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Research Article

Short-term outcomes of paired HIV-exposed formula-fed infants and their mothers on HAART in a Nigerian resource-constrained specialist hospital: a cohort study

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ABSTRACT

Background: Human Immunodeficiency Virus (HIV) has worsened infant mortality in developing countries. These deaths are associated with Low Birth Weight (LBW), varying morbidities and high transmission rate of HIV from mother to her baby. This study assesses the short-term outcome of paired formula-fed infants born to their paired mothers on HAART.
Methods: A cohort study of sixty five paired mothers and their babies attending Prevention of Mother To Child Transmission (PMTCT) clinic for 6 weeks after delivery. The data collected was analyzed using Epi info 3.3.2 version.
Results: All the paired mothers had live births. There were no intra-uterine foetal death, still-births and no pre-term deliveries reported. About 12 (18.5%) of these babies had their birth weight <2.5 kg (LBW). Only 1 (1.5%) baby was positive to PCR-DNA test at six weeks of age. Varying morbidities were reported in 39 (60.0%) of the babies and respiratory tract infection, ophthalmia neonatorum, diarrhoea and malaria were the commonest observed. There was no statistical significant association between transmission of HIV from mother to child and maternal time of initiation of HAART (CI-95%, RR-0.9778, Fishers exact-0.6923). There was also no statistical significant association between transmission rate of HIV and mode of delivery (CI-95%, Fisher exact-0.8461).
Conclusions: The use of HAART in HIV sero-positive mothers was shown to have favourable infants' outcome. It is hoped that this work will improve quality of care by primary care physicians and open more opportunities of up-take of PMTCT programme by affected families.

Keywords: HIV-exposed infant, Formula-fed, Short-term outcomes, Family

INTRODUCTION

Infants born to HIV sero-positive mothers have different shades of outcome which has been established by meta-analysis. Some of these outcomes include: Pre-Term Delivery (PTD), Still Birth (SB), infant's mortality/morbidity, Low Birth Weight (LBW) and high Mother-To-Child Transmission (MTCT) rate of HIV infection among others.[1,2]

The association between the use of HAART in pregnancy and PTD is controversial though other studies have established a correlation especially when its use in pregnancy is less than 13 weeks.[3,4] LBW is shown to be common with infants born to HIV pregnant women on

HAART.[1,5] Respiratory tract infections and diarrhoea disease are commonly documented causes of mortality in HIV-exposed infants on formula feeds who eventually required more frequent hospital attention.[6-8] Recently, several evolutionary interventions have successfully reduced MTCT rate to less than 2% with the use of HAART and infant formula feeding even though World Health Organization still advocates for breast feeding especially in the developing and resource-constrained countries.[9-11]

The fore-knowledge of these outcomes prepares the primary care physicians, care giver and affected families to cope well in terms of resource and support mobilization especially in resource-constrained countries like Nigeria. This study is therefore aimed at assessing the short-term outcome of paired formula-fed infants born to their paired mothers on HAART with the aim of helping attending physicians and affected families mobilized necessary support for their care.

METHODS

This cohort study was conducted in the labour room and PMTCT clinic of Plateau State Specialist Hospital (PSSH), Jos North-Central Nigeria over a period of four months (April-July) in 2010. The study population included all HIV sero-positive mothers on HAART enrolled in the PMTCT program who met the inclusion criteria. Those included were mothers who were on HAART for at least three months before delivery, whose babies were exclusively formula-fed and received ARV prophylaxis (NVP/AZT) for six weeks. Those excluded were mothers who were smokers or drug addicts (e.g. cocaine, marijuana, nicotine), mothers with any other co-morbid medical conditions e.g. sickle cell anaemia, heart diseases, endocrinopathies, cancers and mothers with multiple gestation. Others were mothers that missed HAART for a week or more, those who had prolonged/obstructed labour or assisted delivery and those mothers who delivered elsewhere other than PSSH, Jos.

Sixty five women with their paired babies were recruited consecutively. This was to ensure a 95% confidence of estimating a prevalence of HIV sero-positive women accessing HAART in Nigeria (44%) in the study population with 5% margin of sampling error.

A structured questionnaire comprising two sections was used alongside. The initial sections comprised the bio-data and information concerning the mother, while the other section detailed the corresponding baby's profile. The baby's profile included birth weight and PCR results. The birth weights were taken by trained midwives soon after delivery. The morbidity profile of the paired infants was assessed on weekly appointments till six weeks of age when Dry Blood Spots (DBS) were collected for PCR in Jos University Teaching Hospital, Jos.

Data analysis was done using Epi info 3.3.2 (CDC, Atlanta Georgia, USA).

Ethical clearance was obtained from the hospital ethical committee and a written informed consent was also obtained from the subjects (mothers).

RESULTS

Sixty five HIV-positive mothers paired with their babies on formula feeding were recruited and followed up till six weeks after delivery.

Table 1: Mothers characteristic outcomes.

	Frequency	Percent (%)
Maternal age (years)		
25-29	28	43.08
30-34	29	44.62
35-39	8	12.30
Maternal weight (kg)		
40-49	6	9.23
50-59	15	23.08
60-69	23	35.39
70-79	14	21.54
80-89	6	9.23
90-99	1	1.53
Maternal parity		
<2 (low parity)	23	35.4
2-8 (high parity)	42	64.6
Maternal time of HIV diagnosis		
Before current pregnancy	48	73.8
During current pregnancy	17	26.2
Maternal time of initiation of HAART		
Before current pregnancy	45	69.2
During current pregnancy	20	30.8
Duration of administration of HAART before delivery (months)		
<12	30	46.15
13-25	13	20.00
26-38	9	13.85
39-41	6	9.23
42-55	4	6.15
>56	3	4.62
Maternal mode of delivery		
Caesarean	10	15.4
Vaginal	55	84.6
Maternal outcomes		
Live babies	65	100.0
Pre-term deliveries (PTD)	0.0	0.0
Still births	0.0	0.0
Intrauterine fetal death	0.0	0.0

The mothers were within the ages of 25-38 with a mean maternal age of 30.26 ± 0.5 years. There was no teenage mother and the age distribution was skewed to the more

reproductive age groups. Six mothers (9.23%) weighed below 50kg and only one mother (1.53%) was found to have weighed more than 90kg. The average mean weight for the enrolled mothers was 64.03 ± 1.42 kg. Majority of these mothers' weight were within 60-69 kg (35.39%). Their mean parity was 2.15 ± 1.42 SD. Twenty three (35.4%) of these mothers had low parity (i.e. parity less than two) while majority of them had a high parity (i.e. parity of 2-8). The highest parity was eight while the lowest was a primigravida (Table 1).

The diagnosis of about 48 (73.8%) of the HIV-positive mothers was made before they became pregnant while 17 (26.2%) was during their current pregnancy. More than half the number of mothers started ARVs (HAART) before their current pregnancy in the study. Paired mothers who commenced HAART before their current pregnancy of study were 45 (69.2%). Those who commenced during their current pregnancy of study were 20 (30.8%). Majority of mothers 30 (46.15%) commenced and continued ARVs (HAART) for less than a year before delivery. It is important to note that all the mothers commenced ARVs (HAART) at least three months before delivery. Few mothers commenced ARVs (HAART) about two years and above (maximum of 14 years) before delivery with a cumulative frequency of 22 (33.85%) (Table 1).

Only 10 (15.4%) of the mothers were delivered via caesarean section. Majority 55 (84.6%) of them delivered vaginally and there were no assisted deliveries.

All the mothers recruited in the study delivered live babies at term. None had pre-term delivery, still-births or intra-uterine foetal death (Table 1).

Table 2: Babies characteristic outcomes.

	Frequency	Percent (%)
Baby's birth weight (kg)		
<2.5 (low birth weight)	12	18.5
2.5-4.0 (normal weight)	52	80.0
>4.0 (macrosomia)	1	1.5
PCR-DNA results at 6 weeks of age		
Negative PCR-DNA	64	98.5
Positive PCR-DNA	1	1.5
Types of morbidities		
Acute otitis media	2	3.08
Diarrhoea	3	4.62
Malaria	3	4.62
Ophthalmia neonatorum	3	4.62
Oral candidiasis	1	1.53
Respiratory tract infection	27	41.53
No morbidity	26	40.00

Twelve (18.5%) of babies born had low birth weight while majority of them 52 (80.0%) had normal birth weight. Only one (1.5%) of the babies was macrosomic. The mean birth weight was 2.95 ± 0.5 kg (Table 2).

Transmission of HIV from mother to her child was observed in only one baby putting the transmission rate at 1.5% (Table 2).

The babies had a varying range of morbidities. Twenty six (40.0%) of the babies never had any morbidity at six weeks of age. Twenty seven (41.53%) of them had respiratory tract infection, 3 (4.62%) had diarrhoea, 3 (4.62%) had ophthalmia neonatorum while another 3 (4.62%) of the babies had malaria. It was interesting to note that no baby in this study had more than one morbidity. The cumulative frequency of babies that were sick at six weeks of age was 39 (60.0%) as seen in Table 2.

There was no statistical significant association between the baby's PCR-DNA at six weeks of age and the mode of delivery (95% Confidence interval, Fishers exact >0.005) - Table 3. There was also no statistical significant association between the time of initiation of HAART by the paired mothers and the paired baby's PCR-DNA results (CI-95%, RR-0.9778, Fishers exact >0.005) - Table 4.

Table 3: Association between babies' PCR at 6 weeks of age and mode of delivery.

Babies' PCR-DNA at 6 weeks of age	Caesarean section	Vaginal	Total	Fishers exact value
Negative	10	54	64	0.8461
Positive	0	1	1	0.8461
Total	10	55	65	*

n=65, 95% Confidence interval, Fishers exact = 0.8461

Table 4: Association between time of initiation of HAART in paired mothers and babies' PCR-DNA results.

Time of initiation of HAART	Negative	Positive	Total	Fishers exact value
Before current pregnancy	44	1	45	0.6923
During current Pregnancy	20	0	20	0.6923
Total	64	1	65	

n=65, CI-95%, RR-0.9778, Fishers exact >0.005.

DISCUSSION

The association between the use of HAART in pregnancy and Pre-Term Delivery (PTD) is controversial.[2] This

study however observed that none of the paired mothers had a PTD while other studies have established this relationship. The control for confounders like substance abuse, co-infection with sexually transmitted infections and other maternal co-morbid conditions in this study would have been responsible for this finding. This control of confounders could further explain why all 65 (100%) paired mothers had live babies.

This study revealed more 53 (80.0%) babies had normal birth weight despite the varying time of commencement and duration of HAART by their paired mothers which was at least 3 months. This pattern was observed to have followed the Gaussian distribution with a skew to Low Birth Weight (LBW) of 12 (18.5%). These finding was similar to the work done by Calvet et al. where they reported LBW of 16.5%.[12] Higher rates of 22.3% were reported by Ekouevi et al. in Ivory Coast where the mothers studied had advanced HIV disease with median CD4 cell count less than 200 cell/mL.[1] The disparity among the mothers may have accounted for the difference in incidence of LBW in this study and the one in Ivory Coast.

The transmission rate of HIV from the paired HIV-positive pregnant women was observed to be 1.5%. Despite the racial difference, similar rate of 1% was reported by Townsend et al in the United Kingdom.[13] Chama et al. also in a resource-constrained tertiary hospital in Nigeria reported similar transmission rate of 1.1%.[14] This study had similar intervention strategies as the index study except for the varying feeding options and the timing of the PCR-DNA testing which was at 12 weeks of age. In other studies among non-breastfeeding population, the transmission rate in HIV exposed infants whose mothers were on HAART is reported to be 2%.[15]

There are varying morbidities associated with HIV-exposed babies. The commonest morbidity observed in these babies were respiratory tract infection 27 (41.53%), diarrhoea 3 (4.62%), ophthalmia neonatorum 3 (4.62) and malaria 3 (4.62%). The morbidity pattern in this study agreed with the studies done by Becquet et al and Nacro et al which also identified respiratory tract infection and diarrhoea as the commonest morbidities.[8,16] In this study, malaria 3 (4.62%) and ophthalmia neonatorum 3 (4.62) were included among the most common morbidity after respiratory tract infection even though the diagnosis of malaria was clinical and not laboratory.

The study demonstrated that the transmission of HIV from mother to child was not dependent of the time of initiation of HAART (CI-95%, RR-0.9778, Fishers exact-0.6923) provided the use of HAART in pregnancy was more than 3 months. The study went further to observe no statistical significant association between mode of delivery and the transmission rate of HIV (CI-95%, Fisher exact-0.8461). This finding agreed with studies done by Shah in Mumbai which also found that caesarean section was as effective as the vaginal route for PMTCT especially when the exposed baby receives ARV prophylaxis and breast milk substitutes.[17]

The anticipatory knowledge of these short-term outcomes is of tremendous importance both to the primary care physician and to the affected families. To the primary care physician, it creates an opportunity for efficient knowledge-based counselling and planning while to the affected families hope and reasons for up-take of PMTCT programme.

CONCLUSION

HIV sero-positive women may have to commence HAART even before they become pregnant to substantially reduce the incidence of still births, PTD, LBW, MTCT rate of HIV and infant morbidity. The demonstration of these favourable outcomes could also be the basis for increase PMTCT up-take even in resource-constraint centres, enhance planning and mobilization of necessary family support required for the care of these infants.

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