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Estimation of the rate of mother to child transmission of HIV in Nigeria

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Summary

Definitive diagnosis of HIV infection in infants <18 months of age who were born to HIV-infected mothers is still posing some difficulty in Nigeria and other developing countries. Within this age definitive diagnosis can only be carried out by antigen based techniques which are indeed not available in these developing countries. This has resulted in the absence of authoritative data on the rate of mother-to-child transmission in these countries. Nigeria inclusive. The present pilot study was therefore carried out to generate some information on the rate of mother to child transmission in Nigeria using the PCR technique. Plasma samples were obtained from 68 children of both sexes less than 18 months of age and who were born to HIV infected mothers. The samples were collected from two pediatric departments, in Lagos and in Benin. The presence of HIV 1 RNA in each of the samples, was determined using the Amplicor Monitor V.1.5 technique (Roche Diagnostics). Data showed that HIV-1 RNA was detected in 15 of the 68 samples tested. This gave an HIV-1 RNA detection rate of 22%. Among women who had some intervention, the rate of transmission of infection was 11% while the rate among those without intervention was 30%. The 22% transmission rate recorded in this study is close to the range of 25 to 35% that has been reported in several developed and a few developing countries. A multicenter nationwide study will still be needed to determine the national mother to child transmission rate in Nigeria.

Keywords: HIV/AIDS, mother, child, transmission, diagnosis

Résumé

Le diagnostic définitif de l'infection du VIH chez les enfants de moins de 18 mois nés des mères infectées reste un problème au Nigéria et dans d'autres pays sous développés. Ce diagnostic peut être seulement faite à base des techniques antigéniques qui ne sont pas disponibles dans ces pays. Ceci a conduit au manque des données autoritaires sur le taux de transmission de mère à l'enfant. Cette étude pilote avait pour but de générer des

informations sur ce taux au Nigéria en utilisant les techniques du PCR. Les échantillons de plasma étaient obtenus de 68 enfants des 2 sexes, de moins de 18 mois et des mères infectées dans deux départements de pédiatrie de l'état de Lagos et de Bénin au Nigéria. La présence des ARN du HIV type 1 était déterminé par la technique de l'Amplicor Monitor V 1.5. Les résultats démontraient que 22% (15) des échantillons avaient le VIH type 1. Parmi les mères qui avaient une intervention quelconque, le taux de transmission était de 11% tandis que celles sans aucune intervention étaient de 30%. Le taux de transmission de 22% enregistré est compris entre l'intervalle de 25-35% reportés dans plusieurs pays sous développés et quelques pays développés. Une étude nationale dans multiples centres est recommandé pour déterminer le taux national de transmission du VIH de la mère à l'enfant.

Introduction

More than five million children under the age of 15 years have acquired HIV since the AIDS epidemic began, and almost four million of them have already died of AIDS globally [1]. The World Health Organization estimated that 3 million children were living with HIV infection at the end of 2003, the vast majority infected through mother-to-child transmission (MTCT). [2]. Sub-saharan Africa is home to 90% of the world's HIV infected children. Most of the 580,000 children under the age of 15 who died of HIV/AIDS in 2001 were African [3]. A declaration by the United Nations General Assembly Special Session on HIV/AIDS in June 2001 determined to reduce the proportion of infants infected with HIV by 20% by 2005 and 50% by 2010 [3]. It is therefore important to know the current rate of MTCT in Nigeria in order to determine the level of reduction by 2005 or 2010.

Definitive diagnosis of HIV infection in infants less than 18 months of age who were born to HIV-infected mothers is still posing some difficulty in Nigeria and other developing countries. In these infants, definitive diagnosis can only be carried out by antigen based techniques which are expensive and not widely available in these developing countries. This has resulted in the absence of authoritative data on the rate of mother-to-child transmission in most of these countries, including Nigeria. This

pilot study was therefore carried out to generate some information on the rate of mother to child transmission in Nigeria using the PCR technique.

Materials and method

This was a cross sectional hospital based study carried out between June and July 2003. The study was carried out at the Lagos University Teaching Hospital (LUTH) Lagos, and the Federal Staff Clinic Benin, Edo State both in Nigeria. The study population consisted of 68 children under 18 months of age who were born to mothers who had tested positive for HIV-1 and who consented to be enrolled in the study. Out of the 68 mothers who had babies, only 6 (9%) of the mothers were on HAART (Lamivudine, Stavudine and Nevirapine) before delivery while another 22 (32%) had nevirapine administration at onset of labour. 31 (46%) babies also had oral nevirapine within 72 hrs of delivery but 3 of them were from mothers who did not have any form of intervention. Babies and mothers who had no intervention were mostly those that visited health facilities where this service is not rendered. After delivery, these babies were referred to the paediatric department of these hospitals for proper management and follow-up. Perinatal exposure was confirmed by serology using Genie II (HIV-1/HIV-2) kit and they were all found to be positive. The sensitivity and specificity of the Genie II as reported by the manufacturers are both 100%. About 5ml of blood was collected from each child into EDTA bottles. Within 4hrs of collection of samples the plasma was separated and stored at -70°C until assayed for viral load using the Amplicor Monitor Version 1.5 (Roche Diagnostics). Version 1.5 of the Amplicor Monitor have been reported by the manufacturers to have a sensitivity of 98.9%. Statistical analysis was done by EPI INFO V6.04.

Result

Out of the 68 children studied, 38 (56%) were males, 30 (44%) were females and their birth weights ranged from 2.3 - 4.2kg with a median of 3.2kg. All subjects were within an age range of between 2 to 18 months with a mean age of 10 months. The median gestational age of the babies at delivery was 38 weeks and 52 of the babies were born at full term however, the relative risk of acquiring infection as a preterm was 4.88 (95% CI, 2.05-11.61) (Table 1). Overall, 47 (69%) of the babies were delivered vaginally while 21 (31%) babies were delivered by cesarean sections giving a relative risk of acquiring infection as 1.79 (95% CI, 0.56-5.68). At the time of enrollment of these babies, 39 (74%) were being exclusively breast fed while 26 (38%) were being fed by milk substitutes and 3 (4%) accounted for mixed feeding.

The rate of MTCT among the 28 mothers who had intervention was 11% as 3 of their babies were infected whereas the MTCT rate of the 40 women without intervention, was 30% as 12 of their children were infected. Hence, the efficacy of the intervention was 64% (Table 2). However, 5 (16%) of the 31 children who were adminis-

tered oral nevirapine were also infected as against 10 (27%) of the 37 babies without any oral nevirapine intervention bringing the efficacy of the intervention to 40%. Data showed that HIV-1 RNA was detected in 15 of the 68 samples tested. This gave an HIV-1 RNA detection rate of 22%. The interquartile range (IQR) for the viral load was between 4.2-6.6 log copies with a median of 6.6 HIV-1 RNA log copies/ml.

Table 1: Association of HIV infection with gestational age, mode of delivery and feeding

Risk factors	N	Infected	Not infected	*Relative Risk (CI)
Gestational Age:				
Preterm (<37 weeks)	16	9(56%)	7(44%)	4.88(2.05,11.61)
Full term (>37 weeks)	52	6(11.5%)	46(88.5%)	
Mode of Delivery:				
Vaginal	47	12(25.5%)	35(74.5%)	1.79(0.56, 5.68)
C/S	21	3 (14%)	18 (86%)	
Feeding Method:				
Exclusive breast milk	39	8 (20.5%)	31 (79.5%)	
Breast milk substitute	26	4 (15%)	22 (85%)	
Mixed Feeding	3	3 (100%)	0 (0%)	

*The relative risk computed here did not take into consideration the use of ART interventions.

Table 2: Efficacy in the use of nevirapine/HAART in mothers and babies

Risk Factors	N	Infected	Not Infected	Efficacy
Mothers with intervention (HAART / Nevirapine)	28	3 (11%)	25 (89%)	64%
Mothers without intervention	40	12 (30%)	28 (70%)	
Babies with Intervention (Oral nevirapine)	31	5 (16%)	26 (84%)	40%
Babies without Intervention	37	10 (27%)	27 (73%)	

Discussion

Serologic diagnosis of HIV infection in newborns is difficult because maternal anti-HIV IgG antibodies cross the placenta into the fetal circulation. Conventional enzyme immuno assay (EIA) antibody and Western blot tests may be positive in uninfected newborns for more than 1 year as a result of maternal antibodies [4]. Cul-

ture of the virus is not sufficiently sensitive and is logistically not feasible. Plasma RNA appears to be the diagnostic procedure of choice but is not readily available and affordable in most developing countries. Hence, authentic data of the rate of mother to child transmission of HIV in Nigeria has not been available.

Plasma HIV-1 RNA was the diagnostic procedure used and 22% of the children tested had transmission of the virus from their mothers. This rate is close to the rates of 25 to 35% reported in several developed and a few developing countries [5]. Factors responsible for such high rates of transmission include advanced maternal HIV infection as determined by clinical diagnosis of AIDS, low CD4+ T-lymphocyte count or percent, high plasma HIV RNA levels, longer duration of ruptured membranes before delivery, placental inflammation and sexually transmitted diseases [6-9]. However, in this study, these factors were not measured. Factors less consistently associated with an increased risk of transmission include preterm birth [10] such as observed in this study where the relative risk of infection for preterms was strongly associated with the rate of transmission. It is also important to note that another factor that could be associated with this increased transmission is the mode of delivery [11] as most of the babies were delivered vaginally. The relative risk of infection via this route was however weak (RR=1.79) in this study.

It was observed that the HIV plasma RNA in the children studied was quite high with a median of 6.6 log copies/ml. Studies of vertical transmission indicate that infected infants have a rapid rise of HIV plasma RNA over the first 1 to 2 months of life followed by a slow decline over the next 22 months [12]. In contrast to most adults, perinatally infected children have levels that remain exceedingly high.

Maternal antiretroviral therapy has been shown to reduce transmission as was the case in this study where the rates of MTCT of 11% among mothers with intervention was obtained as compared with the 30% rate among those without intervention. The rate of transmission among mothers with intervention in this study is similar to the rates of 10.6% obtained in Cameroon [5] and 12% obtained in the SAINT study [13]. The use of oral nevirapine among babies has also been reported [12] to reduce rate of transmission as observed in this study where 16% of those with oral nevirapine were infected as compared with 27% who were not given. The efficacy which was less than 50% was low probably because two of the infected babies who had oral nevirapine were born to mothers without any intervention. It is important that nevirapine is given to both mothers and their babies for the prevention to be effective [5]. This study therefore shows the importance of intervention in mothers infected with HIV and their babies so as to reduce the high rate of mother to

child transmission. A nationwide study will still be needed to determine the exact national mother to child transmission rate in Nigeria.

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