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 Nigerin 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 antihody 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 motherchild 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 sern. IIIV-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 urhan areas among children (7.1% versus 1.1%) and also among mothers (6.8% versus 2.4%), (p<0.001). Thus, IIIV 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 IIIV 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 arcas, 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: 1111/-1, H11/-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 nigérians dans le Sud-ouest du Nigéria est rapportée. Une procédure d'échantillonage vasculaire à phisicurs 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 ELIS a été utilisée pour tester, pour les anticorps HIV - 1 et HIV - 2 dans les séreux et le tâchant occidental a été utilisé comme un test de confirmation pour les échantilons initiallements réactifs. On a trouve une scule paire mère - enfant (sur 460 paires) qui était positive pour l'anticorps HIV donnant une concordance mère - enfant pour l'infection de IIIV 1 de 0.22%. L'anticorps pour soit HIV - 1 soit IIIV - 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 IIIV-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 conséquence, l'infection IIIV apparait être un problème réal dans le Sud-ouest du Nigéria. Le manque de concordance entre les séreux mère - enfant suggére qu'une transmission verticale ne serait pas une route de transmission majeure de l'infection IIIV 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 coutenux de chirurgie dans la scarification locale) qui sont des pratiques communes, specialement dans les zones rurales, doivent être l'objet d'enquêtes comme des modes majeurs potentiels de transmission de l'infection. Les progranunes de contrôles doivent tenir compte de ces conclusions pour plantifier sérieusement une éducation complète sur la santé qui couvrira la population enlière, y compris

les enfants.

Introduction

Human immunodeficiency virus (IIIV) infection has become an important public health problem world wide. In some developing countries, however, adequate data on the prevalence, incidence and major modes of transmission are incomplete thereby making planning difficult and the implementation of prevention programmes ineffective. In Nigeria, the Federal Ministry of Health and Social Services has adopted a system of sentinel site surveillance in which pregnant women attending antenatal clinics, STD patients, TB patients and commercial sex workers are screened at each sentinel site. The prevatence of HIV infections in Nigeria by this method as at 1991 has ranged between 1.2% among antenatal patients and 17.5% among commercial sex workers.1 Although this system addresses high-risk groups, it does not give any clue about population figures and does not include the paediatric age group. Shokunbi and colleagues2 have reported a prevalence of 0.84% in blood donors, 1.23% in international travellers and 1.48% in hospital patients but these figures are rather old as they apply to the period 1987-1988. Other workers found a prevalence of 2.0% for HIV-1 and 1.3% for HIV-2 for the period 1985-1990 in a mixed group of female commercial sex workers, blood donors, hospital patients with tuberculosis or sexually transmitted disease and health care workers.3 A more recent report presented prevalence figures among unselected pregnant women 1 However, no reliable population figures on HIV infection in Nigeria are known to exist. Those studies that have been done have not specifically addressed IIIV infection in children although there has been a report of paediatric AIDS in Nigeria5 and the first AIDS case in Nigeria was in a 13 year old sexually active girl.1 The importance of such figures cannot be overestimated as they are vital for programme planning and for projections of disease burden in the population.

The occasion of a national micronutrient survey presented an opportunity to study HIV seropositivity in mother-child pairs in order to provide population-based data on HIV infection in mothers and preschool children in south western Nigeria. This communication presents our findings.

Subjects and methods

The opportunity for this study was provided by a nation-wide micronutrient survey in 1993 and this study was nested in the micronutrient survey. Sampled localities were drawn from the national master sample for the National Integrated Survey of Households (NISH) implemented by the Federal Office of Statistics as part of

the United Nations Household Survey Capability Programme. Nigeria is divided into four health zones: south east, south west, north east and north west. This study was carried out in the south west (B) zone. A multistage cluster sampling procedure was used to select study subjects. The enumeration area (EA), which is a geographically defined area, was the unit of sampling. All the EAs in the south west zone (B) were stratified into rural, periurban and urban. Twelve EAs were selected by a systematic random sampling procedure to represent urban, periurban and rural in a ratio proportional to the population in these areas. Thirty-five (35) households were randomly selected from a list of all children aged 6-71 months in each household. In a situation where there exists more than one pre-school child in the household, the child with the earliest birthday and month then qualifies. Where the chosen child is one of twins, both twins are included in the study. The children selected by a rundom procedure from two other EAs which were used for the pilot and operations research studies of the micronutrient survey are also included in this report, making a total of 14 EAs. The location of these 14 EAs are shown in the figure.

Data collection

Demographic information was collected on the age, education and occupation of the mother, household head, number of children and those that were under-six years of age in the household. Venupuncture was carried out on each subject under strict asepsis. The blood was then transferred into vacutainer tubes and allowed to clot at the room temperature. The tubes were subsequently kept at 4°C until separation of sera in the laboratory. Each

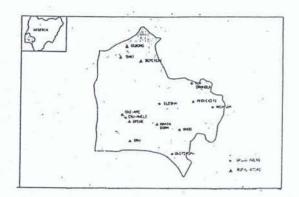


Fig. Map: South West Nigeria showing selected enumeration areas in the study

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 IIIV-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 IIIV-1 and IIIV-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 IIIV antibodies (HIV-1 = 13, HIV-2 = 7), while 18 out of 476 3.8%) of the children sera tested had IIIV antibodies (IIIV-1 =14, IIIV-2=4, Overall, only one pair of sera from a mother and her 5 year old daughter was positive for IIIV-1 antibody. There was no association between IIIV scropositivity in mothers and HIV scropositivity in children in this study (McNemar's corrected X²=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

| | | C | hild* | | | |
|--------|---|----|-------|---|-----|--|
| | | + | - | | | |
| - | + | 1 | 19 | 1 | | |
| Mother | - | 17 | 423 | | 5.3 | |

McNemar corrected chi square = 0.03, p = 0.868Concordance for HIV infection = 1/460 = 0.22%

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

| | Rural (%) | Urban (%) | †p |
|-------------------------------|--------------|--------------|--------|
| Mothers (n=460) | n=206 | n=254 | 1 |
| HIV-1 seropositivity | 3.9 | 2.0 | 0.264 |
| HIV-2 scropositivity | 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 | FC-45 |
| 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 scropositivity was higher in rural areas compared with urban centres (Table 2) and this association was statistically significant (X²=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 n 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.

| | 76 | Seropositivity | | | |
|-----------|------------------------|----------------|---------------|-----------------------|--|
| Age(mont) | ns) Number tested n | HIV-1 n(%) | ПIV-2 п(%) | 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 countrhy 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

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

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. Olaleye et aP, 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 HIVpositive 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. 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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