Master of Public Health

Master international de Santé Publique

Prevention of Mother to Child Transmission of HIV in Nigeria:

A comparison of the HAART and the short course ARV approaches in some AIDSRelief ART facilities in Nigeria

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Table of contents

i. Title page----------1
ii. Table of contents----------2
iii. List of tables----------3
iv. List of figures----------3
v. List of annexes----------3
vi. Acronyms----------4
vii. English abstract----------5
viii. French abstract----------6
Section 1: Introduction----------7
1.1 Background and significance----------7
Section 2: Methods----------9
2.1 Study objectives----------9
2.2 Study design----------9
2.3 Study population and subjects----------9
2.4 Study sites----------10
2.4.1 Map of Nigeria showing the 6 AR sites used----------11
2.5 Data collection----------12
2.6 Statistical analysis----------12
Section 3: Results----------13
3.1 General characteristics of study subjects----------13
3.1.1 Table 1a: Description of study population general characteristics----------13
3.2 Clinical and laboratory parameters prior to initiation of therapy----------14
3.2.1 Table 1b: Clinical and laboratory parameters prior to initiation of therapy----------14
3.3 Treatment history of subjects----------14
3.3.1 Table 1c: Treatment history of subjects----------14
3.4 Infant characteristics----------15
3.4.1 Table 1d: Description of exposed infants----------16
3.5 Factors associated with vertical transmission: ----------17
3.5.1 Table 2: A univariate analysis----------18
3.5.2 Table 3: A multivariate analysis----------20
3.6 Outcomes of breast feeding options----------21
3.6.1 Figure 2: Infant feeding and relationship with unfavourable conditions----------22

3.7 Effects of ARVs on neonatal outcomes----------22
3.7.2 Figure 3: Neonatal outcomes and relationship with type of ART in pregnancy-----22
3.8 Pre-delivery ART duration----------23
3.8.3 Figure 4: Neonatal outcomes and relationship with duration of ART----------23
Section 4: Discussion----------23
4.1 Limitations of the study and possible sources of bias----------26
Section 5: Conclusion----------26
5.1 Recommendations----------27
5.2 Ethical considerations----------27
5.3 Competing interests----------27
5.4 Acknowledgements----------27
Section 7: Bibliography----------28
Section 8: Annexes----------32

List of tables

Table 1a: Description of study population general characteristics
Table 1b: Clinical and laboratory parameters prior to initiation of therapy
Table 1c: Treatment history of subjects
Table 1d: Description of exposed infants
Table 2: Factors associated with vertical transmission: A univariate analysis
Table 3: Factors associated with vertical transmission: A multivariate analysis

List of figures

Figure 1: Map of Nigeria showing the 6 AR study sites
Figure 2: Infant feeding and relationship with unfavourable conditions
Figure 3: Neonatal outcomes and relationship with type of ARV treatment
Figure 4: Neonatal outcomes and relationship with duration of ARVs

List of annexes

Annex 1: Concepts and definitions
Annex 2: Data abstraction form
Annex 3: ART Adult follow up form
Annex 4: Paediatric clinical evaluation form
Annex 5: Infant HIV PCR (DBS) request form
Annex 6: Socio economic classification scheme by Oyedeji

Acronyms

3TC	Lamivudine
AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal Care/Clinic
AR	AIDSRelief
ART	Anti-Retroviral Therapy
ARV	Anti-Retrovirals
AZT	Azidothymidine (Zidovudine)
CD4	T lymphocyte bearing CD4+ marker
CI	Confidence Interval
CRS	Catholic Relief Services
CS	Caesarian Section
DBS	Dried Blood Spots
DNA	Deoxyribo Nucleic Acid
DREAM	Drug Resource Enhancement against AIDS and Malnutrition program
EID	Early Infant Diagnosis
FCT	Federal Capital Territory
GA	Gestational Age
HAART	Highly Active Antiretroviral Therapy
HIV	Human Immunodeficiency Virus
IE	Initial Evaluation
LBW	Low Birth Weight
MCHC	Maternal and Child Health Care
MTCT	Mother-To-Child Transmission of HIV
NBW	Normal Birth Weight
NVP	Nevirapine
OR	Odds Ratio
PCR	Polymerase Chain Reaction
PEPFAR	President's Emergency Plan for AIDS Relief
PEPI	Post Exposure Prophylaxis for Infants
PMTCT	Prevention of Mother-To-Child Transmission of HIV
RT	Rapid Test
Sc-ARVs	Short course Anti Retrovirals
STI	Sexually Transmitted Infection

UMSOM-IHV University of Maryland School of Medicine- Institute for Human Virology
UNICEF United Nations Children Fund
USAID United States Agency for International Development
WHO World Health Organization
ZDV Zidovudine

ABSTRACT (English)

Prevention of Mother-To-Child Transmission of HIV in Nigeria: A comparison of the HAART and Short course ARV approaches in some AIDSRelief facilities.

Context: Evolution of prevention strategies provides multiple options for managing HIV infection in pregnancy. These options include use of triple agents (HAART) or short course therapy primarily for PMTCT. Choice of appropriate strategy is based on baseline immunological status of women and costs .This is further complicated by the need to minimize risks of HIV infection or death associated with chosen infant feeding methods. There is the need to evaluate successes and risk determinants associated with both PMTCT strategies.

Objectives: To compare the efficacy of HAART to Sc-ARVs PMTCT in resource limited settings.

Methods: In a retrospective cohort study, records of mothers who received either of the two PMTCT strategies were linked with infant records and analyzed.

Results: A total of 286 paired records were analyzed; 225 (78.7%) received HAART, 38 (13.3%) received Sc-ARVs while 23 (8%) received no ARV drug in pregnancy. Overall transmission rate was 2.4% (5/208) in infants whose mothers received HAART and 7.9% (3/38) for the Sc-ARV group. At ninth month of life 1% of infants in the HAART group and 13% in the Sc-ARV group were infected. Four infections occurred in the HAART group after ninth month of life due to continued breast milk exposure. Factors found to be associated with risk of vertical transmission included duration of ART use > 3 months (OR 0.19: 95%CI 0.04-0.90), mixed feeding (OR 3.68: 95%CI 1.01-13.52), HAART in pregnancy (OR 0.07: 95%CI 0.02-0.28) and infant post exposure ARV prophylaxis (OR 0.19: 95%CI 0.05-0.77). Breastfeeding was common practice in all groups. While no death was recorded in exclusively breastfed infants, 3.3% of non breastfed infants died.

Conclusions: HAART is a comparably more efficient PMTCT strategy in improving HIV free survival among exposed infants.

Keywords: HIV epidemic, Sub Saharan Africa, PMTCT, Vertical transmission, Transmission risk, Sc-ARV, HAART, Resource limited setting, ARV post exposure prophylaxis.

RESUME (Français)*

Prévention de la Transmission Mère Enfant (PTME) du VIH au Nigeria : Une comparaison entre la trithérapie ARV et le traitement préventif de courte durée dans des structures de « AIDSRelief ».

Contexte : Du fait de l'évolution des stratégies de prévention, plusieurs options sont envisageables pour la prise en charge de l'infection à HIV au cours de la grossesse. Cela inclue l'utilisation de la trithérapie ARV ou de régimes ARV de courte durée spécifiques à la PTME. Le choix de la stratégie est basé sur le statut immunologique des femmes à l'entrée et sur les coûts associés. D'autre part, le choix est influencé par la nécessité de minimiser le risque de transmission ainsi que par la mortalité associée au type d'alimentation de l'enfant. Il est nécessaire d'évaluer les facteurs qui déterminent l'efficacité et les risques de ces deux stratégies PTME.

Objectif : Comparer l'efficacité de la trithérapie et des régimes préventifs de courte durée au niveau des régions à ressources limitées.

Méthodes : Cette étude était basée sur une cohorte rétrospective. Les dossiers des mères ayant reçues l'un des deux types de traitement ARV étaient associés aux registres de leurs enfants puis analysés.

Résultats : Un total de 286 paires de dossiers ont été analysés. 225 (78,7%) ont reçu la trithérapie, 38 (13,3%) ont reçu un régime court alors que 23 (8%) n'ont reçu aucune prévention ARV. Le taux de transmission était de 2,4% (5/208) parmi les enfants dont les mères ont reçu la trithérapie, de 7,9% (3/38) pour le groupe des régimes courts. A l'âge de 9 mois, 1% des enfants du groupe trithérapie et 13% du groupe régimes courts étaient infectés. Quatre infections supplémentaires ont eu lieu après 9 mois dans le groupe trithérapie dues à une exposition continue au lait maternel. Les facteurs associés à un risque de transmission verticale sont notamment la durée du traitement ARV > à 3 mois (OR 0.19: 95%CI 0.04-0.90), l'allaitement mixte (OR 3.68: 95%CI 1.01-13.52), la trithérapie (OR 0.07: 95%CI 0.02-0.28) et la prophylaxie post-exposition des enfants (OR 0.19: 95%CI 0.05-0.77). L'allaitement maternel était une pratique courante dans l'ensemble des groupes. Pas de décès n'a été reporté pour les enfants ayant un allaitement maternel exclusif alors que 3,3% de ceux non allaités de manière exclusive sont décédés.

Conclusions : La trithérapie est la stratégie PTME la plus efficace pour améliorer la survie et éviter la transmission du VIH chez les enfants exposés.

**Translation by Sandrine Simon*

INTRODUCTION

Background and significance

HIV infection remains a public health concern with an estimated 33.4 million people living with the disease globally.[8] The sub-Saharan region accounts for 67% of the global HIV burden where 22.4million infected people reside in the midst of poverty and other endemic diseases.[8] Women in Africa are disproportionately affected and represent 60% of all cases of HIV. Anatomical, socio-cultural and economic reasons account for the increased predisposition of women to HIV in addition to the less common practice of homosexual relationships which is commoner among males in western climes.[7, 13] The vast majority of the 15.7 million women infected with HIV globally belong to the child bearing age of 15 – 39 years increasing the possibility of vertical transmission in the absence of appropriate interventions.[8]

Nigeria has an HIV prevalence of 4.6% and the third largest HIV burden in the world.[6] It also has a relatively high fertility rate/birth rate[9, 13] which can be accounted for by early marriages, polygamous relationships and a desire for larger family size in the face of a high infant mortality rate among other reasons. It has been estimated that there would be 243,730 HIV pregnant women by 2010.[6] As at 2007, only 5-10% of these women had access to anti-retroviral drugs to prevent vertical transmission of HIV to the child.[4, 13] The lack of universal access to PMTCT interventions continue to fuel the burden of paediatric HIV infection, with 220,000 children aged 0-14 years estimated to be HIV infected in Nigeria.[7] These figures place Nigeria as the country with the largest burden of paediatric HIV in the world followed by South Africa. This scourge has increased childhood morbidity and mortality and threatens to reverse the gains of child survival activities including the millennium development goal initiative in Nigeria.[9] with an infant mortality rate (for under 1's) of 96/1000.[27]

Without any intervention 25-45% of breastfed children will acquire the HIV virus with the highest risk of 15% during the birth process and an additional 12-15% for infants who are breastfed for a 24 month period.[3, 10] Other determinants of increased risks of transmission include maternal, obstetric and infant factors. Maternal factors include advanced maternal disease, high viral load, CD4 <200, HIV drug resistance (captured as treatment failure in this study), presence of STIs etc. Delivery factors are prolonged labour, prolonged rupture of membranes and invasive delivery processes while infant factors include prematurity, multiple pregnancies, and breastfeeding among many others.[4,9]

The application of ARV drugs in various combinations and behavioral changes in antenatal and postnatal care have been successful in reducing MTCT risks to less than 1%.[4]

The use of single agents has limited efficacy with additional risks of development of resistance mutations. Zidovudine initiated at 28 weeks had 6.3% transmission risk in Thai mothers with CD4 counts more than 200-350 cells/mm^3 [3, 4]. The use of single dose nevirapine significantly reduced MTCT risk to 12.3% compared with controls[4].

A combination of AZT from 28 weeks with an inclusion of nevirapine during labour has been associated with 2.8% transmission risk in non breastfed infants while AZT/3TC had a 5.7% transmission risk.[4]

The continuation of AZT for duration of 7 days after administration of single dose nevirapine has been shown to reduce the risk of resistance associated with the prolonged half life of Nevirapine which exposes the virus to suboptimal concentrations of the drug after its administration.[3, 15] All the short course strategies however do not protect against breast milk transmission and the infants will require replacement feed or modified breast feeding practices.[3]

The use of triple agent AZT/3TC/NVP reduced transmission risk to less than 1% at birth.[4] From the DREAM and Mma Bana study results, the continuation of HAART in breastfeeding mothers has shown promising prospects for the use of breastfeeding in resource limited settings.[15, 16] In clients with CD4 count <350cells/mm^3, HAART/triple agents is recommended as they require treatment for their disease and secondly for PMTCT.[9] Mothers with higher CD4 counts receive ARV for PMTCT while awaiting disease progression to levels requiring treatment. HAART however is the recommended option for both categories of patients based on its efficacy and the need to limit breast milk transmission in regions where replacement feeds are not affordable feasible, safe and sustainable.[1, 2, 17] Other benefits of HAART over and above the Short Course (single or dual agent) are maximal virological suppression, reduced need for CS, reduced risk of developing drug resistance (resulting from NVP tail off), and it allows for breastfeeding with consequent improved Child survival.[23]

The limitations to the use of HAART are largely the significantly higher cost of medications and required support, dearth of human capacity, side effects associated with ARV particularly nevirapine use in mothers with CD4 >250mm^3, potential effects of prolonged ARV use on neonatal outcomes and the risks of resistance in infected infants who ingest small quantities of ARVs secreted into breast milk.[23]

Most public health programs have adopted the use of short course therapy for pregnant women with CD4 >350mm^3 based on cost and lack of required capacity to initiate and monitor HAART.[4, 9] However it is known that this approach is relatively less effective more so if used in resource

poor communities where breastfeeding is the safest and most sustainable infant feeding method for majority of mothers.[10] The AIDSRelief program funded through PEPFAR in Nigeria has provided a mix of strategies (HAART and Short course) for mothers with high CD4 count. This study is designed to evaluate the outcomes of various PMTCT intervention strategies in the program and to identify determinants of favorable outcomes that could be of public health importance.

METHODS

Study objectives

The main objective of this study is to compare the benefits of HAART to those of short course ARVs for Prevention of Mother to child transmission of HIV in a resource limited setting. Specifically, this study will attempt:

1. To determine the HIV transmission risks in both groups of women receiving either HAART or the short course ARV therapy
2. To determine factors associated with vertical transmission
3. To determine neonatal outcomes of infants exposed to these ARV strategies like prematurity and other adverse birth conditions
4. To determine the effect of various feeding options on indicators of child well being like childhood infectious diseases, malnutrition and infant death.

Study design

This was a retrospective cohort study that was carried out in 6 AIDSRelief ARV sites in Nigeria. The study was carried out between February and June 2010 and the study period was from January 2006 to January 2010.

Study population and subjects

The target population for the study was all HIV infected women registered at the selected 6 AIDSRelief sites during the study period from January 2006 to January 2010 and the study population was all HIV infected pregnant women who received PMTCT interventions at the 6 AIDSRelief ART sites.

Subjects who met the following inclusion criteria were recruited: All pregnant women diagnosed to be HIV infected before or at any time of the pregnancy, placed on any PMTCT intervention at the 6 health facilities involved and carried the pregnancy to term delivering a live baby.

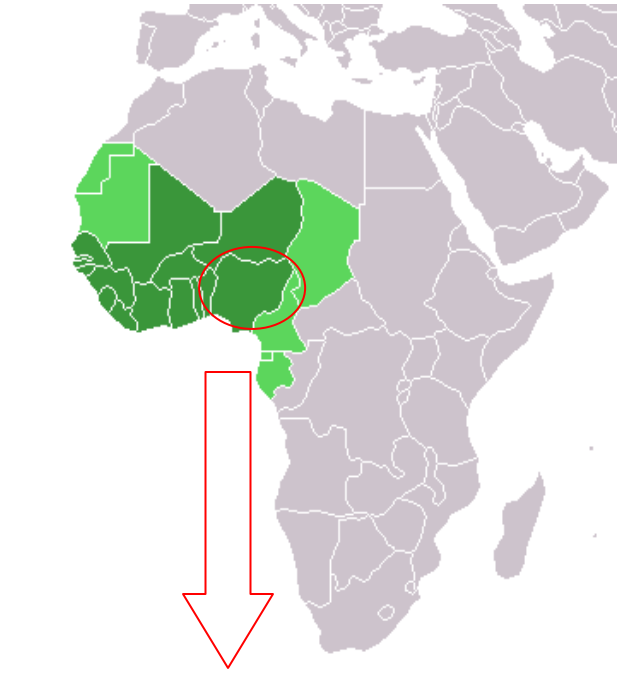
Exclusion criteria: HIV negative pregnant women on follow up at the sites or HIV positive pregnant women in the sites who miscarried or had still births were excluded from the study. Similarly, all mother and infant folders that were impossible to link were excluded.

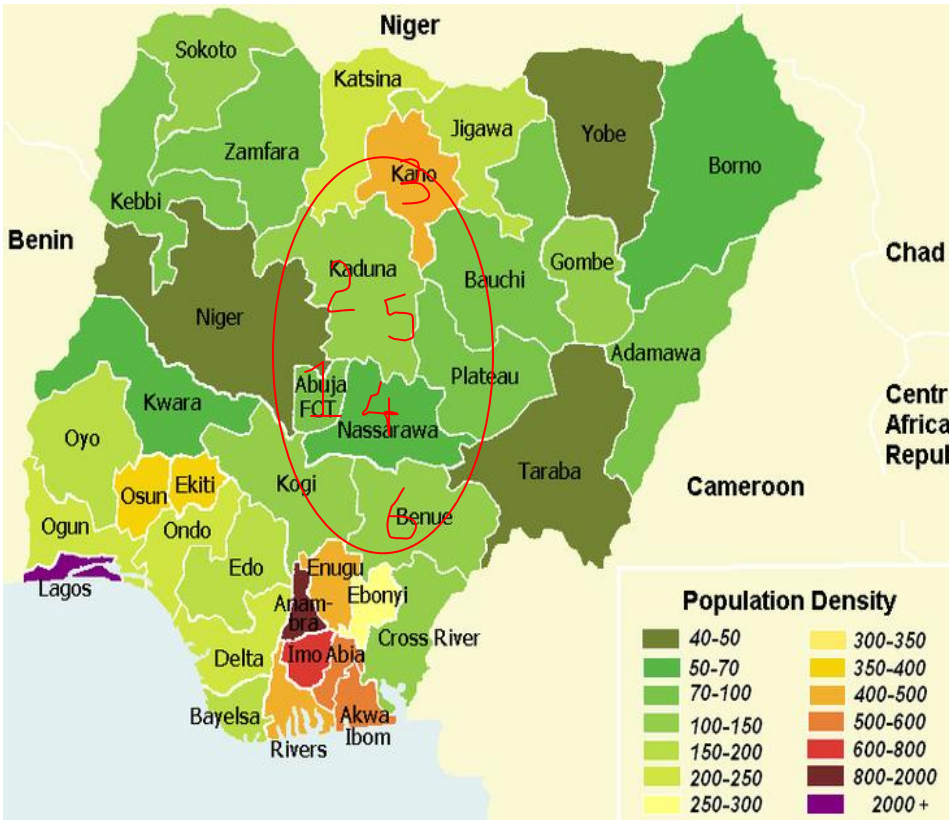
Study sites

Six AIDSRelief sites were selected based on type of PMTCT interventions offered at the facilities. The AIDSRelief model of care for each intervention was considered to be of the same quality across all these sites. The following sites were included in the study:

1. St Vincent's Hospital Kubwa in Abuja FCT,
2. St Gerard's Hospital, Kaduna state,
3. Ahmadiyya Hospital, Kano state,
4. Our Lady of Apostles Hospital Akwanga, Nassarawa state,
5. St Louis Hospital Zonkwa, Kaduna state and
6. St Monica's Hospital Adikpo, Benue state.

Figure1: Map of Nigeria showing 6 AR study sites





Data collection

Maternal and infant records were linked together. Longitudinal patient records including clinical and laboratory data were abstracted from charts using a study profoma (Annex 2). The patient records were abstracted from the following forms:

ART follow up forms (Annex 3), Ante natal registers, delivery registers, Pharmacy forms, Paediatric clinic evaluation forms (Annex 4), Infant DBS forms (Annex 5), IE forms etc

During data abstraction, a few cases of women who had no ART at all in pregnancy were discovered and included in the study (n=23). Also, certain infants still awaiting their HIV test results were included in the study with HIV status 'unknown' (n=20).

For women with more than one HIV exposed infant or multiple gestations, each infant was treated as a separate record.

Statistical analysis

Data was entered into excel 2007 spreadsheet, cross checked and analyzed using Stata software package, version 11 (copy right 2009 Stata Corp LP. 4905 Lakeway Drive College Station, Texas 77845 USA) The study was designed to have a power of 80% to detect a 9% difference in transmission risks for both PMTCT approaches. The transmission risk was expected to be around 1% for HAART and 10% for Sc-ARVs. The minimum sample size required to detect this difference was estimated at 242 subjects. Statistical significance was considered at less than 5% probability level (P value < 0.05).

Comparison of baseline characteristics of the three study groups (no ARVs, sc-ARVs and HAART) including infants was done using Chi2 tests.

A univariate logistic regression was done for each factor with the outcome as HIV negative or positive infant. These factors were selected based on prior knowledge of risk factors for vertical transmission and data obtained specific to this study. Viral load and Ethnic group were left out of the univariate analysis due to insufficient information. Subsequently, taking the significant variables from the univariate analysis and other risk factors identified from previous literature, a multivariate logistic regression was fitted with the outcome of HIV negative or positive infant using a selected category as a reference group and separating other categories into dummy variables. The Odds ratios for each category were then noted.

RESULTS

General characteristics of study subjects: A total of 286 paired records were obtained for this study (284 mothers and 286 infants: - 2 mothers had 2 HIV exposed infants each, who had received PMTCT strategies, one of which was a twin gestation), from six (6) AIDSRelief sites; St Vincent's Hospital Kubwa (93), St Gerard's Hospital Kaduna (69), Ahmadiyya Hospital Kano (67), St Louis Hospital Zonkwa (21), St Monica's Hospital Adikpo (19) and Our Lady of Apostles Hospital Akwanga (17).

Among all 286 records of mothers, 225 received HAART, 38 received Short Course ARVs while 23 mothers received no intervention in pregnancy.

The mean age of subjects was 30 years (95% CI 29-31) and was comparable between the three groups of subjects. Fifty two percent (52%) of mothers who received HAART were in the lower socio economic classes and this was comparable in proportion to the other groups.

Table 1a: Description of study population general characteristics

	Mothers on HAART n=225 no./n (%)	Mothers on Sc ARVs n=38 no./n (%)	Mothers who had no ARVs n=23 no./n (%)	Total no./n (%)	P value
General Characteristics					
All	225/286 (78.7)	38/286 (13.3)	23/286 (8)	286	
Age yrs					
Mean	30	30	30	30	
95%CI	26-36	28-32	29-31	29-31	
Socioeconomic status					
class I	2 (0.9)	1 (2.6)	0 (0)	3 (1.1)	
class II	22 (9.8)	3 (7.9)	2 (8.7)	27 (9.4)	
class III	75 (33.3)	10 (26.3)	7 (30.4)	92 (32.2)	
class IV	70 (31.1)	16 (42.1)	7 (30.4)	93 (32.5)	
class V	47 (20.9)	8 (21.1)	5 (21.8)	60 (21)	
unknown	9 (4)	0 (0)	2 (8.7)	11 (3.8)	0.816
Religion					
Christian	151 (67.1)	31 (81.6)	18 (78.3)	200 (69.9)	
Muslim	33 (14.7)	2 (5.2)	2 (8.7)	37 (12.9)	
unknown	41 (18.2)	5 (13.2)	3 (13.0)	49 (17.2)	0.34
Ethnic group					
Hausa	17 (7.6)	0 (0)	2 (8.7)	19 (6.6)	
Yoruba	6 (2.7)	0 (0)	1 (4.4)	7 (2.5)	
Igbo	35 (15.6)	2 (5.3)	2 (8.7)	39 (13.6)	
Minority groups	72 (32.1)	25 (65.8)	13 (56.5)	111 (38.8)	
Unknown	94 (42)	11 (28.9)	5 (21.7)	110 (38.5)	0.005

Clinical and Laboratory Parameters Prior to Initiation of Therapy

Table 1b shows that previous exposure to ARV drugs was a significant finding among 18.2% (42/225) of mothers who received HAART compared to none in the SC group and 13.1% (3/23) of mothers who received no ARV intervention in current pregnancy. About half (50%) of the patients in the short course group were classified into WHO stage 1 at enrolment compared to 21.3% (48/225) in the HAART group, while advanced disease (Stage 3 and 4) were significantly prominent in 11% of mothers in the HAART group compared to 2.6% of mothers who received short course therapy (p = 0.032). Immunological parameters at enrolment into antenatal care showed 63.3% of the HAART group had CD4 count lower than 350 while 7.9% and 34.8% of the SC and the no Intervention groups had similar findings respectively. CD4 counts >500cells/ml was a significant finding among the Sc-ARV group compared to the others.

Table 1b: Clinical and Laboratory parameters prior to initiation of therapy

	Mothers on HAART n=225 no./n (%)	Mothers on Sc ARVs n=38 no./n (%)	Mothers who had no ARVs n=23 no./n (%)	Total no./n (%)	P value
Previous ART exposure					
None	141 (62.6)	33 (86.8)	15 (65.2)	189 (66.1)	
yes	42 (18.7)	0 (0)	3 (13.1)	45 (15.7)	
unknown	42 (18.7)	5 (13.2)	5 (21.7)	52 (18.2)	0.028
CD4 at initiation					
<200	66 (29.4)	1 (2.6)	4 (17.4)	71 (24.8)	
200-350	77 (34.2)	2 (5.3)	4 (17.4)	83 (29.1)	
350-500	23 (10.2)	9 (23.7)	3 (13)	35 (12.2)	
>500	36 (16)	17 (44.7)	6 (26.1)	59 (20.6)	
unknown	23 (10.2)	9 (23.7)	6 (26.1)	38 (13.3)	<0.001
Viral load at initiation					
<1000	12 (5.3)	0 (0)	1 (4.4)	13 (4.5)	
1000-10000	4 (1.8)	0 (0)	2 (8.7)	6 (2.1)	
>10000	4 (1.8)	0 (0)	1 (4.3)	5 (1.8)	
unknown	205 (91.1)	38 (100)	19 (82.6)	262 (91.6)	0.135
WHO stage at initiation					
stage 1	48 (21.3)	19 (50)	5 (21.7)	72 (25.2)	
stage 2	31 (13.8)	4 (10.6)	5 (21.7)	40 (13.9)	
stage 3	24 (10.7)	1 (2.6)	3 (13.1)	28 (9.8)	
stage 4	1 (0.4)	0 (0)	0 (0)	1 (0.4)	
unknown	121 (53.8)	14 (36.8)	10 (43.5)	145 (50.7)	0.032

Treatment History of Subjects

Entry into antenatal care in the first trimester occurred in 49 women (21.8%) in the HAART group and one woman in the Sc-ARV group. Among those who received no intervention, 78.3% (18/23) were unbooked and presented during labour or after delivery (P<0.001). The use of

ARV for longer than 3 months before delivery was found in 61% of mothers who received HAART while only 7.9% of mothers in the Sc-ARV group received ARV for similar duration.

Delivery in same facility occurred in 68% (153/225) and 60.5% (23/38) of the HAART and SC groups respectively while only 47.8% (11/23) of mothers in the no intervention group presented for the first time in labour. Home delivery occurred in comparable proportions of the HAART and Sc-ARV groups (HAART 5.8%, Sc-ARV 5.3%). Vaginal delivery occurred in 93.8% (211/225) and 86.8% (33/38) of the HAART and SC groups respectively while 17.4% (4/23) of mothers who received no intervention were delivered by caesarean section.

Table 1c: Treatment history of subjects

	Mothers on HAART n=225 no./n (%)	Mothers on Sc ARVs n=38 no./n (%)	Mothers who had no ARVs n=23 no./n (%)	Total no./n (%)	P value
Pre conception duration of ARVs					
<3 months	**152 (67.6)**	**0 (0)**	**0 (0)**	**152 (53.1)**	
>3 months	**64 (28.4)**	**0 (0)**	**0 (0)**	**64 (22.4)**	
Unknown	**9 (4)**	**0 (0)**	**0 (0)**	**9 (3.1)**	**<0.001**
Pre delivery duration of ARVs					
<3 months	**81 (36.0)**	**34 (89.5)**	**0 (0)**	**115 (40.2)**	
>3 months	**137 (60.9)**	**3 (7.9)**	**0 (0)**	**140 (48.9)**	
Unknown	**7 (3.1)**	**1 (2.6)**	**0 (0)**	**8 (2.8)**	**<0.001**
Gestational age at booking					
1st trimester	**49 (21.8)**	**1 (2.6)**	**1 (4.3)**	**51 (17.8)**	
2nd trimester	**52 (23.1)**	**6 (15.8)**	**2 (8.7)**	**60 (21.0)**	
3rd trimester	**38 (16.9)**	**13 (34.2)**	**2 (8.7)**	**53 (18.5)**	
unbooked	**86 (38.2)**	**18 (47.4)**	**18 (78.3)**	**122 (42.7)**	**<0.001**
Place of delivery					
In the facility	**153 (68)**	**23 (60.5)**	**11 (47.8)**	**187 (65.4)**	
Other health facility	**25 (11.1)**	**7 (18.4)**	**2 (8.7)**	**34 (11.9)**	
At home	**13 (5.8)**	**2 (5.3)**	**0 (0)**	**15 (5.2)**	
Others	**8 (3.5)**	**1 (2.6)**	**0 (0)**	**9 (3.2)**	
Unknown	**26 (11.6)**	**5 (13.2)**	**10 (43.5)**	**41 (14.3)**	**0.01**
Mode of delivery					
vaginal	**211 (93.8)**	**33 (86.8)**	**19 (82.6)**	**263 (91.9)**	
ceaserian section	**14 (6.2)**	**5 (13.2)**	**4 (17.4)**	**23 (8.1)**	**<0.001**

Infant characteristics:

A total of 286 neonates were delivered to the mothers.

Preterm delivery (Gestational age less than 37 completed weeks at birth) was documented in 13% of infants in the all three categories while term delivery occurred in 68.5% of the HAART group and 78.9% of the Short course group. The mean birth weight for infants born at term was

3.1kg (95% CI 3.1-3.2). HAART and Sc-ARV groups were 3.1kg and 3.0kg respectively while the no ART group was 3.1kg.

Sixty percent (136/225) of the infants in the HAART group were breastfed while 29.3% received infant formula in the first six months of life. Among those that were breastfed, a quarter (26/136) received other non human milk products in addition to breast milk (mixed feeding). A higher proportion of the infants in the Sc-ARV group were fed with Infant formula (47.4%) while breastfeeding was practiced in 44.7% (17/38) of cases. Almost equal proportion of infants in the no intervention group were either fed with infant formula, breast milk alone or mixed fed.

There were a total of 13 (4.5%) HIV positive diagnosed infants at the date of last visit while 253 (88.5%) tested negative and 20 (7%) infants were still awaiting HIV screening. Transmission rate of 2.2 % was found in the HAART group over a mean follow up period of 11 ±1 months and 7.9% over a mean follow up period of 18 ± 2 months in the Sc-ARV group.

The average duration of follow up for infants was 12 ±1 months: 11 (95%CI 10-12) and 18 (95%CI 15-20) months for the HAART and Sc-ARV groups respectively, and 9 (95%CI 6-13) months for the no ART group.

By 9 months of age, 51.4% (147/286) of infants had their HIV status diagnosed by DNA PCR while 37.8% (108/286) were diagnosed from 18 months onwards using RT. Transmission rates at 9 months were 1% in the HAART group, 13.6% in the Sc-ARV group and 25% in the no intervention group.

There were a total of 13 (4.5%) HIV positive diagnosed infants at the date of last visit while 253 (88.5%) tested negative and 20 (7%) infants were still awaiting HIV screening.

At last visit, 60.1% (149/248) of infants (born at term) were appropriate weight for age and 23.4% (58/248) were underweight for age. Relatively equal proportions of the 3 study groups were underweight for age at last visit: 23.6% for HAART, 24.2% for Sc-ARV and 20% for no intervention.

Table 1d: Description of exposed infants

	Infants exposed to HAART no./n (%)	Infants exposed to Sc-ARVs no./n (%)	Infants with no ART exposure no./n (%)	Total no./n (%)	P value
All	225/286 (78.7)	38/286 (13.3)	23/286 (8)	286	
Gestational age at birth					
Term	154 (68.5)	30 (78.9)	10 (43.5)	194 (67.8)	
Pre term	30 (13.3)	5 (13.2)	3 (13.0)	38 (13.3)	
Post term	7 (3.1)	0 (0)	1 (4.4)	8 (2.8)	
unknown	34 (15.1)	3 (7.9)	9 (39.1)	46 (16.1)	0.038

Birth weight (kg) in term babies						
	Mean	**3.1**	**3.0**	**3.1**	**3.1**	
	95% CI	**3.1-3.2**	**2.9-3.1**	**2.8-3.4**	**3.1-3.2**	
Birthweight						
	Low BW	**26 (11.6)**	**2 (5.3)**	**0 (0)**	**28 (9.8)**	
	Normal BW	**140 (62.2)**	**26 (68.4)**	**9 (39.1)**	**175 (61.2)**	
	unknown	**59 (26.2)**	**10 (26.3)**	**14 (60.9)**	**83 (29.0)**	**0.005**
Feeding before 6months						
	Exclusive breast milk	**110 (48.9)**	**12 (31.6)**	**6 (26.1)**	**128 (44.8)**	
	Infant formula	**66 (29.3)**	**18 (47.4)**	**7 (30.4)**	**91 (31.8)**	
	Mixed feeding	**26 (11.6)**	**5 (13.1)**	**7 (30.4)**	**38 (13.3)**	
	unknown	**23 (10.2)**	**3 (7.9)**	**3 (13.1)**	**29 (10.1)**	**0.037**
Age at last visit (months)						
	Mean	**11**	**18**	**9**	**12**	
	95% CI	**10-12**	**15-20**	**6-13**	**11-13**	
Weight at last visit (for infants born at term)						
	Appropriate for age	**115 (59.0)**	**24 (72.7)**	**10 (50.0)**	**149 (60.1)**	
	under weight	**46 (23.6)**	**8 (24.2)**	**4 (20.0)**	**58 (23.4)**	
	Unknown	**34 (17.4)**	**1 (3.1)**	**6 (30.0)**	**41 (16.5)**	**0.121**
HIV status						
	Negative	**203 (90.2)**	**35 (92.1)**	**15 (65.2)**	**253 (88.5)**	
	Positive	**5 (2.2)**	**3 (7.9)**	**5 (21.7)**	**13 (4.5)**	
	Unknown	**17 (7.6)**	**0 (0)**	**3 (13.1)**	**20 (7.0)**	**<0.001**
Age at diagnosis						
	6 weeks	**27 (12.0)**	**2 (5.3)**	**3 (13.0)**	**32 (11.2)**	
	9 months	**86 (38.2)**	**20 (52.6)**	**9 (39.2)**	**115 (40.2)**	
	18 months	**64 (28.4)**	**9 (23.7)**	**5 (21.8)**	**78 (27.3)**	
	> 18 months	**22 (9.8)**	**5 (13.1)**	**3 (13.0)**	**30 (10.5)**	
	Unknown	**26 (11.6)**	**2 (5.3)**	**3 (13.0)**	**31 (10.8)**	**0.709**
HIV status at 9 months						
	Negative	**112 (99.0)**	**19 (86.4)**	**9 (75.0)**	**140 (95.2)**	
	Positive	**1 (1.0)**	**3 (13.6)**	**3 (25.0)**	**7 (4.8)**	**<0.001**
Septrin prophylaxis						
	No	**63 (28.0)**	**7 (18.4)**	**7 (30.4)**	**77 (26.9)**	
	Yes	**150 (66.7)**	**26 (68.4)**	**11 (47.8)**	**187 (65.4)**	
	unknown	**12 (5.3)**	**5 (13.2)**	**5 (21.8)**	**22 (7.7)**	**0.022**

Factors associated with vertical transmission

Table 2 shows the univariate analysis of factors associated with vertical transmission. Factors found to be positively associated with HIV transmission include mothers with unknown place of delivery OR: 5.36 (95% CI: 1.69-16.96), mothers in whom events in labour OR: 3.68 (95% CI:1.20-11.39) or delivery OR: 3.44 (95% CI:1.12-10.63) were not documented. Mixed feeding OR: 3.68 (95% CI:1.01-13.52) was also positively associated with vertical transmission. Factors negatively associated with HIV transmission were: pre-delivery duration of ART > 3 months OR: 0.19 (95% CI: 0.04-0.90) and mothers who had HAART in pregnancy OR: 0.07 (95% CI: 0.02-

0.28). Infants who received ARV prophylaxis at birth were also found to have a negative association with HIV transmission OR: 0.19 (95% CI: 0.05-0.77).

Table 2: Factors associated with vertical transmission: A univariate analysis

Factors	HIV negative infants	HIV positive infants	Univariate OR (95%CI)		P value
Maternal and Maternal Health Factors					
Maternal age at delivery *					
< 20 years	**4/5 (80)**	**1/5 (20)**	**1**		
20-35 years	**231/242 (95.5)**	**11/242 (4.5)**	**0.19**	**(0.02-10.22)**	**0.44**
> 35 years	**13/13 (100)**	**0/13 (0)**	**0.38**	**(0-15)**	**0.56**
Unknown	**5/6 (83.3)**	**1/6 (16.7)**	**0.82**	**(0.01-78.33)**	**1**
Socioeconomic status					
Upper class	**25/27 (92.6)**	**2/27 (7.4)**	**1**		
Middle class	**86/88 (97.7)**	**2/88 (2.3)**	**0.29**	**(0.04-2.17)**	**0.228**
Lower class	**135/143 (94.4)**	**8/143 (5.6)**	**0.74**	**(0.15-3.70)**	**0.714**
Unknown	**7/8 (87.5)**	**1/8 (12.5)**	**1.79**	**(0.14-22.70)**	**0.655**
Previous ART exposure					
None	**167/177 (94.3)**	**10/177 (5.7)**	**1**		
Unknown	**47/50 (94.0)**	**3/50 (6.0)**	**2.75**	**(0.69-10.86)**	**0.15**
Predelivery duration of ART					
< 3 months	**109/118 (92.4)**	**9/118 (7.6)**	**1**		
> 3 months	**128/130 (98.5)**	**2/130 (1.5)**	**0.19**	**(0.04-0.90)**	**0.036**
Unknown	**16/18 (88.9)**	**2/18 (11.1)**	**1.51**	**(0.30-7.65)**	**0.616**
CD4 count at initiation					
<200	**60/63 (95.2)**	**3/63 (4.8)**	**1**		
>200	**161/166 (97.0)**	**5/166 (3.0)**	**0.62**	**(0.14-2.68)**	**0.523**
Unknown	**32/37 (86.5)**	**5/37 (13.5)**	**3.13**	**(0.70-13.93)**	**0.135**
WHO stage at initiation *					
1	**67/71 (94.4)**	**4/71 (5.6)**	**1**		
2	**34/38 (89.5)**	**4/38 (10.5)**	**1.96**	**(0.34-11.20)**	**0.57**
3	**27/28 (96.4)**	**1/28 (3.6)**	**0.62**	**(0.01-6.68)**	**1**
4	**1/1 (100)**	**0/1 (0)**	**17**	**(0-663)**	**1**
Unknown	**124/128 (96.9)**	**4/128 (3.1)**	**0.54**	**(0.10-3.01)**	**0.61**
Treatment failure					
None	**215/225 (95.6)**	**10/225 (4.4)**	**1**		
Unknown	**14/17 (82.3)**	**3/17 (17.7)**	**4.61**	**(1.14-18.66)**	**0.032**
Last CD4 count before delivery					
<200	**33/34 (97.1)**	**1/34 (2.9)**	**1**		
>200	**190/196 (96.9)**	**6/196 (3.1)**	**1.04**	**(0.12-8.94)**	**0.97**
Unknown	**30/36 (83.3)**	**6/36 (16.7)**	**6.6**	**(0.75-58.03)**	**0.089**
Type of treatment in pregnancy					
None	**15/20 (75)**	**5/20 (25)**	**1**		
Sc ARVs	**35/38 (92.1)**	**3/38 (7.9)**	**0.26**	**(0.05-1.22)**	**0.087**
HAART	**203/208 (97.6)**	**5/208 (2.4)**	**0.07**	**(0.02-0.28)**	**<0.001**

ART treatment in pregnancy *					
None	**15/20 (75)**	**5/20 (25)**	**1**		
Single dose NVP	**2/3 (66.7)**	**1/3 (33.3)**	**1.47**	**(0.02-34.5)**	**1**
ZDV at 28 weeks	**4/4 (100)**	**0/4 (0)**	**0.64**	**(0-6.25)**	**0.7295**
Combivir at 36 weeks	**29/31 (93.5)**	**2/31 (6.5)**	**0.21**	**(0.02-1.50)**	**0.1466**
HAART	**203/208 (97.6)**	**5/208 (2.4)**	**0.08**	**(0.02-0.37)**	**0.0012**
Obstetric Factors					
Gestational Age at booking					
unbooked/no records	**42/44 (95.4)**	**2/44 (4.6)**	**1**		
2nd trimester	**50/53 (94.3)**	**3/53 (5.7)**	**1.26**	**(0.20-7.90)**	**0.805**
3rd trimester	**107/115 (93.0)**	**8/115 (7.0)**	**1.56**	**(0.32-7.70)**	**0.578**
Place of delivery					
In health facility	**200/207 (96.6)**	**7/207 (3.4)**	**1**		
Unknown	**32/38 (84.2)**	**6/38 (15.8)**	**5.36**	**(1.69-16.96)**	**0.004**
Maternal conditions¥					
None	**174/181 (96.1)**	**7/181 (3.9)**	**1**		
Yes	**27/28 (96.4)**	**1/28 (3.6)**	**0.92**	**(0.11-7.78)**	**0.939**
unknown	**52/57 (91.2)**	**5/57 (8.8)**	**2.39**	**(0.73-7.85)**	**0.151**
Adverse events at labour¤					
None	**183/189 (96.8)**	**6/189 (3.2)**	**1**		
unknown	**58/65 (89.2)**	**7/65 (10.8)**	**3.68**	**(1.20-11.39)**	**0.024**
Adverse events at delivery‡					
None	**186/192 (96.9)**	**6/192 (3.1)**	**1**		
Unknown	**63/70 (90)**	**7/70 (10)**	**3.44**	**(1.12-10.63)**	**0.032**
Infant factors					
Gestational Age at birth					
Term	**173/180 (96.1)**	**7/180 (3.9)**	**1**		
Pre term	**32/35 (91.4)**	**3/35 (8.6)**	**2.32**	**(0.57-9.43)**	**0.241**
Post term	**6/7 (85.7)**	**1/7 (14.3)**	**4.12**	**(0.44-38.99)**	**0.217**
Unknown	**42/44 (95.4)**	**2/44 (4.6)**	**1.18**	**0.24-5.87)**	**0.843**
Birth weight					
Low BW	**27/28 (96.4)**	**1/28 (3.6)**	**1**		
Normal BW	**158/164 (96.3)**	**6/164 (3.7)**	**1.03**	**(0.12-8.86)**	**0.982**
Unknown	**68/74 (91.9)**	**6/74 (8.1)**	**2.38**	**(0.27-20.73)**	**0.432**
Adverse conditions at birth * δ					
None	**171/178 (96.1)**	**7/178 (3.9)**	**1**		
Yes	**5/5 (100)**	**0/5 (0)**	**3.8**	**(0-31.79)**	**1**
Unknown	**77/83 (92.8)**	**6/83 (7.2)**	**1.9**	**(0.51-6.84)**	**0.3986**
Time of presentation to facility after birth					
within 72 hrs	**143/149 (95.9)**	**6/149 (4.1)**	**1**		
after 72 hrs	**81/86 (94.2)**	**5/86 (5.8)**	**1.47**	**(0.44-4.97)**	**0.534**
Unknown	**29/31 (93.5)**	**2/31 (6.5)**	**1.64**	**(0.32-8.55)**	**0.555**
ARV prophylaxis at birth					
None	**14/17 (82.3)**	**3/17 (17.7)**	**1**		
Yes	**224/233 (96.1)**	**9/233 (3.9)**	**0.19**	**(0.05-0.77)**	**0.02**
Unknown	**15/16 (93.7)**	**1/16 (6.3)**	**0.31**	**(0.03-3.35)**	**0.336**

Mode of Infant feeding within first 6 months					
Exclusive breast milk	**114/119 (95.8)**	**5/119 (4.2)**	**1**		
Infant formula	**84/87 (96.5)**	**3/87 (3.5)**	**0.81**	**(0.19-3.50)**	**0.783**
Mixed feeding	**31/36 (86.1)**	**5/36 (13.9)**	**3.68**	**(1.01-13.52)**	**0.05**
Health facility Factor					
Health facility MCHC performance					
Poor	**16/18 (88.9)**	**2/18 (11.1)**	**1**		
Fair	**15/18 (83.3)**	**3/18 (16.7)**	**1.6**	**(0.23-10.94)**	**0.632**
Very good	**61/67 (91)**	**0/67 (0)**	**0.79**	**(0.14-4.27)**	**0.781**
Very good	**75/77 (97.4)**	**2/77 (2.6)**	**0.21**	**0.03-1.63)**	**0.136**

**Exact logistic regression was done*

¤ *Adverse events at labour= vaginal bleeding, PROM, Chorioamnionitis, prolonged labour etc*

ǂ *Adverse events at delivery=Instrumental delivery, tears, episiotomy etc*

¥ *Maternal conditions=Malaria, Herpes simplex, STIs, breast conditions*

ẟ *Adverse conditions at birth=congenital abnormalities*

In the multivariate analysis (Table 3), after adjusting for all other factors including known risk factors that were not significant in the univariate model, none of the associations with HIV transmission remained significant.

Table 3: Factors associated with vertical transmission: A Multivariate analysis

Factors	**OR**	**95% CI**	**P value**
Predelivery duration of ART			
< 3 months	**1**		
> 3 months	**0.3**	**(0.04-2.25)**	**0.242**
Unknown	**0.32**	**(0.02-5.14)**	**0.423**
Treatment failure			
None	**1**		
Unknown	**4.44**	**(0.62-31.94)**	**0.139**
Last CD4 count before delivery			
<200	**1**		
>200	**0.41**	**(0.03-5.84)**	**0.509**
Unknown	**0.82**	**(0.04-18.68)**	**0.899**
Type of treatment in pregnancy			
None	**1**		
Sc ARVs	**1.3**	**(0.06-27.87)**	**0.868**
HAART	**0.4**	**(0.02-7.00)**	**0.53**
Place of delivery			
In health facility	**1**		
Unknown	**2.81**	**(0.12-65.20)**	**0.519**
Mode of delivery			
Vaginal	**1**		
Unknown	**0.48**	**(0.01-26.46)**	**0.722**

Maternal conditions			
None	**1**		
Yes	**0.36**	**(0.03-4.26)**	**0.42**
unknown	**1.49**	**(0.11-20.01)**	**0.765**
GA at birth			
Term	**1**		
Pre term	**1.44**	**(0.23-8.88)**	**0.692**
Post term	**3.97**	**(0.10-157.19)**	**0.463**
Unknown	**0.4**	**(0.02-7.07)**	**0.529**
Birth weight			
Low BW	**1**		
Normal BW	**0.25**	**(0.02-2.99)**	**0.271**
Unknown	**0.19**	**(0.01-3.64)**	**0.273**
Adverse conditions at birth *			
None	**1**		
Unknown	**0.39**	**(0.05-2.97)**	**0.364**
Infant feeding before 6 months			
Exclusive breast milk	**1**		
Infant formula	**0.4**	**(0.06-2.48)**	**0.325**
Mixed feeding	**1.61**	**(0.26-10.19)**	**0.612**
Infant given ARVs at birth			
None	**1**		
Yes	**0.25**	**(0.02-2.51)**	**0.237**
Unknown	**0.19**	**(0.01-4.92)**	**0.316**

Outcomes of Breastfeeding options

At least one episode of childhood infectious diseases was documented in 55.3% (21/38) of mixed fed infants compared with 31.9% (29/91) of formula fed and 24.2% (31/128) of exclusively breast fed infants (P=0.022). A slightly higher proportion of exclusively breast fed infants 26.6% (34/128) were underweight for age (weight less than 80% expected for age) at last visit compared to of formula fed infants 20.9 % (19/91) while among mixed fed infants, only 21.1%(8/38) were underweight. These differences were not statistically significant (P=0.678). There were no recorded deaths among the exclusively breast fed group whereas 3.3% (3/91) of formula fed infants and 2.6% (1/38) of mixed fed infants died (P=0.054)

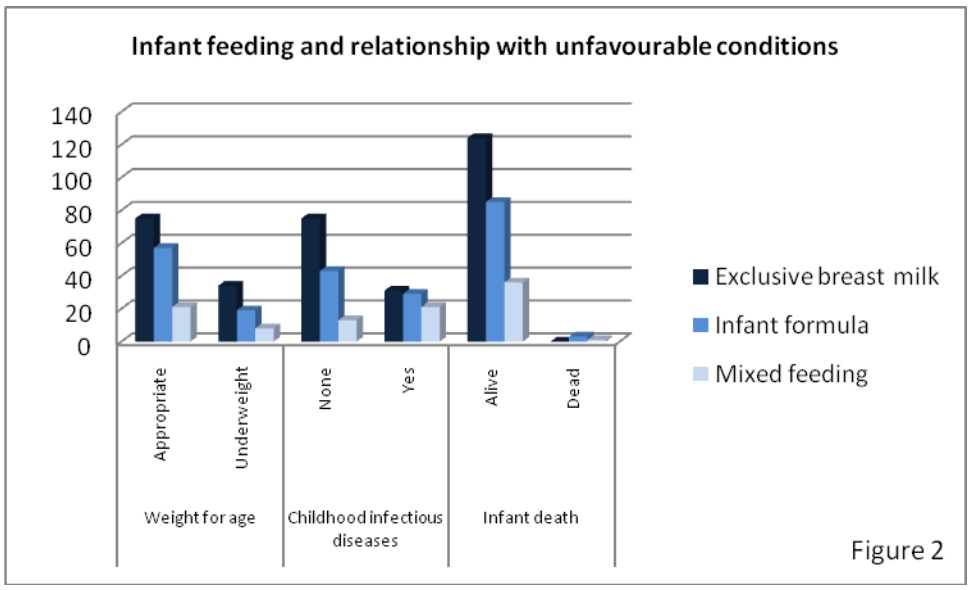


Figure 2: Infant feeding and relationship with unfavourable conditions

Effects of ARVs on neonatal outcomes

The HAART group recorded higher proportions of infant low birth weights: 11.6% (26/225) compared with 5.3% (2/38) in the Sc-ARV group. The no ART in pregnancy group had no low birth weights (P=0.005). There were no adverse birth conditions in both the Sc-ARV and the no ART group whereas 2.2% (5/225) of the HAART group had babies born with adverse conditions (P=0.009). There were almost equal proportions of pre term babies in the 3 intervention arms: 13.3% in the HAART group, 13.2% in the Sc-ARV group and 13% in the no-intervention group.

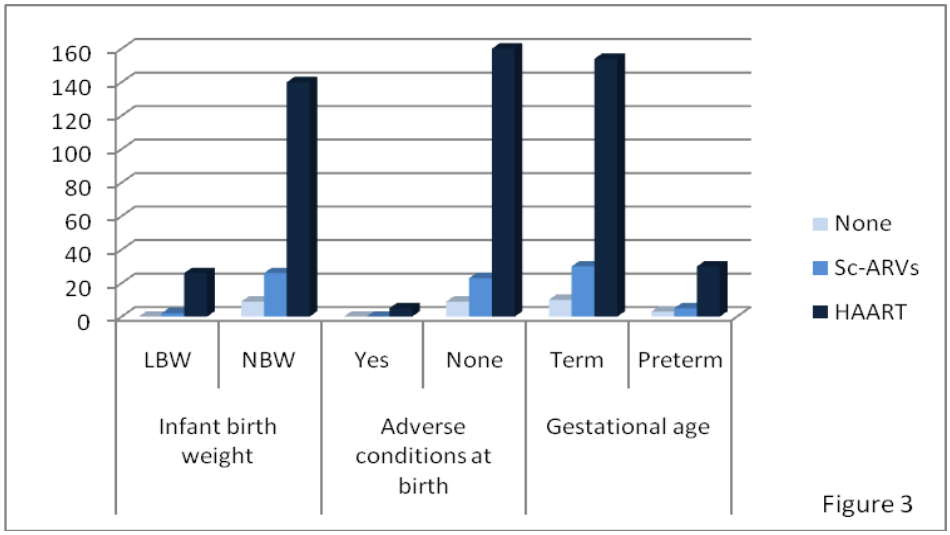


Figure 3: Neonatal outcomes and relationship with type of ARV treatment

Predelivery ART duration: More low birth weights [12.7% (18/142) vs 7.1% (9/126) p 0.025] and adverse conditions at birth [2.8% (4/142) vs 0.8% (1/126) p 0.003] were recorded in infants exposed to more than 3 months ART while in utero compared to shorter durations of exposure.

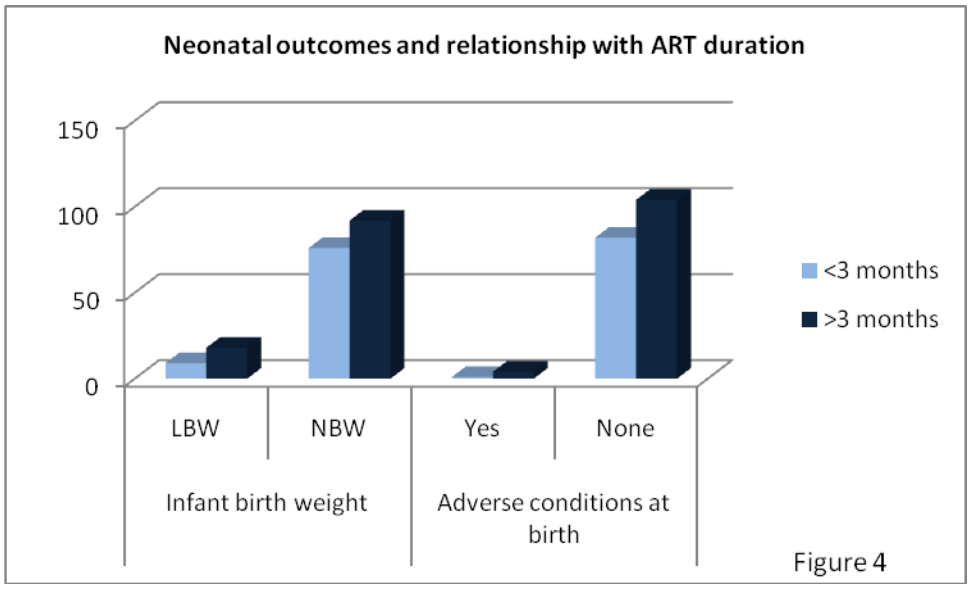


Figure 4: Neonatal outcomes and relationship with duration of ARVs

DISCUSSION

The overall transmission rate in the program was 2.4% (5/208) in infants whose mothers received HAART (17/225 of infants in the HAART group were still awaiting HIV results), 7.9% (3/38) for the Sc-ARV group and 25% (5/20) in the no intervention group (3 in the no intervention group still awaiting HIV results) over the entire follow up period. At the ninth month of life 1% (1/113) of infants in the HAART group, 13% (3/22) in the SC group and 25% (3/12) in the no intervention group had been infected. Four (4) additional infections occurred in the HAART group after the ninth month of life as a result of continued exposure to breast milk. These figures are consistent with findings in many studies in Nigeria[34] and African region suggesting that HAART is more effective for PMTCT particularly in breastfeeding population[25]. This effect can be attributed to higher probability of virologic suppression, a major determinant of low MTCT rates[35]. A significant proportion of the clients in the HAART group (60.9%) received ARVs for duration longer than 3 months before delivery to ensure considerable decay in viral load prior to labour. Among those in the Sc-ARV group only 7.9% of the clients initiated

therapy for > 3months. Transmission risk may have been further modified in this group by the relative immunological stability of these patients prior to initiation of therapy with almost half of the clients (17/38) initiating therapy at CD4 counts higher than 500cells/ml. This suggests possible low baseline viral loads however viral load results were not completely available to corroborate these findings. Twenty three (23) clients received little or no intervention as a result of late diagnosis and late clinic presentation with a transmission risk of 25% (5/20). These clients did not benefit from risk reducing strategies including safe delivery maneuvers and early initiation of infant feeding counseling.

Breast feeding increases risks of postnatal HIV transmission particularly within the first 6 months of life with the highest risk in mixed fed infants[35]. In this study, 60% and 44.7% of the HAART and Sc-ARV groups respectively were breastfed (whether exclusively or mixed) within the first 6 months. Twenty six (26) infants in the HAART group were mixed fed within same period with higher risks of incremental infections compared to 5 infants of mothers in the SC group. The four additional infections (1.4%) after the 9 month of life in the HAART group could be partly explained by the feeding practices and probable cessation of HAART at 6 months in some women who initiated ART at CD4 >350 cells/ml as recommended in the guidelines. This eliminates the protection associated with HAART in mothers who still continue breastfeeding beyond that period. However record of mothers who discontinued HAART was not collected. The PEPI-Malawi study found a 10.6% increase in new infections among breastfeeding infants whose mothers were not on HAART over a 9 month period[31]. Similar findings have been documented by other studies showing the incremental increases in transmission rates in breastfeeding mothers that receive short course ARV in pregnancy[29]. This study has shown that HAART ensures lower MTCT rates than other strategies particularly in breastfeeding populations however, it was not powered enough to provide conclusive comparisons.

Other factors found to be associated with increased risk of vertical transmission include shorter duration of ART use (<3 months) and the need for a regimen change in pregnancy defined as treatment failure. Shorter duration of HAART use is associated with reduced virological suppression rates at time of delivery. Amata study in Rwanda and the DREAM cohort in Mozambique[15] found similar MTCT transmission rates of <2% among newly diagnosed pregnant mothers who received HAART for longer than 12 weeks. Lower virological suppression could explain the increased MTCT among women who required a change in therapy as a result of immunological deterioration. Infants that received prophylactic ARV at birth (typically single dose nevirapine) demonstrated lower risks of transmission. Lallemant M et al in Thai infants[30] provided similar evidence for the efficacy of infant prophylaxis with nevirapine at birth in

reducing MTCT rates as confirmed by this study. Furthermore the majority of the infants who did not receive ARV prophylaxis were those delivered to mothers who did not receive PMTCT interventions in pregnancy further limiting its efficacy in reducing MTCT risks. The efficacy of extended ARV use for pre exposure prophylaxis has been extensively studied in breastfeeding infants[26, 29, 31] however in this study the single dose nevirapine at birth was administered for post exposure prophylaxis. Higher transmission risks were found in women who delivered outside health facilities and those with undocumented place of delivery.

The possibility of additional exposure to high risk delivery practices such as unattended labour, unneeded episiotomies, and lack of access to ART in the peripartal period contribute to higher MTCT risks in this group. In Nigeria, majority of deliveries are conducted outside orthodox facilities[36]. However all the factors discussed above were found to be insignificant when subjected to multivariate analysis probably as a result of the sample size and number of undocumented patient records.

The effect of ART on neonatal outcomes has been described in many studies and remains contentious. While some studies suggest a tendency towards higher rates of prematurity, low birth weight[23] others have reported little or no such knowing that HIV infection is associated with similar effects with or without ARV use[33]. However the risk of neural tube defects associated with Efavirenz is fairly conclusive.[37] In this study, exposure to HAART was associated with more low birth weight (11.6%), premature infants (13.3%), and adverse events at birth such as congenital abnormalities (2.2%) than other intervention groups. Similarly, these conditions were found to be commoner among infants exposed to longer duration of ART.

The benefits of using ARVs to prevent MTCT need to be augmented with strategies to minimize or manage the potential risks.

Exclusive breast feeding was shown to be protective against childhood infectious diseases and infant death. Various studies demonstrate the benefits of breast feeding to child survival in resource limited settings[10, 22] due to its safety, affordability, availability and immune content. No death was recorded among exclusively breastfed infants while 3.3% and 2.6% of formula fed and mixed fed infants respectively died. The socioeconomic status of the mother in this study reflects an impaired capacity to ensure steady supply of replacement feeds in a safe and sustainable fashion. Similarly, 31.9% of formula fed infants and 55.3% of mixed fed infants had various infectious diseases particularly diarrheal diseases while only 24.2% of the exclusively breast fed infants had infectious diseases.

In this study, the risk of death in non breastfeeding infants (3.3%) exceeds the risks of incremental HIV transmission associated with breastfeeding particularly in mothers who receive HAART over 9 months (1.4%).

Limitations of the study and possible sources of bias:

The challenges faced in carrying out this study were mostly related to poor record keeping and documentation. Retrieving records especially for patients who had Sc-ARVs was challenging because these interventions are no longer common practice. Linking mother and infant records in some sites was also a difficult task and some records were excluded because folders could not be linked. Files that could not be linked may most probably be those of HIV negative infants, since most HIV infected infants have been retained in care with their caregivers on treatment.

In this case, if the records were mostly from the HAART group, the missing records could have biased the OR towards the null. However the ORs already show a relationship between ART and infant HIV status even with this bias. If the missing records were evenly distributed, there would not be a significant difference in the results while if they were from the Sc-ARV group, could have biased the OR away from the null.

Another source of bias could be infants with unknown HIV status, some of whom might be HIV positive or might have died (HIV related) without the knowledge of the health facility.

CONCLUSION

- HAART prevented more vertical transmissions than short course therapy despite the presence of more advanced HIV disease in mothers who received HAART.
- Factors found to be positively associated vertical transmission include shorter duration of HAART use (less than 3 months), mixed infant feeding, poor documentation of labour and delivery events while factors negatively associated with transmission included receiving HAART in pregnancy and ARV prophylaxis for exposed infants.
- Exclusive breast feeding ensures better HIV free survival among infants in resource limited settings than other infant feeding methods.
- Antiretroviral therapy in pregnancy may be a predisposing factor to LBW and other unfavorable outcomes however a larger study needs to be designed to evaluate these effects conclusively.

Recommendations

1. Early identification of HIV disease in pregnant women should be emphasized to maximize the benefits of HAART on transmission and neonatal outcomes.
2. The resources and capacity to deliver HAART for all HIV positive pregnant women should be developed in health care facilities providing PMTCT services to minimize MTCT, childhood morbidity and mortality.
3. The National HIV program needs to re emphasize the benefits of breastfeeding as the safest feeding method in resource limited settings except if replacement is considered affordable, sustainable and feasible.
4. A larger evaluation of the effect of ARVs on neonatal outcomes is needed to provide information for appropriate management of infants who have been exposed to ARVs in utero.

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Competing interests: None declared

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Annexes

Annex 1: Concepts and Definitions

Socio economic status of mothers was classified using the Oyedeji scheme which is relevant in the Nigerian setting[12]. Due to the difficulty of diagnosing HIV drug resistance in this environment, treatment failure was used in place of HIV drug resistance. Treatment failure was defined based on diagnosis by the ART doctor (using clinical, virological and immunological features) and placement of patient on 2nd line ART. Any of the following ARV drug combinations was considered Short course ARV therapy: Single dose Nevirapine, Zidovudine, Lamivudine and Zidovudine. Any triple ARV drug combination including 2nd line treatment was considered as HAART. Maternal conditions in pregnancy recorded were Malaria, Herpes simplex, STIs and breast conditions like mastitis or abscesses. Adverse events at labour was recorded as any of the following: vaginal bleeding, PROM, chorioamnionitis and prolonged labour while events at delivery included instrumental delivery, tears or episiotomies.

Adverse conditions at birth of the infant were recorded as any gross abnormalities while other infant conditions considered included malnutrition or any childhood infections like respiratory tract infections, diarrhoeal disease and malaria. Presentation of infants to health facility after birth was grouped as within 72 hours and those presenting after 72 hours.

Main outcome measure was HIV status of the infant. The HIV status of the infants was determined using lab results of PCR or Rapid test. Certain sites were carrying out early infant diagnosis and had PCR results for the infants as early as 6 weeks while other sites were yet to commence EID and had Rapid test results for the infants from about 18 months age. The age at HIV screening was grouped into those screened at/around 6 weeks, 9 months, 18 months and above. The infants' folders had DBS forms where information on the mothers' ART in pregnancy, ARV prophylaxis given to the infants, infants feeding, HIV test results as well as septrin chemoprophylaxis was obtained. Babies born with birth weight below 2.5 kg were classified as having low birth weight, and those with birth weight above 4.5 kg were classified as high birth weight. For estimating weight for age of the infants at last presentation the Wellcome classification[38] was used and any child who presented with a weight less than 80% of the expected weight for age was said to be malnourished while those with 80% and above were said to be appropriate weight for age.

In assessing Health facility factors, a site clinical component assessment tool developed by the University Of Maryland School Of Medicine Institute for Human Virology and used by the Continuous Quality Insurance unit to evaluate the ART sites was used. The CQI unit assesses various components of the health facilities using specific health indicators and scores the components from 1 (lowest) to 5 (highest). The Maternal and Child Health component of the assessment was used as a factor to assess the health facilities for the purpose of this study.

Annex 2: Data Abstraction Forms for PMTCT approach evaluation

Maternal Information

BIODATA	Patient I.D. number |__|__|__|__||__|__|__|__||__|__|__|__||__|__|__|__|		
1. **Age/date of birth:**	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	**OR**	|__|__|__| years
2. **Level of education:**	Primary Secondary Tertiary	Other (informal, none) *If yes, specify:* |____________________________|	
3. **Occupation:**	|____|		
4. **Religion:**	|____|		
5. **Tribe/ethnic group:**	|____|		

PREGNANCY

6. **LMP:**	7. **Date of booking:**
|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y

PRIOR HIV/ART INFORMATION

8. **Previous ART exposure:** *If yes, please fill below.*	yes	no	not recorded	
9. **Date of ART initiation:** |__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	10. **CD4 count at initiation:** |__|__|__|__| cells/mm^3 11. **Viral load at initiation:** |__|__|__| |__|__|__| |__|__|__| copies/mL		12. **Stage at initiation** CDC: A, B, C	WHO: 1, 2, 3, 4
13. **Prior treatment:**	**Date initiated:**	**Date stopped:**		
|____________________________|	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	UK	
|____________________________|	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	UK	
|____________________________|	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	UK	
|____________________________|	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	UK	
|____________________________|	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	UK	
	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	UK	
|____________________________|				

14. **Treatment failure**	yes	no	not recorded
Documented mutation (*if diagnosed with drug resistant HIV*) |__________________|	Date detected: |__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	Documented mutation |__________________|	Date detected: |__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y

BIODATA	Patient I.D. number |__|__|__|__||__|__|__|__||__|__|__|__||__|__|__|__|	

HIV/ART INFORMATION AT DELIVERY

15. **Patient taking ART at delivery:** Yes No *If yes, fill in section 19.*	17. **Last CD4 count before delivery and date:** |__|__|__|__| cells/mm^3 |__|__|/|__|__|/|__|__| d d / m m / y y
16. **Patient taking Septrin prophylaxis:** Yes No NR *If yes, date of tx initiation:* |__|__|/|__|__|/|__|__| d d / m m / y y	18. **Last Viral load before delivery and date:** |__|__|__| |__|__|__| |__|__|__| copies/mL |__|__|/|__|__|/|__|__| d d / m m / y y

19. **Treatment:**	**Date initiated:**	**Date stopped:**	
|______________________|	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	UK
|______________________|	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	UK
|______________________|	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	UK
|______________________|	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	UK
|______________________|	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	|__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	UK

LABOUR/DELIVERY

20. **Mode of delivery:**	vaginal CS	21. **Date of delivery:** |__|__|/|__|__|/|__|__| d d / m m / y y

22. **Place of delivery:** In the facility Other place *If yes, please specify:* |________________|	23. **Other maternal infections & conditions:** *If yes, list below* — NONE (i.e. malaria, Herpes simplex, STI's, breast conditions etc) |______________________________| |______________________________| |______________________________| |______________________________| |______________________________| |______________________________|
24. **CS at delivery:** Yes No Not reported *If yes, please fill below.* elective CS (was not in labour b/f CS) — emergency CS (went into labour b/f CS) Indication(s): |______________________________| |______________________________| |______________________________|	

25. **Adverse events at labour:** *If yes, list below.* — NONE	26. **Adverse events at delivery:** *If yes, list below.* — NONE
(i.e. vaginal bleeding, PROM, chorioamnionitis, prolonged labour, etc) |______________________________| |______________________________|	(i.e. instrumental delivery, tears, episiotomy etc) |______________________________| |______________________________|

Infant information

BIODATA	Patient I.D. number (mother) |__|__|__|__|__|__|__|__|__|__|__|__|__|__|	Infant I.D. number |__|__|__|__|__|__|__|__|__|__|__|__|

27. Date of birth **28. Birth weight:**	|__|__|/|__|__|/|__|__| d d / m m / y y |__|__|.|__| kg		**29. Date of presentation to the facility:**	|__|__|/|__|__|/|__|__| d d / m m / y y	N/A
30. Adverse conditions at birth: *If yes, please specify below.*			yes	no	not recorded
(i.e. prematurity, gross abnormalities etc) |_____|		**Sequellae:** Yes	No	*If yes, specify:* |_____|	
|_____|		Yes	No	|_____|	
31. Infant feeding:		Exclusive breast milk	Infant formula	Mixed feeding (both formula & breast milk before 6 months)	
32. HIV status of infant: (please specify whether PCR or RT)		Result: neg pos Date of test: |__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y		Result: neg pos Date of test: |__|__|/|__|__|/|__|__|__|__| d d / m m / y y y y	

33. Other conditions of infant: *If yes, list below.*	NONE	**34. Infant alive:**	Yes	No	Not recorded
(i.e. infections, failure to thrive etc) **Condition:**	**Date of initial dx:**	*If yes, please fill in below.* **Date of last visit:**	|__|__|/|__|__|/|__|__| d d / m m / y y		
|_____|	|__|__|/|__|__|/|__|__| d d / m m / y y	**Weight at last visit:**	|__|__| kg		
|_____|	|__|__|/|__|__|/|__|__| d d / m m / y y	*If no, please fill in below.*			
|_____|	|__|__|/|__|__|/|__|__| d d / m m / y y	**Date of death:**	|__|__|/|__|__|/|__|__| d d / m m / y y		
|_____|	|__|__|/|__|__|/|__|__| d d / m m / y y	**Cause of death and diagnosis**			

15. Infant given ARV prophylaxis:			
Yes	No		NR
If yes, date of tx initiation	|__|__|/|__|__|/|__|__| d d / m m / y y		
16. Infant taking Septrin prophylaxis:			
Yes		No	NR
If yes, date of tx initiation:		|__|__|/|__|__|/|__|__| d d / m m / y y	

Annex 3: ART Adult Follow up form

Follow-up Form

1. Patient Name _____ **2.Visit Date** _____/_____/20____

3. ID ☐☐ - ☐☐☐☐ **4. Existing Hosp/Clinic #** _____

SATELLITE # **PATIENT ENROLLMENT #**

5.Provider _____ **8a. Current regimen began:** _____

6.Last CD4 Count ☐☐☐☐ c/mm^3 **Date**: _____ **8b. Regimen** _____

6a. CD4 prior to starting ARV ☐☐☐☐ c/mm^3 **Date**: _____

7.Last Viral Load ☐☐☐☐☐☐ **Date**: _____ **9. Pregnant?** ◯ Yes ◯ No **LMP** _____

10. Adherence

Number of doses missed last week _____ ◯ None

_____ ◯ None last month

◯ DOT _____ times/week ◯ Home visits _____ times/week ◯ Support group

◯ Rx was **interrupted (unintentional)** Date: _____ # of days _____

◯ Rx was **stopped (intentional)** Date: _____ # of days _____

◯ Patient reports taking herbal medications

Adherence Codes (circle those that appply)

1. Forgot	7. Prog. Stopped
2. Side effects	8. Delivery/Travel problems
3. Feeling sick	9. Dispensary out of stock
4. Illness in the family	10. Unable to pay for meds
5. Work conflict	11. Perceived lack of need
6. Sharing medications	12. Other

11. Presenting Complaint(s):

◯ **None**
◯ Recent weight loss
◯ Fever
Night Sweats
◯ Headache
◯ Cough>2 Weeks
Shortness of breath
◯ Nausea/Vomitting
◯ Chronic Diarrhea
Pain when swallowing
◯ Numbness/tingling
◯ New visual problems
New swelling

12. Presenting Complaint(s):

13. Prevention Goal ◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5 ◯ 6 ◯ 7 ◯ 8 ◯ Send for Counseling

14. Physical Exam

Temp:	. C	**RR:**	cpm	**HR:**	bpm	**BP:**	mm/Hg	**Wt:**	KG	**Height**		**BMI**	

15 Clinical TB Screening: TB Suspect Not TB Suspect

16. ARV Side Effects

None | Rash | Peripheral neuropathy

Headache | Diarrhoea | Stevens Johnson Syn | Lipoatrophy | Insomnia | Renal Insuffic.

Anemia | Hyperlipidemia | Hepatic Toxicity (LFT >5x normal) | Pancreatitis | Psychosis | Renal Failure

Severe N&V | Hyperglycaemia | Liver failure | Lactic acidosis | Suicide attempt

Comments -

17. OIs or AIDS Defining Illnesses

None

Pulmonary TB | Oral Candidiasis | CMV Retinitis | Neuro (Toxo, PML…) | Encephalopathy/Dimentia | Salmonellosis

Extrapulm TB | Esophageal Candidiasis | Herpes Zoster | Cutaneous KS | Urethritis/cervicitis | Sepsis

PCP | Diarrhoea/wasting | Herpes Simplex | Susp Visceral KS | Genital Ulcerative disease | Malaria

Pneumonia | Other Mycobacteria | Cr Meningitis | Susp Lymphoma | PID

Comments -

18. Assessment Improving/Stable | Active OI | Drug toxicity | Non-adherence | WHO Stage | WAB

19.Plan -

ARV Therapy

Continue current treatment | Change regimen (indicate code)

Restart treatment | Stop treatment (indicate code)

Start new treatment (naïve patient)

Regimen

Therapy Change Codes (circle one)

1. Toxicity
2. Treatment Failure
3. Non-adherence
4. Drug interaction
5. Pregnancy
6. Patient Preference
7. Drugs not available
8. Migratory patient; follow-up difficult
9. Transfer to other program
10. Inability to pay
11. Other

20. When is the patient's next appointment

1 Week | 2 months

2 Week | 3 months

4 Week | 6 months

Date:

20. Signature:

Print Name:

Annex 4 :

Paediatric Clinical Evaluation

○ Initial Visit
○ Follow-up Visit

1. Visit Date _____ (dd/mm/yyyy)

2. Name _____ Surname _____ Other Names

3. ID ___ State ___ Facility No. ___ Serial Enrollment No.

4. Hospital No. _____

Sex M ☐ F ☐ **Age(years and months)** _____

5. Presenting complaint:

6. Symptoms in the past month (check all that apply).

○ Fever	○ Poor appetite	○ Pain – Legs/feet
○ Night sweats	○ Nausea and/or vomiting	○ Numbness or tingling in legs and/or feet
○ Fatigue	○ Diarrhoea	○ Loss of developmental milestones
○ Weakness	○ Thrush	○ Depression
○ Failure to gain weight	○ Pain – Abdominal	○ Other 1 (specify) _____
○ Weight loss	○ Rash	○ Other 2 (specify) _____
○ Weight gain	○ Cough	○ Other 3 (specify) _____
○ Headache	○ Difficulty of breathing	

FOR INITIAL VISIT ONLY

7. Family history / additional comments: _____

8. Past medical problems: _____

9. Previous ARV:

Maternal ARV during pregnancy	*Intrapartum ARV*	*Neonatal ARV prophylaxis*	*Prior ARV prescription for child*
○ HAART (regimen): _____ ○ ZDV only ○ ZDV/3TC ○ None ○ Unknown	○ NVP ○ None ○ ZDV ○ Unknown	○ Single dose NVP ○ ZDV x 1 week ○ ZDV x 6 weeks ○ Unknown	Specify:

FOR FOLLOW UP VISIT ONLY

10. Illnesses since last visit: _____

11. Drug allergies: _____

12. Hospitalization:

13. Diet / Feeding: ○ Currently EBF ○ Currently BMS ○ Currently mixed feeding

○ Weaned from BF (age at weaning: _____) ○ Nutritional supplement (specify) _____ ○ Regular diet for age

14. Is patient taking: a. Herbal supplement ○ **Y** ○ **N**

b. Traditional medicines ○ **Y** ○ **N**

15. BIRTH HISTORY, to be completed at INITIAL VISIT ONLY

a. Maternal HIV status: ○ **Pos** ○ **Neg** ○ **Unknown**

b. Duration of membrane rupture (ROM): _____ **minutes**

c. Delivery: ○ **Vaginal** ○ **C-section**

d. Gestation age at birth: _____ **weeks** g. Birth weight: _____ **kg**

e. Congenital anomaly: ○ **Y** ○ **N** , if yes specify: f. Date of Birth_____

16. Latest CD4 (if available) ____ **((%)**Counts/mL

Date ____/____/____

17. CD4 at start (if available) ____ (%)Counts/mL

Date ____/____/____ ○ Lab records seen

18. Current medications (probe and specify) ○ None

○ ART Treatment _____

○ TMP/SMX _____

○ ART infant PMTCT prophylaxis _____

20. Physical Exam

Temp ____.____ **°C**	**BP** ____/____ **mm/Hg**	**Head Circ.** _____ **cm** %
Pulse	**Wt** _____ **kg** _____ %	**Mid Upper Arm Cir.-** _____ **cm** _____ %
		Ht/Lt _____ **cm** _____ %

	Normal	Abnormal	Not Done	Comments
General appearance	☐	☐	☐	
Head and Neck	☐	☐	☐	
Eyes	☐	☐	☐	
ENT	☐	☐	☐	
Respiratory	☐	☐	☐	
Cardiovascular	☐	☐	☐	
Abdomen	☐	☐	☐	
Gastrointestinal	☐	☐	☐	
Anorectal	☐	☐	☐	
Genitourinary	☐	☐	☐	
Lymph nodes	☐	☐	☐	
Skin	☐	☐	☐	
Extremities	☐	☐	☐	
Musculoskeletal	☐	☐	☐	
Psychiatric	☐	☐	☐	
	☐	☐	☐	

Neurological	☐	☐	☐
Other (specify in comments)	☐	☐	☐
Other (specify in comments)			

○ Anti-TB meds
○ Other (specify)
○ Other (specify)

19. Presumed ARV side effects:
Past (if this is initial visit) or Current (if this is follow-up visit).

○ N/A	○ Peripheral neuropathy	○ Pancreatitis
○ None	○ Rash	○ Fat accumulation or loss
○ Significant nausea/vomit	○ Jaundiced	○ Hyperglycemia
○ Headache	○ Stevens Johnson syndrome	○ Kidney problems
○ Diarrhoea	○ Itching	○ Hepatitis
○ Pain abdomen or muscle	○ Anaemia	○ Lactic acidosis
○ Insomnia/bad dreams	○ Weakness/fatigue	○ Other (specify) _____
○ Confusion/dizzy		

Tanner Stage ○ 1 ○ 2 ○ 3 ○ 4 ○ 5

21. Developmental milestones	Normal	Delayed	Not evaluated
Cognition	○	○	○
Gross motor	○	○	○
Fine motor	○	○	○
Language	○	○	○

22. Functional status: ○ Ambulatory ○ Bedridden

Name:

Hosp No:

23. HIV status: **○ Exposed Baby:** ☐ Not tested
☐ DNA PCR #1, **Date:** ___/___/___, **Result:** ☐ Pos ☐ Neg ☐ Indeterminate
☐ DNA PCR #2, **Date:** ___/___/___, **Result:** ☐ Pos ☐ Neg ☐ Indeterminate

○ Confirmed HIV infected infant/child

24. WHO staging criteria (History of any of the following) – Past/current if Initial Visit; If Follow-Up Visit, only check new diagnoses since last visit and re-stage if necessary. Complete only if confirmed HIV infection or DNA-PCR not available < 18 months

Stage 1
○ Asymptomatic
○ Persistent generalised lymphadenopathy
○ Hepatosplenomegaly
Stage 2
○ Papular pruritic eruptions
○ Seborrheic dermatitis
○ Fungal nail infections
○ Angular chelitis
○ Lineal gingival erythema
○ Extensive HPV or molluscum infection (>5% of body area/face)
○ Recurrent oral ulcerations (>2 episodes/6 mos)
○ Parotid enlargement
○ Herpes zoster (>1 episode/12 mos)
○ Recurrent or chronic URI: otitis media, otorrhea, sinusitis (>2 episodes/6 mos)

Stage 3
○ Unexplained moderate malnutrition (-2 SD or Z score) not responding to standard therapy
○ Unexplained persistent diarrhoea (>14 days)
○ Unexplained persistent fever (intermittent or constant, >1 mo)
○ Oral candidiasis (outside neonatal period)
○ Oral hairy leukoplakia
○ Pulmonary tuberculosis
○ Severe recurrent presumed bacterial pneumonia (>2 episodes/12 mos)
○ Acute necrotizing ulcerative gingivitis/periodonits
○ Unexplained anaemia (<8 gm/dL), neutropenia (<1,000/mm³), or thrombocytopenia (<30,000/mm³) for > 1 mo.
○ HIV-related cardimyopathy
○ HIV-related nephropathy

Stage 4	
Symptomatic HIV-antibody positive infant age <18 mos, 2 or more of the following: ○ Oral candidiasis/thrush ○ Failure to thrive ○ Severe pneumonia ○ Sepsis	
○ Unexplained severe wasting or severe malnutrition	○ Cryptosporidiosis or isosporiasis (with diarrhoea >1 mo)
○ Pneumocystis pneumonia	○ CMV infection of organ other than liver, spleen, lymph nodes (and onset age >1 mo)
○ Recurrent severe bacterial infections (>2 episodes/12 mos, excluding pneumonia)	○ Disseminated mycobacterial disease other than tuberculosis
○ Chronic orolabial or cutaneous HSV (lasting >1 mo)	○ Candida of trachea, bronchi or lungs
○ Extrapulmonary tuberculosis	○ Acquired recto-vesico fistula
○ Kaposi's sarcoma	○ Cerebral or B cell non-Hodgkins lymphoma
○ Esophageal Candidiasis	○ Progressive multifocal leukoencephalopathy (PML)
○ CNS toxoplasmosis	
○ Cryptococcal meningitis	○ HIV encephalopathy
○ Any disseminated endemic mycosis	

25. Only complete at Initial Visit or if change to more advanced WHO stage at Follow Up Visit.

26. Immunization: ○ Up to date ○ Incomplete
○ Vaccination needed _____

27. TB Status: ○ No signs or symptoms suggesting TB ○ Sputum sample date sent_____/_____/_____ Sputum sample date received_____/_____/_____
○ Currently on INH prophylaxis, dose, adherence ○ Currently on TB treatment → Duration _____ Sputum sample Result_____
○ Suspected TB, referred for evaluation (include referral date) ○ Prior history of treated TB

28. Assessment and Plan

29. List all medication being started, stopped or continued:

Medication	Recommendation			Reasons for Discontinuation*	Dose and Comments
	Start	Stop	Continue		
Zidovudine (AZT)	○	○	○		
Lamivudine (3TC)	○	○	○		
Stavudine (D4T)	○	○	○		
Abacavir (ABC)	○	○	○		
Nevirapine (NVP	○	○	○		
Efavirenz (EFV)	○	○	○		
Kaletra (LPV/r)	○	○	○		
D4T/3TC/NVP – **FDC 6**	○	○	○		
D4T/3TC/NVP – **FDC 12**	○	○	○		

AZT/3TC/NVP – FDC	○	○	○		
Others(specify)					
_____					
TMP/SMX (Cotrimoxazole)	○	○	○		
Rifampicin (RIF)	○	○	○		
Isoniazid (INH)	○	○	○		
Ethambutol	○	○	○		
Pyrizinamide	○	○	○		
Other (specify):	○	○	○		
_____					
Other (specify):	○	○	○		
_____					

* Reason for discontinuation:
1 = Side effect / Toxicity / Drug interaction
2 = Disruption in drug supply / Stock out
3 = Patient non-adherence
4 = Treatment failure
5 = PMTCT prophylaxis complete
6 = Patient refused
7 = Other, specify _____

30. What referrals will be made for the patient

○ None	○ In-patient care / Hospitalization	○ Family counselling / VCT	○ Clean water	○ Other referral (specify)
○ Family planning services	○ TB treatment / DOT program	○ Support group services	○ Insecticide treated nets	○ Protection Services (Birth Registration)
○ Nutritional support + Plumpy Nut	○ Adherence counselling	○ Home-based care	○ Immunization	

31. When is the patient's next appointment? ○ 1 week ○ 2 weeks ○ 4 weeks ○ 2 months ○ 3 months → ____/____/**20**

Clinician Signature _____ **Print Name**

Annex 5: DBS form

HIV Reference Laboratory
Infant HIV PCR (DBS) Request/ Report

Sample Sent from SITE ID:

Result Sent to Site ID:

INSTRUCTIONS: Please print in block letters. This requisition form must accompany the sample/s. Mark all tests on one form. Samples must reach the laboratory before 3.00 p.m. Monday to Friday.

Section 1: Patient Information

Hospital Number

First Name

Surname

Date of Birth (DD/MM/YY)

Age (Months) **Gender: Male Female**

Section 3: Lab Use Only

Sample Reference Number

Date Specimen received by Lab (DD/MM/YY)

Was sample testable? Yes ☐ No ☐

If no, reason test was not performed
Technical problems ☐
Labeled improperly ☐
Insufficient blood ☐
Layered or clotted ☐
Improper packaging ☐

Section 2: CLINICAL INFORMATION *(COMPLETE IN CLINIC BEFORE SENDING SPECIMEN TO LAB)*

Date Specimen Drawn DD/MM/YYYY

Reason for PCR *(tick one)*:

- ☐ 1st test for healthy exposed baby
- ☐ 1st test for sick baby
- ☐ Repeat test after cessation of breastfeeding (do at least six weeks after last breast milk)
- ☐ Repeat because of problem with first test
- ☐ Repeat to confirm 1st result

For infants 9 months or older:
Rapid test done?
☐No ☐Yes

If yes, date done: __ __/__ __/__ __

Result of rapid test:
☐Positive ☐Negative
☐Indeterminate

ART administered to Mother during pregnancy:
(tick all received, nothing, or unknown)

- ☐ Nothing
- ☐ HAART started during pregnancy
- ☐ HAART started before pregnancy
- ☐ AZT + 3TC at 34-36 weks
- ☐ AZT less than 4 weeks
- ☐ AZT more than 4 weeks
- ☐ NVP
- ☐ Unknown

Baby received: *(tick all received, nothing, or unknown)*

- ☐ Nothing
- ☐ AZT
- ☐ NVP
- ☐ Unknown

Was baby ever breastfed?
☐No ☐Yes ☐Unknown

Is baby breastfeeding now?
☐No ☐Yes ☐Unknown

Age (in months) Breastfeeding stopped ____

Cotrimoxazole given to baby?

- ☐ No
- ☐ Yes, taking CTX daily
- ☐ Starting CTX today

Annex 6: SOCIO-ECONOMIC CLASSIFICATION SCHEME BY OYEDEJI

OCCUPATION

CLASS	OCCUPATION
I	Senior Public Servants, Professionals, Managers, large scale traders, businessmen and contractors
II	Intermediate grade public servants and senior school teachers.
III	Junior school teachers, drivers, artisans.
IV	Petty traders, labourers, messengers
V	Unemployed, full-time housewife, students and subsistence farmers.

EDUCATIONAL STATUS

CLASS	EDUCATIONAL ATTAINMENT
I	University graduates or equivalents
II	School certificate holders ordinary level (GCE) who also had teaching or other professional training.
III	School certificate or grade II teachers certificate holders or equivalents.
IV	Modern three and primary six certificate holders.
V	Those who could either just read and write or were illiterate.

Oyedeji GA. Socio-economic and cultural background of hospitalized children in Ilesha. Nig J Paediatr 1985; 12: 111-7.