Feeding pratices and HIV positivity rates of exposed infants: results of a prospective study

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Abstract

Background: Breast milk despite its benefit is a known route of HIV transmission in developing countries this cannot be easily replaced and as such the feeding of the HIV exposed infant becomes a great challenge. We evaluated the impact of infant feeding practices on HIV positivity rates.

Methods: HIV DNA PCR was performed at birth, six weeks, 12 weeks and 24 weeks on HIV exposed infants who were either exclusively breast fed (EBF) or had breast milk supplement (BMS) in a prospective study conducted at the HIV Clinic of the Jos University Teaching Hospital.

Results: A total of 140 infants out of the 164 recruited were studied. The methods of delivery were 112 (80.0%) SVD, 27 (19.3%) by caesarean section and 1 (0.7%) by forceps delivery. HIV DNA PCR was available for 103 infants. HIV DNA PCR positivity rates were 16.1% vs. 4.1% at birth; 19.3% vs. 5.9% at 6 weeks; 29.0% vs. 7.3% at 12 weeks and 32.2% vs. 7.3% at 24 weeks for EBF and BM respectively (OR = 7.37; 95%CI: 2.28-23.7).40 (35.7%) of the mothers membranes ruptured less than 4 hours before delivery. Artificial rupture of membranes was performed at the labour room for 60 (53.6%) of the women and 12 (10.7%) had ruptured membranes for more than 4 hours prior to delivery.

Conclusions: This study further confirmed the importance of feeding counseling amongst mothers of HIV exposed infants.

Keywords: Human immunodeficiency virus, Exclusive breast feeding, Breast milk substitutes

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Introduction

Human immunodeficiency virus (HIV) infection /acquired Immunodeficiency syndrome (AIDS) is currently a worldwide health problem of immense magnitude especially in sub-Saharan Africa, where most of the infections occur.[1,2,3] Twenty eight years after the initial reports of (AIDS) and when it was first observed in Africa, the HIV epidemic has spread through the continent with devastating effects. As at the end of 2012, it was estimated that 35 million adults were living with HIV worldwide.[1] Nigeria has the second highest number of new infections reported each year and an estimated 3.7% of the population are living with HIV[2]. Approximately 210,000 people died from AIDS in Nigeria in 2011.[2] An estimated 240,000 children are infected with HIV annually and 69,400 children were infected with HIV in Nigeria as at the end of 2011.[1,2] The majority of these children live in sub Saharan Africa where half of HIV infected children die before their fifth birthday and HIV is already contributing to increased childhood mortality rates on the overall[4,5].

The overwhelming majority of infected children acquire the infection through mother-to-child transmission, which can be during pregnancy, labour, delivery or breast feeding. This cumulative transmission rate amount to 30% - 35% in HIV-1 infected women in the absence of antiretroviral therapy.[6,7] Up to 35% of children are infected during breast feeding.[8]

The benefits of breast-feeding are well documented, particularly with regards to infectious disease prevention, nutritional gains, maternal-infant bonding, and contraception. There is ample evidence of a positive influence of breast feeding, especially exclusive breast feeding, on the survival of the child [9-12] and effects on cause specific mortality, such as that attributable to acute respiratory infections (ARI) and diarrhoea. This forms the basis of the current practice to breast feed children even in the face of HIV infection. We embarked on this study to determine the impact of exclusive breast feeding (EBF) on HIV transmission.

Materials and Methods

This was a secondary data analysis of a prospective study undertaken at the Jos University Teaching Hospital (JUTH) in part fulfilment of the requirement for the award of the Fellowship of the National Postgraduate

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Medical College of Nigeria in the faculty of paediatrics. The study was conducted over a fourteen-month period at the paediatric infectious disease clinic (PIDC) of the AIDS Prevention Initiative in Nigeria (APIN), located in JUTH. The clinic is run by trained paediatricians and nurses.

The minimum sample size of 120 was determined using the Kish formula for cross sectional studies. The study protocol was approved by the Human Research and Ethics Committee of JUTH. All consecutively delivered infants of HIV positive mothers attending the Prevention of Mother to Child Transmission programme of APIN, JUTH after due parental consent were recruited. The mothers were counselled on infant feeding options and supported to adhere to either exclusive breast feeding (EBF) or the use of breast milk substitutes (BMS) for 6 months. The infants and their mothers were followed up weekly for 6 weeks and fortnightly for three months and monthly until 6 months to ensure compliance with the initial feeding option of their choice. Mixed feeding practices were discouraged on each visit. Regular home visits were also made to ensure that mothers adhered to feeding practices. Each child had three millilitres of venous blood collected from the antecubital vein under aseptic conditions at birth, 6 weeks, 12 weeks and 24 weeks for HIV DNA PCR determination using standard manufacturers procedure. In this study all the infants were given single dose nevirapine within 72 hours of delivery.

Statistical analysis

Data was analysed using the EPi Info 7 Statistical programme (CDC, Atlanta, GA). Means±SD was used to describe continuous variables while the Chi-Squared test was used to compare proportions. P values < 0.05 were considered significant.

Results

Characteristics of study subjects

During the 14 months period of recruitment, a total of 164 infants were recruited, out of which 14 died and 10 was excluded from the study because their mothers practiced mixed feeding. A total of 39 mothers chose EBF and 101 decided on BMS and adhered to them during the study period. Table 1 summarizes the background information of the mothers of the surviving infants. The married women were 117 (83.6%), the divorced amongst them accounted for 5 (3.6%) while the single and widow were 9 (6.4%) each. The mean maternal age in years was 28±4 years. The mothers from the upper socioeconomic class accounted for 18 (13%) while the middle and lower class accounted for 66 (47%) and 56 (40%) respectively. All the women from the upper socioeconomic status opted for BMS. About 40 (35.7%) of the mothers membranes ruptured less than 4 hours before delivery. Artificial rupture of membranes was performed at the labour room for 60 (53.6%) of the women and 12 (10.7%) had ruptured membranes for more than 4 hours prior to delivery.

The babies delivered by spontaneous vertex delivery (SVD) were 112 (80.0%), 27 (19.3%) by caesarean section (CS) and one (0.7%) by forceps delivery. Of the 140 the infants that participated, 62 were males and 78 were females (M: F=1:1.25). In this study the infants were given single dose nevirapine within 72 hours of birth. Seventeen of the mothers who fed their babies with BMS were on antiretroviral therapy (ART) and mean duration of therapy was twelve months.The drugs included stavudine,lamivudine and nevirapine.

HIV positivity rates

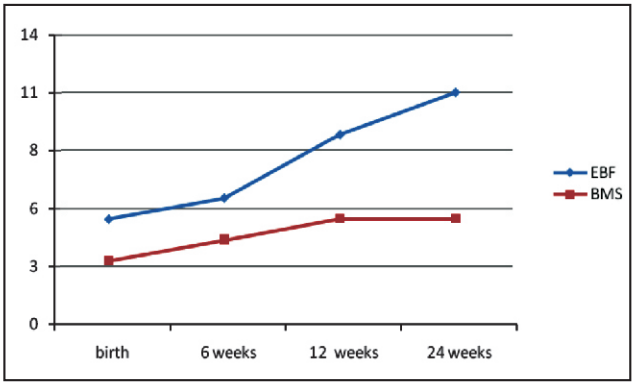

Figure 1. Proportions of infants on exclusive breast feeding (EBF) and breast milk supplements (BMS) testing positive for HIV DNA polymerase chain reaction at the Jos University Teaching Hospital

HIV DNA PCR was available for 103 infants. HIV DNA PCR was positive in five (16.1%) vs. three (4.1%) at birth; six (19.3%) vs. four (5.9%) at 6 weeks; nine (29.0%) vs. five (7.3%) at 12 weeks and eleven (32.2%) vs. five (7.3%) infants at 24 weeks for EBF and BMS respectively (OR = 7.37; 95%CI: 2.28-23.7) as shown in Figure 1. All infants who were PCR positive at birth were delivered by the vaginal route.

Discussion

The global strategy for Infant and Young child feeding, adopted by the World Health Organization (WHO) and the United Nations Children's Fund, states that the optimal feeding pattern for overall child survival is EBF for the first 6 months and continued breastfeeding for up to 2 years and beyond, with complementary feeding from age 6 months .This study confirmed the importance of feeding counseling amongst HIV infected women. For most babies, breast feeding without question is the best way to be fed, but unfortunately breast feeding can also transmit HIV.

A total of 140 infants out of the 164 recruited were studied. Following adequate counseling 39 (27.9%) of the women decided to breast feed exclusively and 101 (72.1%) used breast milk substitutes. It was found that more frequent counseling visits were advantageous and encouraged mothers to stick to their initial choice of feeding method. This was comparable to the study by Morrow[13], and Haider and colleagues[14], where similar results were obtained. The factors that influenced feeding choices in this population included the supply of free milk, frequent visits, maternal counselling and non-stigmatization was observed in this study. It was also observed that all the 17 mothers from the higher socioeconomic class used BMS.

Several studies have attested to the fact that breast milk effectively protects infants against morbidity and mortality especially from diarrheal disease, ARTI and minor illnesses. [15,9,10,12,15,16,] National health agencies and the WHO 2013 guide lines recommend that HIV positive mothers in low income countries breastfeed exclusively.[17]HIV DNA PCR was available for 103 infants. HIV DNA PCR positivity rates were 16.1% vs. 4.1% at birth; 19.3% vs. 5.9% at 6 weeks; 29.0% vs. 7.3% at 12 weeks and 32.2% vs. 7.3% at 24 weeks for EBF and BM respectively (OR = 7.37; 95%CI: 2.28-23.7). From the results available 95(92.2%) of the infants were PCR negative at birth. This is comparable to a Ugandan study using single dose nevirapine which documented an efficacy of 47%.[18]However 8 (7.8%) of the infants were PCR positive at birth,3 of them were on BMS while the remaining 5 on EBF. Early transmission of HIV during pregnancy occurs. Transmission of HIV infection during pregnancy has been estimated to be between 5-10%[8]Some of the infants who were on BMS were HIV infected at birth ,and one was confirmed infected at six weeks and the at three months. The infants that were infected at 6 weeks and 3 months may have been infected intrapartum accounting for the negative PCR at birth.

Several obstetric factors increase the presence of cervicovaginal infections, use of invasive procedures such as amniocentesis, and presence of meconium stained fluid. In this study only 1(0.7%) infant was delivered by forceps. This particular infant was HIV negative. From previous data intrapartum transmission accounts for between 10-20% of all transmission rates.[8] In utero transmission is also possible if the mothers became infected during pregnancy. There is a strong correlation between high viral load during pregnancy or at delivery and the risk for perinatal HIV transmission. The mechanism of in utero transmission is most likely through trans placental transmission of HIV, possibly enhanced by placental membrane inflammation that would increase the presence of infected maternal lymphocytes in the placenta and amniotic fluid. This was not assessed in this study. Placentitis is a likely phenomenon in our women. Chorioamnionitis has been reported to be associated with an increased risk for transmission.

In this study the infants were given single dose nevirapine within 72 hours of birth. Nevirapine has some advantages over zidovudine, this includes the fact that it is very cheap, and involves single dose administration both to mother and baby. Zidovudine on the other hand is an expensive drug, administered to the mother from thirty six weeks gestation [19]and to the infant for six weeks after birth.

The methods of delivery were 112 (80.0%) SVD; 27 (19.3%) by CS, and one (0.7%) by forceps delivery. All infants who were PCR positive at birth were delivered by the vaginal route, supporting the fact that vaginal delivery is an important risk factor for transmission. Intrapartum transmission can occur during labour or contact with broken infant skin or mucous membranes with the infected blood or other maternal secretions during delivery.

Another important risk factor for infection which is prolonged duration of membrane rupture was considered in this study. Prolonged duration of membrane rupture was reported to be a risk factor for transmission.[20] In a small US study assessing chorioamnionitis, Van Dyke et al[20]reported that women with chorioamnionitis and rupture of membranes for more than 4 hours had a 38% risk for transmission compared with only 6% among those who has no evidence of chorioamnionitis and duration of membrane rupture less than 4 hours. About 40 (35.7%) of the mothers membranes ruptured less than 4 hours before delivery. Artificial rupture of membranes was performed at the labour room for 60 (53.6%) of the women and 12 (10.7%) had ruptured membranes for more than 4 hours prior to delivery. Even though prolonged rupture of membrane was a risk factor in other studies it was not a risk in this study, and the number of subjects used was very few.

For infants who were on EBF a total of 32.2% was found to be HIV positive. Out of these, 6 were HIV negative at birth but subsequently became positive 2.93% at 6 weeks, 10.73% more at three months and 5.86% more at 6 months. It was then concluded that the observed infections were caused by transmission through breast feeding as was obtained in other studies.[21,22,23] The rate of post partum infection through breastfeeding is estimated at 12% - 14% [24,20] as compared to 19.4% in this study. High maternal viral load, maternal immnosuppression, presence of HIV in breast milk and breast disease increase the risk of breast milk transmission of HIV[21,25] For infants on BMS the rate of transmission was 6.0% in 84 infants who had PCR DNA results. This showed EBF was associated with a greater PCR DNA positivity than BMS. The result of this study

is in contrast to a South African study in which the three feeding groups did not differ in any risk factors for transmission, and the probability of detecting HIV at birth was similar.[26] Our study showed that BF increased the risk of transmission and this was comparable to the Italian study which showed that duration of EBF practice significantly increased the risk of transmission.[26]

However 20 (64.5%) of the EBF infants were PCR negative at 6 months of age which means they were not infected. In this study none of the mothers who breastfeed their infants was on ARV drugs either they did not meet requirements for starting ARV. This could be explained by the fact that if the mothers had low viral load in breast milk, the risk of transmission would be reduced. Also the cellular content of breast milk compared with colostrum, could influence the risk depending on whether cell free or cell associated virus is most important in transmission. Semba et al [27]reported that a high viral load in breast milk was significantly related to transmission risk. Also another mechanism could be the presence of specific antibodies directed against HIV –1 in breast milk of sero–positive mothers.[27]

Although extended breastfeeding accounts for approximately 40% of infant HIV infections worldwide, most breast fed infants remain uninfected, despite prolonged and repeated exposure to HIV-1. In this study by six months of age infection rates amongst the EBF infants almost doubled. Mechanisms associated with transmission of HIV –1 through breastfeeding and facts related to protection from such transmission remain poorly understood.[28]

This study had some limitations. PCR data was not complete for all the patients recruited. It is also possible that mixed feeding could have occurred as it was impossible to directly observe the women feeding their babies throughout the six months. Our efforts were restricted to weekly home visits.

Conclusions

This study confirmed the importance of feeding counseling amongst HIV infected women and the use of BMS to prevent HIV transmission was a safe and viable option even in resource constrained countries. Counselling and proper supervision of HIV positive mothers in relation to feeding Choices.

Conflict of Interest

None declared in this work.

References

1. Joint United Nations Programme on HIV/ AIDS-Global 16th october,2014.
2. Joint United Nations Programme on HIV/ AIDS 2012.Federal republic of Nigeria.Global AIDS response. www.unaids.org/2012.Assessed 16th October,2014
3. Priot P, Bartos M, Ghys PD, N Walker, B Schwartländer. The global impact of HIV/AIDS. Nature 2001; 410: 968-973.
4. Angyo IA, Adekwu AO, Okpeh ES. Protein energy malnutrition and Human immunodeficiency virus infection in children in Jos. Nig J Paediatr 1998;25:64-7.
5. Asindi AA.,Ibia BO. Paediatric AIDS in Calabar. Nig J Paediatr 1992;19:47-5.
6. UNAIDS. New Data on the prevention of mother-to-child Transmission of HIV and their policy implications. WHO Technical consultation on behalf of the UNFPA UNICEF/WHO/UNAIDS Inter-Agency Task Team on Mother-to-Child Transmission of HIV 2000; Geneva; Switzerland 2000.
7. Fowler MG, Simonds RJ, Roongpisuthipong A. Update on perinatal HIV transmission. PediatrClin North Am, 2000; 47:21-38.
8. De Cock KM, Fowler MG, Mercier E,et al. Prevention of mother-to-child transmission in resource poor countries. Translating research into policy and practice. JAMA 2000;283:1175-1182.
9. Shahidullah M. Breast feeding and child survival in Matlab, Bangladesh. J Biosoc Sc 1994; 26: 143-154.
10. Habicht JP, DaVanzo J, Butz WP. Does breast feeding really save lives or are potential benefits due to biases? Am J Epidemiol 1986; 123: 279-290.
11. Jason JM, Nieburg P, Marks JS. Mortality and infectious disease associated with infant feeding practices in developing countries. Paediatr 1984; 74: 702-727.
12. Feacham RG, Koblinsky MA. Interventions for the control of diarrhoea diseases among young children: promotion of breast feeding. Bull World Health Organ 1984; 62: 271-291.
13. Morrow AL, Guerrero ML, Shults J, et al. Efficacy of home –based peer counseling to promote exclusive breast feeding: a randomized controlled trial. Lancet 1999; 3532: 1226 -331.
14. Haider R, Ashworth A, Kabir I, Huttly SRA. Effect of community based peer counselors on exclusive breast feeding practices in Dhaka, Bangladesh: a randomised controlled trial. Lancet 2000; 356: 1643 –1647.
15. Victora CG, Smith PG, Vaughan JP. Evidence for protection by breast feeding against infant deaths due from infectious diseases in Brazil. Lancet 1987; 2: 319-322.
16. Van de Perre P, Simonon A, Hitimana DG, ,et al. Infective and anti-infective factors of breast milk of HIV infected women. Lancet 1993, 341: 914-918.
18. World health Organisation. Global update on HIV treatment 2013:results ,impact and opportunities. 2013-apps.who.int. (Assessed 16th October,2014)
19. Owor M, Deeyre M, Duefield C, et al. The one-year safety and efficacy data of the HIVNET 012 randomized trial. In: Program and abstracts of the XIII International AIDS conference; July 9-14, 2000; Durban, South Africa.
20. Wiktor SZ, Leroy V, Ekpini ER, et al. 24-month efficacy of short-course maternal zidovudine for the prevention of mother-to-child transmission in a breast feeding population: a pooled analysis of two randomized clinical trials in West Africa. In: Program and abstracts of the XIII International AIDS Conference; July 9-14, 2000; Durban, South Africa.

20. Van Dyke RB, Korber BT, Popek E, etal. A prospective cohort study of maternal child transmission of human immunodeficiency virus type 1 in the era of maternal antiretroviral therapy. J Infect Dis 1999;179:319-328.
21. Ekpini ER, Wiktor SZ, Sattern GA, et al. Late postnatal mother-to-child transmission in Abidjan, Cote d'Ivoire. Lancet 1997; 349: 1054-1059.
22. Karlsson K, Massawe A, Urassa E, Kawo G, Msemo G, Kazimoto T, et al. Late postnatal transmission of human immunodeficiency virus type-1 infection from mother-to-child in Dares-Salaam, Tanzania. Pediatr Infect Dis J 1997; 16: 963-967.
23. Leroy V, Newell ML, Dabis F, et al. International multicentre pooled analysis of late postnatal mother-to-child transmission of HIV-1 infection. Lancet 1998; 352: 597-600.
24. Dunn DT, Newell ML, Ades AE,,et al. Risk of human immunodeficiency type-1 transmission through breast feeding. Lancet 1992; 340: 585-588.
25. John G, Nduati RW, Mbori-Ngacha DA, et al. Correlates of mother-to-child human immunodeficiency virus type-1 transmission; association with maternal plasma HIV-1 viral load, genital HIV-1 DNA shedding, and breast infections. J Infect Dis 2001; 183: 206-212.
26. Coutsoudis A, Pillay K, Spooner E, et al. Influence of infant feeding patterns on early mother-to-child transmission of HIV-1 in Durban, South Africa: a prospective cohort study. Lancet 1999; 354: 471-476.
27. Human immunodeficiency virus type 1 infection and breast milk. The Italian Registrar for HIV infection in Children. ActaPaediatricSuppl 1994 ; 400:. 51 –8.
28 Kourtis AP, Butera S, IbegbuC, Belec L, Duerr A,: Breast milk and HIV-1:Vector of transmission or vehicle of protection? Lancet Infectious Diseases 2003;3 786-793.