testing indicated that 479 (6%) of the pregnant women were HIV seropositive. All newborns of these seropositive mothers were seropositive at birth, however, at one year of age, 50% of these infants became seronegative thus indicating that the seropositivity at birth was reflecting transfer of maternal antibodies and not fetal contamination.

The rapid spread of AIDS in malaria endemic areas has raised concern about the potential mechanisms of the interaction between the two diseases (6). As malaria is the major cause of anemia in Zaire and as blood transfusion are often considered an essential treatment for children with severe *Plasmodium falciparum* infection, 167 hospitalized children were investigated, 112 (67%) of whom had malaria and 78 (47%) of these had received transfusion during the current hospitalization.

Twenty-one (13%) of the total group were HIV seropositive including 11 (11%) of the 112 malaria patients. Of the 78 malaria patients who had received transfusion during the current hospitalization, 10 (21%) were seropositive. Of the 55 non-malaria patients, 10 (18%) had received transfusion and 3 (30%) of these were HIV seropositive whereas 7 (16%) without transfusion were HIV seropositive. Pretransfusion specimens were available for 4 seropositive children and these were all seronegative. Of all blood transfusion, 87% were administered to malaria patients and there was a strong dose-response association between the number of transfusion and HIV seropositivity.

Two complimentary studies designed to evaluate the associated of *Plasmodium falciparum* malaria and AIDS in children was carried out from May - July 1986 (7). The purpose of Study A was to see whether HIV infection increases the risk of severe malaria.

This was tested by comparing the prevalence of HIV infection in selected children with symptomatic *Plasmodium falciparum* malaria of varying degrees of severity with asymptomatic children.

A total of 333 children, 9 months - 12 years, were enrolled in the study. Among 164 symptomatic children infected with *Plasmodium falciparum* 59 (36%) had severe malaria and 105 had non severe malaria. The HIV seropositivity rates of the symptomatic (1.2%) and healthy children (0.6%) were not significantly different. The three seropositive children had previously received blood transfusions.

Study B was designed to see whether HIV infection increases the risk of *Plasmodium falciparum* infection, symptomatic or not, by examining the prevalence of *Plasmodium falciparum* infections and HIV seropositivity in a large, unselected sample of children presenting at the hospital. Of 1046 patients, age 1 month to 13 years, 540 (51%) had positive *Plasmodium falciparum* blood smears. Forty (3.8%) of the children were HIV seropositive, 23 (57%) of whom had received previous blood transfusions. HIV seropositive children had a lower malaria slide positivity rate than the seronegative children (37.5% vs 52.2%).

This study found no direct, facilitating interaction between HIV seropositivity and *Plasmodium falciparum* malaria. HIV seropositivity was highest in the under 6 month old group and in the older children with a history of blood transfusion. These results confirm vertical transmission and blood transfusions as the dominant modes of HIV transmission in children.

Blood transfusions have been recognized as an important mode of AIDS transmission in children in Kinshasa. With the emergence of chloroquine resistant falciparum, the number of transfusions in children reached an all time high in 1986. The authors began an educational campaign and set guidelines in order to reduce the number of blood transfusions. To our knowledge, this marks the first such effort to combat AIDS transmission via blood transfusions (8). Conferences on the inherent dangers of AIDS were held for the medical staff and for the Zairian Society of Pediatrics. It was recommended that blood transfusions be reserved only for children with a hemoglobin of less than 5 gm% as studies have shown that children above this limit are not hemodynamically compromised. In addition, an HIV screening unit was installed at the blood bank in order to verify HIV infection before transfusion. These efforts proved effective as the number of transfusions decreased from 16,352 in 1986 to 4,531 in 1987 and to 3,035 in 1988.

It is most interesting to note that not only was there no increase in mortality due to reducing the number of transfusions, but there was a significant decrease in transfusion-related complications and accidents. The incidence of transfusion-related diseases, such as cytomegalovirus infection, hepatitis B and malaria, were correspondingly reduced. These results demonstrated the existence of a large number of unnecessary transfusions and indicates that a world-wide campaign following this model and coupled with HIV screening of blood before transfusion, can be a major contribution towards curbing the transmission of AIDS to children.

Summary

Acquired Immunodeficiency Syndrome has emerged in this decade as an important public health hazard. In Kinshasa, Zaire, the first pediatric case was verified in December, 1983. A series of seroprevalence studies has revealed that the transmission of AIDS to children has been primarily due to maternal fetal transmission, blood transfusions and contaminated needles and syringes. While vertical transmission was more predominant in the under 2 year age group, blood transfusions were strongly implicated

dren. No facilitating interaction was found between malaria and AIDS in children. A campaign to reduce the number of blood transfusions given to children presenting with malaria induced anemia had dramatic results. The number of transfusions decreased from 16,352 in 1986 to 3035 in 1988. This reduction coupled with the installation of an HIV screening unit at the blood bank marks the first such effort to reduce transfusion related AIDS in children.

Key words

AIDS, epidemiology, malaria, children, Africa.

Zusammenfassung

Die Epidemiologie des erworbenen Immundefizienzsyndroms bei Kindern in Kinshasa, Zaire

Das erworbene Immundefizienzsyndrom wurde in der letzten Dekade zu einer großen Gefahr für das öffentliche Gesundheitswesen. In Kinshasa, Zaire, wurde der erste pädiatrische Fall im Dezember 1983 bestätigt. Verschiedene Seroprävalenz-Studien zeigten, daß die Übertragung von AIDS auf Kinder hauptsächlich auf fetomaternale Transmission, Bluttransfusionen und kontaminierte Nadeln und Spritzen zurückzuführen war. Während die vertikale Transmission in der Gruppe der unter zweijährigen Kinder vorherrschte, waren bei älteren Kindern Bluttransfusionen die Hauptursache. Begünstigende Interaktionen zwischen AIDS und Malaria bei Kindern wurden nicht festgestellt. Eine Kampagne mit dem Ziel, die Anzahl der Bluttransfusionen bei Kindern mit malariebedingter Anämie zu verhindern, brachte dramatische Erfolge. Die Zahl der durchgeführten Bluttransfusionen sank von 16.352 im Jahre 1986 auf 3035 im Jahre 1988. Diese Reduktion, verbunden mit der Einführung eines HIV Screenings in der Blutbank, war ein wichtiger Schritt, um transfusionsbedingte AIDS-Infektionen bei Kindern zu verhindern.

Schlüsselwörter

AIDS, Epidemiologie, Malaria, Kinder, Afrika.

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