

Human immunodeficiency seropositivity among mother-child pairs in South West Nigeria: A community-based survey

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Summary

A community based survey to determine the prevalence of human immunodeficiency infection in Nigerian women and children in South Western Nigeria is reported. A multi-stage cluster random sampling procedure was used to select mother-child pairs from 35 enumeration areas in South western Nigeria. The final study sample consisted of 460 mothers and 476 children (including 16 sets of twins). A commercially available recombinant antigen-based ELISA method was used to test for HIV-1 and HIV-2 antibody in sera and Western blotting was used as a confirmatory test for initially reactive samples. Only one mother-child pair (out of 460 mother-child pairs) was found to be positive for HIV antibody giving a mother-child concordance for HIV infection of 0.22%. Antibody to either HIV-1 or HIV-2 was detected in 3.8% (18/476) of the children's sera and in 4.3% (20/460) of mothers sera. HIV-1 reactivity was commoner than HIV-2 reactivity (2.9% versus 0.8% among children and 2.8% versus 1.5% among mothers). There were many more positive samples in the rural than in urban areas among children (7.1% versus 1.1%) and also among mothers (6.8% versus 2.4%), ($p < 0.001$). Thus, HIV infection appears to be a real problem in South western Nigeria. The lack of concordance between mother-child sera suggests that vertical transmission may not be a major route of transmission of HIV infection in children in South western Nigeria. It is suggested that certain high risk practices (such as the re-use of unsterilised hypodermic needles for injections and surgical knives in local scarification) which are common practices, especially in rural areas, need to be investigated as potential major modes of transmission of the infection. Control programmes need to take note of these findings in order to adequately plan comprehensive health education which will cover the whole population, including children.

Keywords: HIV-1, HIV-2, Seropositivity, Children, Nigeria.

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Résumé

Une étude basée sur la communauté pour déterminer la prévalence de l'infection immunodéficitaire chez les femmes et les enfants nigériens dans le Sud-ouest du Nigéria est rapportée. Une procédure d'échantillonnage vasculaire à plusieurs niveaux fait au hasard a été utilisée pour sélectionner les paires mères - enfant à partir de 35 zones d'énumération dans le Sud-ouest du Nigéria. L'échantillon final d'étude comprenait 460 mères et 476 enfants (y compris 16 paires de jumeaux). Une méthode commercialement disponible basée sur l'antigène recombinant ELISA a été utilisée pour tester, pour les anticorps HIV - 1 et HIV - 2 dans les séreux et le lâchant occidental a été utilisé comme un test de confirmation pour les échantillons initialement réactifs. On a trouvé une seule paire mère - enfant (sur 460 paires) qui était positive pour l'anticorps HIV donnant une concordance mère - enfant pour l'infection de HIV 1 de 0.22%. L'anticorps pour soit HIV - 1 soit HIV - 2 a été détecté chez 3,8% (18/476) des séreux d'enfants et dans 4,3% (20/460) des séreux des mères. La réactivité de HIV - 1 était plus répandue que celle de HIV-2 (2,9% contre 0,8% chez les enfants et 2,8% contre 1,5% chez les mères). Il y avait beaucoup plus d'échantillons positifs dans les zones rurales qu'urbaines chez les enfants (7,1% contre 1,1%) ainsi que chez les mères (6,8% contre 2,4%) ($p < 0,001$). Par conséquent, l'infection HIV apparaît être un problème réel dans le Sud-ouest du Nigéria. Le manque de concordance entre les séreux mère - enfant suggère qu'une transmission verticale ne serait pas une route de transmission majeure de l'infection HIV chez les enfants dans le Sud-ouest du Nigeria. On peut suggérer certaines pratiques à hauts risques (tels la réutilisation des seringues hypodermiques non stérilisées pour les injections et les couteaux de chirurgie dans la scarification locale) qui sont des pratiques communes, spécialement dans les zones rurales, doivent être l'objet d'enquêtes comme des modes majeurs potentiels de transmission de l'infection. Les programmes de contrôles doivent tenir compte de ces conclusions pour planifier sérieusement une éducation complète sur la santé qui couvrira la population entière, y compris

sample was centrifuged at 3000 rpm for 15 minutes and the sera were separated using automatic micropipette with sterile tips. One tip was used per sample to prevent cross contamination during the process of serum transfer to pre-labelled pilot containers according to the mother-child pair number codes. After separation, the sera were stored at -20°C in aliquots: pending analysis.

Laboratory methods

Sera were initially screened for the presence or absence of HIV-1 or HIV-2 antibodies using commercially available recombinant antigen-based ELISA (Welcozyme HIV/2, Murex Diagnostic Ltd, Dartford, England). The test detects antibodies to either or both viruses at the same time. Sera that were reactive for HIV antibody in the initial screening assay were retested using a rapid dot ELISA (Abbott HIV 1/2 Test Pack, Laboratories Abbott, France). This test distinguishes between antibodies to HIV-1 and HIV-2. All repeatedly reactive and some randomly selected negative sera were then subjected to further analysis to establish presence of specific antibodies to HIV-1 (Bio-Rad Novapath HIV-1 immunoblot, Bio-Rad, France) or HIV-2 (ELAVIA HIV-2 Immunoblot, Diagnostic Pasteur, France) proteins in each serum sample by immunoblotting (Western blotting) technique. Criteria used for HIV-1 or HIV-2 or dual reactivity were as described previously³.

Results

Antibody to either HIV-1 or HIV-2 was detected in 4.1% (38/936) of the entire study population. No individual was reactive to both HIV-1 and HIV-2. Overall, 20(4.3%) of the 460 sera collected from mothers were reactive for HIV antibodies (HIV-1 = 13, HIV-2 = 7), while 18 out of 476 3.8% of the children sera tested had HIV antibodies (HIV-1 =14, HIV-2=4, Overall, only one pair of sera from a mother and her 5 year old daughter was positive for HIV-1 antibody. There was no association between HIV seropositivity in mothers and HIV seropositivity in children in this study (McNemar's corrected $X^2=0.03$, $p=0.868$). Of all the sera from 16 sets of

Table 1 Concordance in HIV seropositivity between mother-child pairs in south-west Nigeria

	Child*	
	+	-
Mother	1	19
	17	423

McNemar corrected chi square = 0.03, p = 0.868

Concordance for HIV infection = 1/460 = 0.22%

*Each set of twins counted as one child for this paired analysis.

Table 2 Rural-urban differences in HIV seropositivity in South West Nigeria

	Rural (%)	Urban (%)	†p
Mothers (n=460)	n=206	n=254	
HIV-1 seropositivity	3.9	2.0	0.264
HIV-2 seropositivity	2.9	0.4	0.049*
HIV-1 or HIV-2 seropositivity	6.8	2.4	0.023*
Children (n=476)	n=211	n=265	
HIV-1 seropositivity	5.2	1.1	0.012*
HIV-2 seropositivity	1.9	0.0	-
HIV-1 or HIV-2 seropositivity	7.1	1.1	0.001*

†Fisher exact test

*p<0.05

twins included in this study, only one child of a pair was positive for HIV-1 antibody, all the others were negative for either HIV-1 or HIV-2 antibody.

The prevalence of HIV seropositivity was higher in rural areas compared with urban centres (Table 2) and this association was statistically significant ($X^2=14.87$, $p<0.001$). There were 6/254 (2.4%) mothers and 3/265 (1.1%) children that were positive for either virus in the urban sites whereas 14/206 (6.8%) mothers and 15/211 (7.1%) children were positive for either virus in the rural areas. The prevalence of HIV-1 seropositivity was higher than that of HIV-2 in both rural and urban areas (Table 2). Age-specific analysis of HIV infection showed that none of the 10 children below 6 months included in this study was positive for HIV-1 or HIV-2 antibody. The prevalence of HIV-1 and HIV-2 infection was similar among children 7 months to 72 months old (Table 3).

Table 3 Age distribution of children tested for HIV-1 and HIV-2 seropositivity in South-West Nigeria.

Age(months)	Number tested	Seropositivity		
		HIV-1 n(%)	HIV-2 n(%)	Total HIV-1&2 n(%)
<6	10	0(0.0)	0(0.0)	0(0.0)
7-24	82	2(2.4)	1(1.2)	3(3.7)
25-48	203	6(3.0)	2(1.0)	8(3.9)
49-72	181	6(3.3)	1(0.6)	7(3.9)
Total	476	14(2.9)	4(0.8)	18(3.8)

Discussion

The existence of the human immunodeficiency virus in Nigeria has been well established^{1,5,6} and both HIV-1 and HIV-2 have been isolated from infected individuals in this country^{2,3}. However, Nigeria has always been thought of as one of the countries with low prevalence and was considered to be in the pre-epidemic phase as at 1988.⁷ In

1992, the Federal Ministry of Health from its sentinel site surveillance programme estimated that the prevalence of HIV infection in the country ranged from 1.2% among antenatal patients to 17.5% among commercial sex workers.¹ Olaleye *et al*, however, demonstrated from sera collected between 1985-1990 that the prevalence of HIV-1 infection was 2.0% and that for HIV-2 infection 1.3% among a heterogeneous group made up of commercial sex workers, blood donors, tuberculosis patients, patients with sexually transmitted diseases and health care workers. The figures from the present study are higher than any of these previous figures. While there are major differences in study design, the time interval between the last study and this one (1990-1993) argues for expecting higher figures if spread of the infection in the community has continued unabated. Since stringent laboratory quality control measures were utilised in this study, laboratory errors are unlikely to explain the findings. Thus, we think these figures are a true reflection of the problem in the community. As far as can be established, this is the first major community study to determine the magnitude of HIV-1 and HIV-2 infection among children in Nigeria.

While in adults in sub Saharan Africa, the major route of infection has been demonstrated to be heterosexual contact, vertical transmission is believed to be the main mode of acquisition in children. The lack of mother-child concordance for HIV reactivity in this study suggests that vertical transmission may not have the main mode of transmission to children in the area studied at the time of the study. Other Nigerian studies of paediatric HIV infection among hospitalised children in Enugu⁹ suggested that vertical mode of infection was responsible in 30% of 63 HIV-positive children while another study of malnourished children in Ibadan¹⁰ could prove vertical transmission in only 20% of 10 seropositive children. On the other hand, a study of hospitalised children in Jos¹¹ showed vertical transmission in 69.6% of 23 HIV-infected children. Thus, there seems to be considerable heterogeneity in the proportion of paediatric HIV infection attributable to vertical transmission. The frequency of blood transfusion in the general population is too low to account for the figures in this study and other modes of transmission should be considered. It is known that unqualified people ("quacks") administer injections with unsterilised needles and that they may use the same needle for several people. These practices are more common in rural areas, partly because of limited access to the formal health system, unrestricted sale of across-the-counter drugs and relative rarity of law enforcement agencies. While the risk from intramuscular injections is low, it should be noted that contaminated needles have been shown to be a major vector for spreading HIV-1 among hospitalised children in Romania.⁸ In

addition, certain cultural practices that may favour the spread of HIV infection are practised. For example, circumcision is still routinely carried out in south west Nigeria and the traditional "surgeon" is often called upon to make scarification on the child's body as protection against convulsions. In addition, the incision of tribal marks on children's faces is still widely practised. In these procedures, "sterilisation" between patients and after the day's work may only go as far as washing the knives clean of obvious blood stains. These cultural practices are more common in rural areas. We hypothesise that these factors (use of unsterilised needles in giving injections and cultural practices) may be important modes of transmission of HIV infection in children in south west Nigeria. The observation that the infection is commoner in rural areas will be consistent with this hypothesis. However, more work is needed to confirm this hypothesis. If, indeed, these probable modes of transmission are shown to be important, the implications for HIV control are obvious. Although the "local surgeons" knives and unsterilised needles are mentioned on education posters as potential routes of infection for HIV and AIDS, not enough emphasis is laid on the extent of this potential danger. Drug hawkers and quacks are only mentioned with respect to the health hazards posed by the distribution of dangerous and expired drugs and not HIV infection that could be acquired through their injections and other surgical procedures. The emphasis in health education may need to be modified as far as HIV prevention in children is concerned.

One important limitation of surveys is that they provide only a snap shot of the situation at the time the survey was undertaken. They are less useful in monitoring trends. Despite this limitation, however, they remain very useful in situations where population-based routine disease surveillance systems fall short of the optimum (as occurs in most of Africa). Surveys can be repeated periodically and the results compared with previous ones. We believe that this work provides a baseline against which future surveys can be compared in assessing the impact of HIV infection on the Nigerian population.

Whilst AIDS and HIV infection is world wide, its epidemiology is known to vary from place to place and may vary from location to location within the same country. It is the complete compilation and understanding of HIV/AIDS microepidemiology within a country that may provide an effective tool for its prevention and control. Since health education remains the most powerful tool against HIV infection, provision of the epidemiological data needed for the design of effective intervention programmes (especially with respect to risk factors) should receive the highest priority.

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