

ORIGINAL RESEARCH

Utilization of HIV and AIDS mother-to-child transmission prevention and babies' outcome in Asaba, Nigeria

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Received: September 10, 2013

Accepted: October 9, 2013

Online Published: December 17, 2013

DOI: 10.5430/jnep.v4n2p178

URL: <http://dx.doi.org/10.5430/jnep.v4n2p178>

Abstract

Adoption of HIV Prevention of Mother-to-child Transmission (PMTCT) among women in poor-resource settings is low and little is known about factors associated with babies' outcome among those adopting it. This retrospective part of a bigger study was to investigate the association between HIV PMTCT utilization and babies' outcome (Babies' HIV Status, weight and condition at delivery and after birth) focusing on mother-infant pairs on PMTCT before 2010. Secondary data analysis was employed, followed by descriptive and inferential statistical analyses at $p < .05$. Results showed that premature rupture of membrane had a significant impact on babies' outcome. Additionally, 18 (13.7%) babies tested positive to HIV as indicated by the PCR result. This percentage was considered high compared with the less than 1% in the U.S While the infection rate is decreasing in Nigeria those already infected need to be included in multiple levels of preventive management. Consideration of these findings is a major boost in evidence-based HIV PMTCT especially in the study setting.

Key words

HIV Prevention of Mother-to-child Transmission, Utilization, Mother-infant pair, Babies' outcome, Nigeria

1 Introduction

The emergence of Human Immunodeficiency Virus (HIV) since the 1980s has increased the existing heavy burden of disease and death among women and children in low- and middle-income countries^[1]. Sadly, HIV and Acquired Immune Deficiency Syndrome (AIDS) epidemic is now adversely affecting the modest gains made in the previous decades in maternal and child survival^[1]. UNAIDS/WHO^[2] estimated that 2.3 million children were living with HIV/AIDS, and that 2 million of these children were in sub-Saharan Africa. In 2007, the number of children under 15 years of age who were living with HIV increased to 2.5 million. Of this total, an estimated 370,000 were new infections and majority of these infections occurred through Mother-To-Child Transmission (MTCT)^[3-5]. About 90% of MTCT infections occurred in Africa. In contrast, reports from Europe and the United States of America (USA) indicate that, the availability of effective antiretroviral (ARV) treatments and avoidance of breast feeding, reduced MTCT of HIV to less than 1%^[3].

According to WHO estimates^[4], child mortality due to HIV was 35.2% by the age of one year, and 52.5% by the age of two years, before the era of antiretroviral therapy (ART). In 2000, it was projected that by 2010, in some countries (for example, Zimbabwe), AIDS would push the infant mortality rate and the under-five mortality rate higher than they would have been in the absence of AIDS^[1]. Most of these children acquired HIV from their mothers during pregnancy, delivery or breastfeeding. Without any intervention, between 20% and 45% of infants may become infected, with an estimated risk of 5%-10% during pregnancy, 10%-20% during labor and delivery, and 5%-20% through breastfeeding^[5-7].

Various research studies have demonstrated an unacceptably low utilization of PMTCT services among women in poor-resource settings^[4,5]. Moreover, very few of the world's pregnant women have access to comprehensive PMTCT services^[5]. WHO^[8] in 2006, recommended the scaling up of PMTCT services which include, routine 'opt-out' antenatal HIV testing for all pregnant women at first antenatal visit, and the provision of long course combination antiretroviral therapy to those who need it. Despite these efforts and the substantial donor investments for implementing PMTCT services in developing countries, some women, who tested HIV positive do not return to clinics for follow up visits, or fail to adhere to prescribed ARV drug treatments. Studies have also revealed that many HIV-positive pregnant women avoid antenatal services to avoid disclosure of their status^[9,10]. It was reported in 2006^[8] that in resource-limited countries, only 3% of the women in need of prophylactic Nevirapine (NVP) received the drug and only 28.1% of the women attending antenatal care where PMTCT services are available were offered and utilized the PMTCT interventions^[8].

Research evidences from high-income countries in Europe and the USA have shown that wide-spread implementation of evidenced-based packaged PMTCT interventions, built around the use of long-course of highly active antiretroviral treatment (HAART), avoidance of breastfeeding and elective caesarean sections among HIV positive women, have greatly reduced the rate of HIV transmission in infants to less than 1 percent^[1,3,5,12,13]. Also, in some low- and middle-income countries in sub-Saharan Africa such as Botswana, Tanzania, and Cote d'Ivoire, where high quality PMTCT services have been provided, MTCT of HIV have been reduced to between 2%-4%, a rate fairly comparable with the USA and Western Europe^[1,3-5,13].

In Nigeria, there are still new cases of infant HIV infections. It was estimated that the country had more than 75,000 infants born to HIV positive mothers in 2004^[14]. Like many low-income developing countries, PMTCT intervention services are not widely distributed in all the healthcare facilities in Nigeria and the level of utilization is still low^[15]. Furthermore, the phenomenon of high level of poverty, lack of access to information and low level of literacy may reduce the effectiveness of PMTCT interventions^[5,15]. The Nigerian policy on PMTCT and the national PMTCT guidelines, since 2008, recommend the promotion of early enrollment of pregnant women for antenatal care which offers routine HIV counseling and testing (HCT) to all the pregnant women registering in antenatal care clinic. Women who tested HIV positive and consented to PMTCT regimen, are counseled, enrolled and offered ARV therapy, safer delivery and safer infant feeding options. These women and their infants are then followed up through delivery to 18 months postpartum. In developing countries of Africa, many pregnant women are assisted by traditional birth attendants (TBAs) and some pregnant women use formal health sectors only as back-up. This invariably affects women's utilization of PMTCT which is mainly facility-based^[16].

Measuring the impact of national PMTCT programmes towards the elimination of new HIV infections among children by 2015 and keeping their mothers alive is one of the goals of WHO^[17]. Various time points have been used in research and programmes for reporting the impact of PMTCT interventions. According to WHO^[17], different metrics can be used to assess the effectiveness and impact of PMTCT programmes. These include the level of new pediatric HIV infections, the rate of mother-to-child transmission of HIV, child survival and health condition after birth. Besides reducing infant mortality in the context of a generalized HIV epidemic, a PMTCT programme also provides an entry point for strengthening health systems to improve maternal and child health outcomes. It is thus recommended that all evaluations monitor outcomes at 6 weeks and 18 months interval^[18]. This study contributes to this quest and its objective was to investigate the association between utilization of HIV PMTCT and babies' outcome (Babies' HIV Status, weight and condition at delivery and after birth) among mother-infant pair in Nigeria.

2 Methods

This study is part of a larger adherence study utilizing a retrospective study design to examine the outcome of babies born to HIV-positive mothers in Federal Medical Centre (FMC) Asaba, Delta State, Nigeria. The total population of women who tested HIV-positive and accessed antenatal care, intra-natal care and post natal care and were enrolled for PMTCT at FMC Asaba, between January 2008 and December 2009 and infants below 24 months as at January 1, 2010 were included in the study. This population includes mother-infant pairs. Those above 24 months of age were excluded in compliance with the 2006/2007 WHO guideline of 6 weeks to 18 months of age^[17,18]. A purposive sampling technique was thus adopted for the study.

The Independent variable was measured by mothers' adoption, accessibility and utilization of PMTCT before pregnancy, during pregnancy and labor/puerperium as conceptualized in this study while the dependent variable is babies' outcome and was measured as babies' condition or status at delivery and after birth (dead, still birth or alive), HIV status and weight. The values of these measurements are recommended by WHO, 2006 and 2007 guidelines. Babies' outcome which the researchers were interested in was measured using babies' clinical status at delivery and after birth (dead, still birth or alive), weight and PCR result of Babies' HIV status. Standard test (reference) weight of baby was measured with the aid of Baby Weighing Scale^[19].

Due to high risk of death before the age of 2 years among HIV-infected infants, and given the increasing availability of pediatric anti retro-viral treatment in many resource-limited settings, WHO recommends that national programmes should establish the capacity to provide early virological testing of infants for HIV Assays and diagnostic platforms that should be considered by health ministry programmes for early infant HIV diagnosis. Such include externally validated tests for HIV DNA or HIV RNA (including Polymerase Chain Reaction test, PCR) which was used to determine the HIV status of the babies in this study.

A proposal was written seeking ethical permission to the Research Ethics Committee of the research setting. This was followed by an ethical permission to conduct this study. Secondary data from 131 mother-infant pairs was collected, edited and were later entered into SPSS (version 15) statistical software for analysis. A simple frequency distribution of the socio-demographic information was then computed. Contingency tables were used for descriptive analysis while Chi square and the exact Fisher test were used for inferential statistics to test for association and the statistical significance was set at 95% confidence level.

3 Results

One hundred and thirty one mother-infant pairs out of a larger study were secondarily analyzed for this part of the study. The age of the mothers ranged between 20 and 46 years, with a mean of 33 years. Majority of these (79, 60.3%) were in the 20-29 years age group. Most of the participants (40, 31%) were traders or engaged in one business activity or the other. Concerning their marital status, 124 i.e. 94.7% were married, 4 (3.0%) were single mothers while 3 (2.3%) were widows. Of the 131 participants, 129 i.e. 98.5% were Christians, while only 2 (1.5%) were Islamic faithfuls. Majority i.e. 55 (42%) completed secondary education.

Associations of mothers' socio-demographic factors with the choice of infant feeding method are shown in Table 1. There were significant relationships between marital status, religion and choice of infant feeding method, (married: $p = .038$), (Christianity: $p = .025$) at 1 degree of freedom and level of significance of 0.05. In an attempt to determine the degree of significance of Chi square test association of the outcome measures, multivariate Chi-square and Fisher exact test were calculated. This revealed significant relationships between mothers' utilization of PMTCT interventions and the babies' outcome of PCR result as presented in Table 2. There were however, no significant associations between PMTCT and Age ($p = .113$), occupation ($p = .997$) and level of education ($p = .159$). Regarding mode of delivery, there was also no significant association ($p = .738$).

Table 1. Association of socio-demographic factors with the mothers' choice of infant feeding method

	(Exclusively Breastfed) EBF for 0 ≤ 6 months N (%)	Breast milk substitute/ infant formula N (%)	N = 131 N	<i>p</i>
Mother's Age Range				
20-29	31 (39.2)	48 (60.8)	79 (60.3)	.113
30-46	29 (55.8)	23 (44.2)	52 (39.7)	
Occupation				
Trading	16 (40.0)	24 (60.0)	40 (30.5)	.997
Artisan	13 (46.4)	15 (53.6)	28 (21.3)	
Civil service	14 (48.3)	15 (51.7)	29 (22.1)	
Others	15 (44.1)	19 (55.9)	34 (26.0)	
Marital status				
Married	60 (48.4)	64 (51.6)	124 (94.6)	.038*
Single	-	4 (100.0)	4 (3.1)	
Widow	-	3 (100.0)	3 (2.3)	
Religion				
Christianity	64 (49.6)	65 (50.4)	129 (98.5)	.025*
Islam	1 (5.0)	1 (5.0)	2 (1.53)	
Education				
Primary	14 (46.7)	16 (53.3)	30 (22.9)	.159
Secondary	21 (38.2)	34 (61.8)	55 (42.0)	
Tertiary	25 (54.3)	21 (45.7)	46 (35.1)	

Notes. Multivariate Chi-square test*, Fisher's Exact test**

Table 2. Association of Mothers' utilization of PMTCT and the babies' PCR results

	Baby's PCR result		<i>P</i>
	Positive N(%) n = 18	Negative N(%) n = 113	
Time of diagnosis			
Before pregnancy	4 (22.2)	35 (30.9)	.009*
During pregnancy	10 (55.6)	74 (64.5)	
Labor/Intra partum	4 (22.2)	4 (3.54)	
Commencement of ARV			
Before pregnancy	4 (22.2)	29 (87.9)	.006*
During pregnancy	9 (50)	78 (89.7)	
Labor/Intra partum	5 (27.8)	6 (54.5)	
Membrane state before delivery			
Intact	0 (0.0)	22 (19.5)	.042**
Ruptured	18 (100)	91 (80.5)	
Mode of delivery			
Normal delivery	16 (88.9)	97 (85.8)	.738*
Caesarean section	2 (11.1)	16 (14.2)	
Counseling on infant feeding			
Mother received counseling on infant feeding options during ANC visits	13 (72.2)	107 (94.7)	.005**
Mother received counseling on infant feeding options at labor/intra partum	5 (27.8)	6 (5.3)	

Notes. Multivariate Chi-square test*, Fisher's Exact test**

As shown in Table 3, 18 (13.7%) were positive to HIV using PCR test while 113 (86.3%) were negative.

Table 3. Babies’ HIV status through the PCR test

Status	N (%)
Positive	18 (13.7)
Negative	113 (86.3)
Total	131 (100.0)

According to Table 4, maternal gestational age of equal or less than 28 weeks represents the majority (51, 38.9%) at HIV diagnosis and (50, 38.2%) as when ARV prophylaxis commenced. In this study, these are indicators of PMTCT utilization.

Table 4. Gestational age at which HIV diagnostic testing and ARV prophylaxis/treatment were utilized by mothers

Gestational age	Diagnostic Testing N (%)	ARV prophylaxis/Treatment N (%)
Before pregnancy	40 (30.5)	34 (25.9)
≤ 28 weeks	51 (38.9)	50 (38.2)
>28 weeks	39 (29.8)	42 (32.1)
Labor/delivery	1(0.76)	5 (3.8)
Total	131 (100.0)	131 (100.0)

Babies’ state or condition at delivery and after birth was measured in terms of being born dead, as a fresh still birth or born alive. Table 5 shows that none was born dead, 4(3%) were still born while the majority, 127 (97%) were born alive.

Table 5. Babies’ state at delivery/birth and after birth

	Babies’ State			Total N (%)
	Stillbirth N (%)	Dead N (%)	Alive N (%)	
At delivery/birth	4 (3.1)	-	127 (96.9)	131 (100.0)
After Birth	-	3 (2.4)	124 (97.6)	127 (100.0)

According to Table 5, none of the 131 babies was still born or dead at birth while the majority, 127 (96.7%) were alive at birth. Post partum however, 3 (2.3%) of the 127 who were alive died and 124 remained alive.

The weight of the babies from birth through 18 months was depicted in Figure 1.

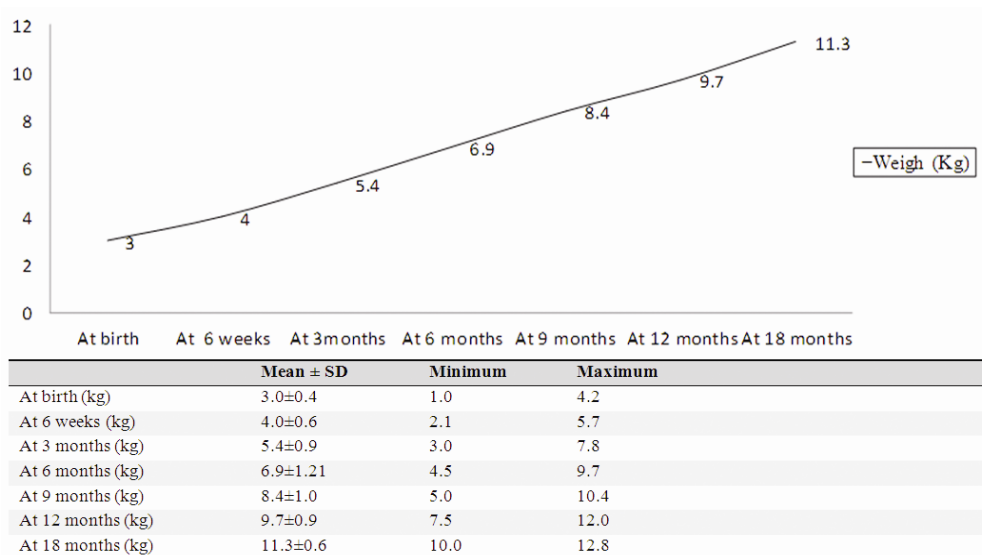


Figure 1. Babies’ weight from birth to 18 months

4 Discussion

This study shows no significant relationship between maternal age, occupation, level of education and utilization of PMTCT intervention services regarding choice of infant feeding methods. This variance could probably be as a result of integrating PMTCT into the regular antenatal clinic rather than the initial stand alone PMTCT programs, the quality of counseling and consistent support of the counselors. Christian HIV positive mothers, showed the tendency to exclusively breast-feed and use milk substitute almost equally (approximately 50% each). Same goes for the HIV positive mothers of the Islamic religion whose use of formula feeding and exclusive breast milk are also equal (5%) with overall significant association between religion and choice of infant feeding, $p = .03$ (see Table 1). This is in agreement with the earlier report by Karcheret *et al.* [20], that religion had a significant relationship with utilization of infant feeding method in Uganda. Nonetheless, with the majority of the people in the study setting being Christians, this result should be interpreted with caution because the study setting is a Christian dominated environment, meaning majority of the people are Christians. Similarly, mothers who are married used exclusive breast-feeding compared to mothers who are single, who utilized formula feeding ($p < .05$). This phenomenon might be related to the fear of spousal disclosure of HIV status; the fear of stigmatization and abandonment by their spouse and family.

Prior to the introduction of routine ante natal HIV testing and counseling for pregnant women and subsequent PMTCT interventions, the rate of mother-to-child transmission was 15%-20% during pregnancy and delivery (Avert [5], WHO [8]). In Europe and the USA where women who are HIV positive wait for their viral load to be undetectable before planning for pregnancy, MTCT infection has virtually been eliminated according to Avert [5]. This is contrary to the finding in this study where 18 (13.7%) of the infants were positive to HIV using PCR as shown in Table 3 and of this number, at the time of the diagnosis of the mothers of 10 (55.6%) of them was actually during pregnancy. There was a significant relationship between the time of diagnosis and infants' HIV status, $p = .009$ (see Table 2). This calls for more vigilant surveillance and follow up in PMTCT interventions according to WHO recommendations. In the same vein, not all women who were diagnosed accept to commence antiretroviral drug according to WHO [10]. Many women fail to return to ANC until delivery or when complication occurs in labour⁸. The commencement of ARV (see Table 4) before and during pregnancy compared to starting ARV during labor/delivery was statistically significant in reducing the risk of MTCT of HIV infection ($p = .006$) as depicted in Table 2. This might be due to the efficacy of ARV drugs which could reduce serum viral load, to an undetectable level within few weeks/months, thus minimizing the risk of MTCT of HIV [8].

In Western Europe and the USA elective caesarean section in addition to ARV prophylaxis have reduced the risk of prenatal and intra partum HIV transmission to less than 2% [8]. However, it also suggested that the risk associated with elective caesarean section should be weighed against its benefit in poor-resource countries [6, 10, 11]. In this study, the mode of delivery was not statistically significant in the risk of HIV infection among the babies delivered by the HIV positive mothers. This corroborates the findings of Deller and De Camp [21]. The use of a long-course combination of ARV prophylaxis and safer delivery practices in health facilities may have accounted for low risk of MTCT.

A study by Colvin *et al.* [22] reported no association between prolonged rupture of membranes and increased risk of MTCT in a 2007 World Health Organization Bulletin. But in Coovadia's opinion [3], the longer labor continues after the rupture of membranes, the greater the risk of MTCT. This study contrarily found that there was a significant association between rupture of membranes and risk of mother-to-child transmission of HIV infection ($p < .05$). In this study, HIV positive mothers with intact membranes up to the point of the delivery had 0.0% rate of MTCT versus (18) 100% among the HIV positive mothers who had ruptured membranes (see Table 2).

Regarding feeding option for babies by HIV mothers, safer infant feeding practices can significantly reduce post natal MTCT of HIV infection [17]. In developed countries, avoidance of breast-feeding among HIV mothers has virtually eliminated post natal HIV transmission in infants [1, 5, 8]. Short duration of exclusive breast-feeding combined with long-course ARV prophylaxis for HIV positive mother and her baby, in previous studies have been found to significantly reduce HIV transmission through breast-feeding in African settings to between 2%-4% [3, 4]. In this study, there is no

significant difference in the rate of MTCT of HIV infection between the utilization of short duration exclusive breast-feeding compared with formula feeding. Also previous study found that infants who are not breast-fed had increased rate of morbidity and mortality [1, 10]. In contrast, findings from the current study did not show any significant difference in morbidity between exclusively breast fed and formula fed infants (see Table 1). The use of long-course antiretroviral drugs in mothers and babies as well as long- course Cotrimoxazole prophylaxis may have accounted for these changes. Also the quality of counseling, health education of mothers on infant feeding, consistent support and follow-up through ANC to beyond the post natal period, may have also contributed to that (see Table 2).

For babies' HIV status, in the United States and Western Europe the rate of MTCT of HIV infection is less than 1% [3, 5, 23], and 2-4% obtained in Africa under research settings. In contrast, a higher rate of 13.7% was found in this study (see Table 3). The time of starting antiretroviral drugs and premature rupture of membranes may have been responsible for the difference in the rate of transmission. Previous study also suggests that there are higher incidence of pregnancy complications such as, prematurity, retarded growth, and low birth weight among babies of HIV positive mothers [24]. On the contrary, this study did not find any such complications. Longer follow up beyond 18 months is desirable to confirm this.

Body weight is one of the indexes for measuring the wellbeing of infants [25, 26]. In this study the majority of the babies had expected normal birth weight with mean birth weight of 3.0 ± 0.4 and 8.4 ± 1.0 at 9months (see Figure 1). The babies' weight might have been influenced by greater awareness and continuous nutritional counseling for mother-infant pair with provision of special meal for deserving infants during follow up visits of the PMTCT services.

5 Conclusion

This study investigated the utilization of PMTCT of HIV interventions among HIV positive mothers and the health outcome of their exposed babies. The study found that while PMTCT utilization was generally acceptable, the entire components according to WHO guideline was not followed. Premature ruptured of membranes had a significant association with babies' outcome of HIV status. The rate of MTCT of HIV infection, 18 (13.7%) is considered high compared with the less than 1% in the United States and some western European countries or the 2%-4% rate from some African countries. Finally, the analysis of the impact of the utilization of exclusive breast-feeding or formula feeding on MTCT of HIV infection did not show any statistical significance in the study population. Utilization of PMTCT is important but more importantly, there is the need to ensure the implementation of the entire components to achieve desired babies outcome. Also, while reduction in HIV incidence is fast improving, those already infected need close monitoring, follow up and care. This has great implications for nursing, maternal and child health.

Limitation

Secondary data analysis which restricted detailed available information is a limitation to this study and also hinders broader generalizability. Nonetheless, it conveys vital information for policy consideration as it represents what was on the ground at the time of data collection and depicts reality. Hence, a broader perspective with primary data is recommended.

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