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Effectiveness of infant feeding strategies to prevent mother-to-child HIV vertical transmission in Ekiti State

Abstract

Background: Prevention of mother-to-child transmission has become a key public health priority in Nigeria. Safe infant feeding practices remain an integral part of prevention of mother-to-child transmission of HIV. World Health Organization guidelines on infant feeding in the context of HIV-infection recommend that infant feeding practices should support the greatest likelihood of infant HIV-free survival, while also protecting against non-HIV morbidity and mortality.

Aim: To determine the effective mode of infant feeding strategies to prevent mother-to-child HIV vertical transmission in Ekiti State.

Method: One hundred and sixty HIV-exposed children within aged group 0-18months old of both sexes who were born to HIV-infected mothers that received their antenatal care at Federal Teaching Hospital, Ido-Ekiti between 2012 and 2016 were recruited for this study. Blood samples were collected as dried blood spots (DBS) at the ART Laboratory for HIV-DNA PCR analysis from HIV-exposed children at 6weeks old. HIV rapid screening test using serial algorithm method and HIV-DNA PCR analysis was carried out for HIV-exposed children that are nine months old and above. Structured questionnaire was used to obtained demographic characteristic, feeding choice and other relevant information for the study.

Results: Out of 160 HIV-exposed children born to HIV-Infected mothers, 15(9.4%) were HIV sero-positive by DNA PCR testing. Exclusive breast-feeding pattern had highest frequency of 102(63.8%) with low prevalence of 3(1.9%) in HIV positive as compared with other feeding pattern.

Conclusion: The use of ARV drugs during the period of breast feeding by the mother and or the infant has been associated with reduced vertical transmission of HIV in a program setting, this can be an effective and safety mode of infant feeding pattern in HIV exposed children.

Keywords: infant-feeding pattern, HIV-transmission, anti-retroviral drug

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Abbreviations: AIDS, acquired immunodeficiency disease syndrome; HIV, human immunodeficiency virus; MTCT, mother-to-child transmission; HAART, highly active anti-retroviral therapy; PMTCT, prevention of mother-to-child transmission of HIV; WHO, world health organization; ART, antiretroviral therapy; PCR, polymerase chain reaction

Introduction

Worldwide, the HIV epidemic has had a major impact on maternal, child health and survival. An estimated 12million and 1.1million were women and children respectively have been infected with HIV. During the last few years, about 30-50% of approximately 500,000 infants were infected with HIV worldwide annually through breastfeeding and 1600 new infections occur daily.[1,2] In 2012, 3.3million children were living with HIV (Human Immunodeficiency virus) of who 260,000 were new infections. However, about 370,000children were infected newly with HIV through mother-to-child transmission.[3] Over 1,000children were infected newly with HIV daily; out of these more than half die as a result of AIDS, because of inadequate access to HIV treatment. Globally, in the year 2011, about 34million [31.4million-35.9million] people were living with HIV, including 3.4million (3,000,000-3,800,000) children less than 15years of age. In 2010, about 250,000 (220,000-290,000) children, less than 15years of age, died from acquired immunodeficiency disease syndrome (AIDS) related causes.[4] Nigeria is one of the countries in Sub-Saharan Africa continues with the highest loads of pediatric AIDS.[5] In 2011, Nigeria had an estimated 440,000 children less than 15years, living with HIV. Mother-to-child transmission (MTCT) accounts for 90% of HIV infections in children under the age of 15years.[4] Prevention of mother-to-child transmission (PMTCT) has become a key public health priority in Nigeria, a country faced with 56,681 annual HIV-positive births and more than 210,000 women living with HIV.[6] The national PMTCT programme in Nigeria commenced in 2002 with supports from the World Health Organization (WHO) and The United Nations Children's Fund (UNICEF).[7] There are about 1,216 PMTCT service points across the Nigeria presently. In 2009, 18.7% of pregnant women living with HIV received antiretroviral (ARV) agents to reduce the risk of mother-to-child transmission (MTCT), showing a significant increase in PMTCT coverage from 5.3% in 2007, although the coverage for ARV prophylaxis during the breastfeeding period

has still remained low.[8] Providing ARV prophylaxis to pregnant women living with HIV has prevented more than 350,000 children from acquiring HIV infection since 1995 and resulted in a 24% decline in newly infected children since 2004.[4] HIV transmission through breastfeeding occurs throughout lactation and is correlated with the duration of breastfeeding and HIV levels in breast milk.[9,10] In the absence of antiretroviral therapy the risk of breast milk HIV transmission is approximately 16%.[11,12] Breast milk transmission of HIV is increased in mothers with advanced HIV disease and may be increased in those with acute primary HIV infection, mastitis, or mixed breastfeeding.[10,11,13–17] Antiretroviral regimens for the prevention of mother-to-child transmission of HIV (PMTCT) alter breast milk HIV transmission risk estimates. Studies including maternal/infant nevirapine yield lower breast milk HIV transmission rates as a result of breast milk HIV suppression or infant prophylaxis by nevirapine.[18] Studies that provide highly active anti-retroviral therapy (HAART) to immune-suppressed women yield lower breast milk HIV transmission risk estimates because the highest risk transmitters have received effective viral suppressive therapy.[19,20] Safe infant feeding practices remain an integral part of prevention of mother-to-child transmission of HIV (PMTCT). The 2010 World Health Organization (WHO) guidelines on infant feeding in the context of HIV infection recommend that infant feeding practices should support the greatest likelihood of infant HIV-free survival, while also protecting against non-HIV morbidity and mortality.[21] Breastfeeding is the ideal form of nutrition for the first 6months of infant life; breastfeeding is an important pillar of child survival and the ideal way of feeding an infant, as well as providing a unique biological and emotional basis for child development. However, breastfeeding is a route of HIV transmission from an HIV-infected mother to her infant.[16] Transmission of HIV to the infant through breastfeeding is a major cause of new pediatric HIV infections worldwide. Although extended breastfeeding accounts for approximately 40% of infant HIV infections worldwide, most breastfed infants remain uninfected, despite prolonged and repeated exposure to HIV.[22] In the absence of interventions, 15-25% of HIV-positive mothers who do not breastfeed will infect their infants during pregnancy or delivery. With breastfeeding, there is an absolute increase in transmission of about 5-20%. Available interventions that reduce transmission during pregnancy and delivery mean that the relative proportion of infants infected through breastfeeding is now higher. Avoidance of breastfeeding eliminates the risk of HIV transmission, but is detrimental in terms of child survival. Increased infant morbidity and mortality associated with replacement feeds have been reported in several sub-Saharan African countries.[18,23–26] Replacement feeding is the feeding of an infant who is receiving no breast milk but is given a diet that provides all the nutrients the infant needs until the age at which he/she can be fully fed with family foods. During the first 6months of life, replacement feeding should be with a suitable breast milk substitute such as commercial infant formula. After 6 months, the suitable breast-milk substitute should be complemented with other foods.[12,18] Replacement feeding completely prevents any risk of HIV transmission through breastfeeding. However, Replacement feeding earns an increased risk of morbidity and mortality associated with malnutrition and associated with infectious diseases other than HIV. This is especially high in first sixmonths of life and decreases thereafter.[27] The relative risks of morbidity and mortality associated with replacement feeding vary according to many factors including the environment, individual circumstances of the mother and her family and in particular her education and economic status.[28–32] Mixed feeding is the feeding an infant breast milk along with other liquids and/or solid foods during the first six months of life. Mixed feeding has been associated with higher risk of HIV infection for the infant than exclusive breastfeeding.[33–35] Mixed feeding and replacement or formula feeding is the most dangerous feeding option for the young infant. It increases the risks of HIV and other infections. Improved HIV free survival has been reported in HIV-exposed infants when breastfed in similar settings, especially when exclusively breastfed, compared with mixed feeding or replacement feeding.[34] Only in a few better-resourced countries and settings have outcomes been comparable.[35] Exposure to exclusive breastfeeding during the first 3months of life was determined to have a protective effect beyond the first 3 months after mixed feeding had been implemented.

Early exclusive breast-feeding provides protection that supersedes subsequent mixed feeding, a premise that may be consistent with residual confounding rather than extended protection from exclusive breastfeeding. Kuhn and colleagues found a significantly increased HIV transmission risk for mixed breastfeeding versus exclusive breastfeeding.[17] Exclusive breastfeeding during the first months of life carries less risk of HIV transmission than mixed feeding, affords considerable protection against infectious diseases, and provides other benefits. In a study in South Africa, infants who were exclusively breastfed were half as likely to be HIV infected by six months of age compared to infants who were also given formula milk.[3] Other studies have also demonstrated that exclusive breastfeeding carries a lower risk than all types of mixed feeding.[14] The most compelling recent evidence concerns the use of antiretroviral (ARVs) to greatly reduce the risk of HIV transmission through breastfeeding, while simultaneously ensuring the mother receives appropriate care. If an HIV-positive mother breastfeeds her infant while taking ARVs herself or giving ARVs to her infant each day, the risk of transmission over 6months of breastfeeding is reduced to about 2%. If she breastfeeds for 12months while taking ARVs or giving them to the infant, then the risk is about 4%. Without these ARV interventions, about 14-17% of breastfed infants of HIV positive mothers would become HIV infected by 18months of age.[4] Women whose severity of disease makes them eligible for antiretroviral treatment for their own health are also most at risk of infecting their infants. The new evidence and recommendations therefore have profound implications for child survival. In addition, the health benefits to these women of starting lifelong treatment will improve their lives and enable them to better the care for their children beyond the breastfeeding period. Prevention of mother to child transmission is vital in reducing HIV-related child mortality and morbidity.[36,37] Worldwide progress in stopping new HIV infections among children has been dramatic. In 2013, 240 000 children were estimated to be newly infected with HIV.[38] This is 58% lower than in 2002, the year with the highest incidence, when 580 000 children were newly infected. HIV infection among pregnant women is related to the risk of infection transmission to a newborn. The rate of mother-to-child HIV transmission without any prevention may exceed 30% and it increases to about 45% when children are breastfed.[39] WHO (World Health Organization) recommends a programmatic approach to the prevention of prenatal HIV transmission that all HIV positive pregnant and breastfeeding women receive lifelong triple ARV (antiretroviral) from the point of diagnosis.

The infant would then receive 4-6weeks of ART (Antiretroviral Therapy) nevirapine (NVP) or Zidovudine (AZT) regardless of the feeding method. According to the mothers, the most effective way of preventing transmission of HIV to the unborn baby was a single dose of nevirapine. Many believed that treatment is equal to cure and gives

the baby full protection.[40] Providing access to antiretroviral drugs to pregnant women living with HIV has averted more than 900000 new HIV infections among children since 2009.[38] These declines have been due in large part to improved prevention technology, including widespread antenatal screening for HIV, suppressive antiretroviral prophylaxis and therapy, use of cesarean sections, and avoidance of breast feeding.[9,10] In particular, the use of antiretroviral drugs to prevent mother-to-child transmission (MTCT) has expanded massively since the first reports of zidovudine (ZDV) prophylaxis, and many countries have initiated programs to prevent HIV vertical transmission with the result that today MTCT rates of HIV infection are low as 1% in developed countries and less than 5% in developing countries.[41,42] Interventions to reduce the transmission of HIV from mother to child have been extremely successful in pregnant women aware of their HIV status. Judicious use of pre labour caesarean section, formula feeding and antiretroviral therapy has reduced transmission to less than 1% in these mothers and their infants. Before the introduction of such interventions, natural history data showed vertical transmission rates of around 25%. The risk of transmission from mother to child has been associated with advanced maternal HIV disease, maternal plasma HIV viral load and CD4 lymphocyte count, mode of delivery, duration of rupture of membranes, prematurity and mode of infant feeding pattern. Hence, the aim of this study is to determine the effective mode of infant feeding strategies to prevent mother-to-child HIV vertical transmission in Ekiti State

Materials and methods

Study design

One hundred and sixty (160) HIV-exposed children within aged group 0-18months old of both sexes who were born to HIV-infected mothers that received their antenatal care at Federal Teaching Hospital, Ido-Ekiti between 2012 and 2016 were recruited for this study. Blood samples were collected as dried blood spots (DBS) at the ART Laboratory for HIV-DNA PCR analysis from HIV-exposed children at 6weeks old. HIV rapid screening test using serial algorithm method and HIV-DNA PCR analysis was carried out for HIV-exposed children that are nine months old and above. Some of these HIV-exposed children had their HIV DNA PCR analysis tested more than one time to confirm their HIV status. All the HIV infected pregnant mothers were on highly active antiretroviral therapy (HAART) during pregnancy, most of them were delivered through cesarean section and their babies received nevirapine (NVP) or zidovudine (AZT) for six weeks. However, babies on breastfeeding were on cotrimoxazole daily. Ethical approval was obtained from the Hospital also, parent consent was sort on behave of the children before carried out the research. Structured questionnaire was used to obtained demographic characteristic, feeding choice and other relevant information for the study.

Inclusion criteria

i. HIV-exposed Babies born to HIV -Infected mothers.

ii. HIV-exposed Babies on breastfeeding.

iii. HIV-exposed Babies on replacement feeding.

iv. HIV-exposed Babies on mixed feeding.

v. HIV-exposed Babies on nevirapine (NVP) or zidovudine (AZT) for six weeks.

vi. HIV-exposed Breastfeeding babies on cotrimoxazole daily .

Methods

Rapid test screening using serial algorithm, Principle of rapid test kit, HIV-1/2 Ag/Ab Combo is an immuno chromatographic test for the simultaneous and separate qualitative detection of free HIV-1 p24 antigen and antibodies to HIV-1 and HIV-2. The test device is a laminated strip that consists of a Sample Pad containing monoclonal biotinylated anti-HIV-1 p24 antibody, a Conjugate Pad containing monoclonal anti-HIV-1 p24 antibody-colloidal selenium and HIV-1 and HIV-2 recombinant antigen-colloidal selenium, and a nitrocellulose membrane with an immobilized mixture of recombinant and synthetic peptide HIV-1 and HIV-2 antigens in the Lower Test Area, immobilized streptavidin in the Upper Test Area, and an immobilized mixture of anti-HIV-1 antibodies, HIV-1/2 antigens, and HIV-1 p24 recombinant antigen and anti-HIV-1 p24 monoclonal antibody in the Control Area.

Procedure of rapid test kit

50µL of sample (venipuncture or capillary whole blood, serum or plasma) is applied to the sample pad (followed by Chase Buffer for venipuncture or finger stick whole blood specimens) and migrates by capillary action through the Conjugate Pad and then through the nitrocellulose membrane. If HIV-1 p24 antigen is present in the specimen; it binds with the monoclonal biotinylated anti-HIV-1 p24 antibody from the Sample Pad and then with monoclonal anti-HIV-1 p24 antibody-colloidal selenium from the Conjugate Pad to form a complex (biotinylated antibody-antigen-colloidal selenium-antibody). This complex migrates through the solid phase by capillary action until it is captured by immobilized streptavidin at the Upper Test Area (labeled "Ag") where it forms a single pink/red "Ag" line. If HIV-1 p24 antigen is not present in the specimen or is below the limit of detect ion of the test, no pink/red Ag line is formed.

Note

The monoclonal biotinylated anti-HIV-1 p24 antibody used in this assay does not cross react with HIV-2 p26 antigens. If antibodies to HIV-1 and or HIV-2 are present in the specimen, the antibodies bind to recombinant gp41 (HIV-1) and gp36 (HIV-2) antigen-colloidal selenium conjugates from the Conjugate Pad. The complex migrates through the solid phase by capillary action until it is captured by immobilized HIV-1 and HIV-2 synthetic peptide antigens and recombinant gp41 antigen at the Lower Test A rea (labeled "Ab") and form s a single pink/red "Ab" line. If antibodies to HIV-1 and/or HIV-2 are absent or are below the detection limit of detection of the test, no pink/red Ab line is formed. To ensure assay validity, a procedural "Control" line containing a mixture of anti-HIV-1 antibody, HIV-1/2 antigens, and HIV-1 p24 recombinant antigen and anti-HIV-1 p24 monoclonal antibody is incorporated in the nitrocellulose membrane. For a test result to be valid there must be a visible pink/red Control line. During the testing procedure the colloidal selenium conjugates released from the Conjugate Pad will be captured by the antibodies and antigens immobilized in the Control Area and form a pink/red Control line for samples that are either positive or negative. A pink/

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red Control line may appear even when a test sample has not been applied to the Test Unit.

Interpretation of result of rapid test kit

Read the test result between 20 and 30minutes after the addition of the Sample. Do not read test results after 30minutes

Antibody reactive

(Two Lines-Control Line and Antibody-Line) A pink/red control line appears in the control area and a pink/red antibody line appears in the lower test area of the test unit. The intensity of the antibody and control lines may vary. Any visible pink/red color in both the control and lower test areas, regardless of intensity, is considered Reactive. A reactive test result means that HIV-1 and or HIV-2 antibodies have been detected in the specimen. The test result is interpreted as preliminary positive for HIV-1 and or HIV-2 antibodies

Antigen (HIV -1p24) reactive

(Two Lines-Control Line and Antigen Line) A pink/red, control line appears in the control Area and a pink/red antigen line appears in the upper test area of the test unit. The intensity of the antigen and control lines may vary. Any visible pink/red color in both the control and upper test areas, regardless of intensity, is considered reactive. A reactive test result means that HIV-1 p24 antigen has been detected in the specimen. The test result is interpreted as preliminary positive for HIV-1 p24 antigen.

Note

A test result that is preliminary positive for HIV-1 p24 antigen in the absence of reactivity for HIV-1 or HIV-2 antibodies may indicate an acute HIV-1 infection in the test subject. In this case the acute HIV-1 infection is distinguished from an established HIV-1 infection in which antibodies to HIV-1 are present.

Antibody reactive and antigen (HIV-1 p24) reactive

(Three Lines-Control, Antibody and Antigen Lines) A pink/red control line appears in the control area and a pink/red antibody line appears in the lower test area and a pink/red antigen line appears in the upper test area of the test unit. The intensity of the antibody, antigen and control lines may vary. Any visible pink/red color in the control area, the lower test area and the upper test area, regardless of intensity, is considered reactive. The test result is interpreted as preliminary positive for HIV-1 and or HIV-2 antibodies and HIV-1 p24 antigen.

Non reactive

(One Line-Control Line) A pink/red control line appears in the control area of the test unit, and no pink/red antibody or antigen line appears in the lower test area and the upper test area of the test unit, respectively. A nonreactive test result means that HIV-1 or HIV-2 antibodies and HIV-1 p24 antigen were not detected in the specimen. Invalid (No Control Line), if there is no pink/red control line in the control area of the test unit, even if a pink/red line appears in the lower test area or the upper test area of the test unit, the result is invalid and the test should be repeated.

Polymerase chain reaction (PCR) analysis

The polymerase chain reaction (PCR) is a laboratory technique for DNA replication that allows a "target" DNA sequence to be selectively amplified.

Principle of polymerase chain reaction

The PCR involves the primer mediated enzymatic amplification of DNA. PCR is based on using the ability of DNA polymerase to synthesize new strand of DNA complementary to the offered template strand. Primer is needed because DNA polymerase can add a nucleotide only onto a preexisting 3-OH group to add the first nucleotide. DNA polymerase then elongates its 3 end by adding more nucleotides to generate an extended region of double stranded DNA.

Components of polymerase chain reaction

DNA template: The double stranded DNA (dsDNA) of interest, separated from the sample.

DNA polymerase: Usually a thermostable Taw polymerase that does not rapidly denature at high temperatures (98°C) and can function at a temperature optimum of about 70°C Interpretation of result

i. **Oligonucleotide primers:** Short pieces of single stranded DNA (often 20-30 base pairs) which is complementary to the 3 ends of the sense and anti-sense strands of the target sequence.

ii. **Deoxynucleotide triphosphates:** Single units of the bases A, T, G, and C (dATP, dTTP, dGTP, dCTP) provide the energy for polymerization and the building blocks for DNA synthesis.

iii. **Buffer system:** Includes magnesium and potassium to provide the optimal conditions for DNA denaturation and renaturation; also, important for polymerase activity, stability and fidelity.

Procedure of polymerase chain reaction

PCR components are mixed together and are taken through series of 3 major cyclic reactions conducted in an automated, self-contained thermo cycler machine.

i. **Denaturation:** This step involves heating the reaction mixture to 94°C for 15-30seconds. During this, the double stranded DNA is denatured to single strands due to breakage in weak hydrogen bonds.

ii. **Annealing:** The reaction temperature is rapidly lowered to 54-60°C for 20-40seconds. This allows the primers to bind (anneal) to their complementary sequence in the template DNA.

iii. **Elongation:** Also known at extension, this step usually occurs at 72-80°C (most commonly 72°C). In this step, the polymerase enzyme sequentially adds bases to the 3 each primer, extending the DNA sequence in the 5 to 3 direction. Under optimal conditions, DNA polymerase will add about 1,000bp/minute.

Results

One hundred and sixty (160) children who were born to HIV-infected mothers that received their antenatal care at Federal Teaching Hospital, Ido-Ekiti between the year 2012 and 2016 were recruited for this study. Some of these children had their PCR HIV analysis tested more than one time to confirm their HIV status. All the HIV infected pregnant mothers were on HAART during pregnancy while their babies received nevirapine (NVP) or zidovudine (AZT) for six weeks, babies on breastfeeding were on cotrimoxazole daily. Out of

160children born to HIV-Infected mothers, 15(9.4%) were HIV sero-positive by DNA PCR testing. Comparing age groups and sex, Male had high frequency of 87(54.4%) with prevalence of 52(32.3%) in age group 0-3months compared to 46(28.7%) female in the same age group as shown in Table 1. Sex distribution with feeding patterns and PCR HIV analysis shows that male had high frequency of 87(54.4%) compared to female with frequency of 73(45.6%). Exclusive feeding pattern had highest frequency of 102(63.8%) compared to replacement and mixed feeding of 10(6.3%) and 48(30.0%) respectively. However, male had highest feeding pattern in both exclusive and mixed feeding pattern of 57(35.6%) and 26(16.2%) respectively compared to female but in replacement feeding, female had highest frequency of 6(3.8%) compared to male. Out of 160subjects, 125(78.1%) had their PCR-HIV analysis tested for the first time, 58(36.3%) were female and 67(41.9%) were male; 35(21.9%) had their PCR-HIV analysis tested for second time, 15(9.4%) were female and 20(12.5%) were male. PCR-HIV analysis results show that, 10(6.3%) female had their PCR positive for HIV while 5(3.1%) male had their PCR positive for HIV has shown in Table 2. Comparing age group, feeding pattern and PCR- HIV analysis, "Age group" 0-3months had highest frequency of 98(61.2%) among the study age groups with lowest prevalence of 1(0.6%) in PCR positive to HIV. Exclusive breast-feeding pattern and the number of HIV exposed children tested with PCR HIV analysis for the first time in this age group was reportedly higher as 72(45.0%) and 86(53.8%) respectively compared to other age groups in the study population as shown in Table 3. However, exclusive breast feeding had lowest prevalence of PCR-HIV positive of 3(1.9%) compared to replacement and mixed feeding pattern 4(2.5%) and 8(5.0%), PCR-HIV positivity at first testing is higher with frequency of 10(6.3%) compared to 5(3.1%) at the second PCR-HIV analysis testing as shown in Table 4.

Table 1 Age and sex distribution among children born to HIV infected mothers

Age in months (number)	Female (%)	Male (%)
0-3(n=98)	46(28.7)	52(32.3)
6-Apr(n=22)	10(6.3)	12(7.5)
9-Jul(n=16)	8(5.0)	8(5.0)
12-Oct(n=10)	4(2.5)	6(3.8)
13-15(n=8)	3(1.8)	5(3.1)
16-18(n=6)	2(1.3)	4(2.5)
Total (160)	73(45.6)	87(54.4)

Table 2 Sex distribution, feeding mode and PCR analysis for children born to HIV infected mothers

SEX (%)	Breast feeding (%)	Mixed feeding (%)	Replacement feeding (%)	PCR 1st (%)	PCR 2nd (%)	PCR Positive (%)	PCR Negative (%)
Female	45	22	6	58	15	10	63
73(45.6)	(28.1)	(13.8)	(3.8)	(36.3)	(9.4)	(6.3)	(38.8)
Male	57	26	4	67	20	5	82
87(54.4)	(35.6)	(16.2)	(2.5)	(41.9)	(12.5)	(3.1)	(51.3)
Total	102	48	10	125	35	15	145
(160)	(63.8)	(30)	(6.3)	(78.1)	(21.9)	(9.4)	(90.6)

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Table 3 Age distribution, feeding mode and PCR analysis for children born to HIV infected mothers

Age Frequency (%)	Breast Feeding (%)	Mixed feeding (%)	Replacement feeding (%)	PCR 1st (%)	PCR 2nd (%)	PCR Positive (%)	PCR Negative (%)
0-3Months	72	26		86	12	1	97
98(61.22)	(45.0)	(16.3)	-	(53.8)	(7.5)	(0.6)	(60.6)
4-6Months	16	5	1	14	8	2	20
22(13.8)	(0.0)	(3.1)	(0.6)	(8.8)	(5)	(1.3)	(12.5)
7-9Months	11	4	1	10	6	4	12
16(10.0)	(6.9)	(2.5)	(0.6)	(6.3)	(3.8)	(2.5)	(7.5)
10-12Months	2	6	2	7	3	3	7
10(6.3)	(1.3)	(3.8)	(1.3)	(4.4)	(1.8)	(1.9)	(4.4)
13-15Months	1	4	3	5	3	3	5
8(5.0)	(0.6)	(2.5)	(1.9)	(3.1)	(1.8)	(1.9)	(3.1)
16-18Months	-	3	3	3	3	2	4
6(3.7)		(1.8)	(1.9)	(1.8)	(1.8)	(1.3)	(2.5)
Total	102	48	10	125	35	15	145
(160)	(63.8)	(30)	(6.3)	(78.1)	(21.9)	(9.4)	(90.6)

Table 4 Distribution of PCR results based on feeding pattern among HIV- exposed infants

PCR(n)	Breast Feeding (%)	Mixed Feeding (%)	Replacement Feeding (%)	PCR 1st (%)	PCR 2nd (%)
Positive	3	8	4	10	5
15	(1.9)	(5)	(2.5)	(6.3)	(3.1)
Negative	99	40	6	115	30
145	(61.9)	(25)	(3.8)	(71.9)	(18.8)
Total	102	48	10	125	35
160	(63.8)	(30)	(6.3)	(78.1)	(21.9)

Discussion

Out 0f 160 samples tested, 15(9.4%) were found to be positive for HIV, this is similar to the finding of Iregbu and Chama[43,44] who reported 9.1% and 9.9% respectively in their study. This may be because of enhancing patterns in the Nigerian PMTCT convention throughout the years which upgraded scope of ARV treatment among HIV positive mothers and the current change in rules to commence every pregnant woman on ARVs regardless of the CD4 count. Investigation of information from PMTCT program execution demonstrated a decreased danger of MTCT (3.5 to 12.9%) contrasted with when ARVs are not given (15 to 45%).[1] According to Kwasi Torpey et al.,[45] it was observed that higher rate of MTCT was associated with different other factors that affect the risk of transmission, including the "viral load" or amount of virus in the mother's body (highest right after infection and when AIDS develops; a very sick mother is eight times more likely to transmit HIV to her infant than a healthy mother), the condition of the breasts (whether there are sores around the nipples), mother and newborn not receiving ARVs, home delivery, being born to a mother younger than 30years of age, and mother not disclosing her HIV-status. The association was significant in the age groups six weeks to six months and six months to 12months. They believe that place of delivery, disclosure of HIV positive status, and mother's age-do influence adherence to ARVs regimen, infant feeding practices, or counseling offered during PMTCT interventions.[46] In this present study, male had high frequency of 87(54.4%) with prevalence of 52(32.3%) in age group 0-3months compared to 46(28.7%) female in the same age group which is similar to previous studies reported 88 males and 75 females with male to female ratio of 1.2:1 by Onankpa et al.[47] 121(54.0%) males(M), 103(46.0%) females(F) with an M:F ratio of 1:0.9 reported by Anígilájé et al.,[48] 63(56.2%) male and 49(43.8%) female as reported by Jean[49] and 329(54.8%) males and 271(45.2%) females, giving a male: female ratio of 1.2:1 by Babatunde et al.[50] In this study, exclusive breast feeding within age group 0-3months was reportedly higher compared with other feeding pattern, the degree of HIV positive was reported lower within this age group. Similar to previous report that exclusive breastfeeding rates among children less

than 6months of age in two-thirds of developing countries with trend data have increased between 1998-2008. In supporting the findings of this study, exposure to exclusive breastfeeding during the first 3months of life was determined to have a protective effect beyond the first 3months after mixed feeding had been implemented; it was suggested that early exclusive breast-feeding provides protection that supersedes subsequent mixed feeding, a premise that may be consistent with residual confounding rather than extended protection from exclusive breastfeeding; this suggestion was the true reflection of this present study as very low HIV-transmission was recorded within the first 3months of life among exclusive breast feeding pattern. Similar to the findings in this study, Coutsoudis and colleagues reported that HIV-exposed infants who were breastfed exclusively for at least 3months had a lower risk of HIV infection than mixed-fed infants.[51]

The lower risk of HIV infection among infants practicing exclusive breast feeding was also supported in an observational study in South Africa,[52] where they found out that exclusive breast feeding during the first three months of life was associated with a lower risk of HIV transmission than mixed feeding. This is mainly important because breastfeeding remains critical for infant health and survival in resource-limited settings with high HIV prevalence. The pattern of infant feeding among the mothers in this study showed that exclusive feeding pattern had highest frequency of 102(63.8%) compared to mixed feeding 48(30.0%) and replacement 10(6.3%), although this study did not include information on infant morbidity and mortality, however the use of mixed feeding and replacement feeding or infant feeding formula has been associated with increased infant morbidity and mortality in developing countries which should not be recommended for routine use for PMTCT.[53,54] Similarly, Jean[49] reported high prevalence of exclusive breastfeeding as the most common feeding option, present in 50/112(44.6%) infants. Among the 80 infants aged 6months or less, 40(50%) were exclusively breastfed, 30(37.5%) replacement feeding (received formula) and 10(12.5%) received mixed feeding. Similar to our findings, Anoje et al.[55] from southern Nigeria reported high prevalence of 80% exclusive breast-feeding and Torpey[46] in Zambia reported 84% of babies receiving exclusive breast milk as compared with other feeding option. Our study showed that the risk of vertical transmission of HIV associated with exclusive breast feeding was considerably lower reported as 3(1.9%) compared with 4(2.5%) in replacement feeding and 8(5.0%) in mixed feeding. It is believed that the lower transmission rate in exclusively breastfed infants is explained by the facts that these infants presumably maintain a healthy gut epithelium, which acts s a viral barrier, and that breast milk contains immune factors that have been appeared in vitro to have antiviral and hostile to HIV impacts.[56,57] In supporting the discoveries of this present study, Ahmed reported that exclusive breastfeeding for the first six months is related with a 3-4 fold lower risk of HIV transmission when contrasted with mixed feeding (mixed feeding means the newborn child gets both breast milk and some other sustenance or fluid including water, non-human milk and formula before a six months of age). In this manner, exclusive breastfeeding should be recommended because it protects infants from morbidity and mortality whether or not HIV related.[58]

Similarly, one study found that around 4% of exclusively breastfed infants become infected with HIV in the first 6 months of life, even without ARVs.[30] It is believed that mixed feeding in the first six months carries a greater risk of transmission due to the liquids and food given to the infant alongside the breast milk can damage the already delicate and penetrable gut wall of the small infant and enable the virus to be transmitted more easily. Mixed feeding also poses the same risks of contamination and diarrhea as artificial feeding, diminishing the chances of survival. The rate of HIV transmission in the feeding pattern was reported high in mixed feeding compared to other feeding patterns in this study. According to Mbori-Ngacha stated that mixed feeding has been associated with higher risk of HIV transmission compared with exclusive breast feeding[54] which is similar to the findings in this study. It was reported that a newborn child with blended encouraging alternative was 5.6times at higher danger of contracting HIV disease than babies on selective bosom nourishing partners and that blended sustaining increment the peril of HIV contamination. Mixed feeding with breast milk and other feeds has been suggested to be associated with a higher risk of HIV infection for the infant than exclusive breastfeeding and in any case, should be avoided because it carries risks of diarrhea and other infectious diseases as well as of HIV infection.[14,59] In developing nations where breast feeding sustaining is normally practiced and can't maintain a strategic distance from, exclusive breast feeding should be encouraged and breast feeding mothers should be given ARV medications to diminish the risk and danger of baby infection through breast milk. In 2010, the World Health Organization (WHO) changed the PMTCT rules and supported that all babies born to HIV-positive mothers ought to get a course of ARV drugs, be exclusively breastfed for a half year and integral sustained for up to one year.[60]

Antiretroviral drugs and shortened breastfeeding markedly diminish breastfeeding HIV-1 transmission, shifting the balance to make replacement feeding less beneficial. In a few settings shortened breastfeeding poses comparative dangers as replacement feeding and gives no newborn child medical advantage contrasted and broadened breastfeeding. With the new recommendations, it is accepted that HIV-infected woman who takes ARVs and mixed feeds may at present have a higher rate of HIV-transmission than a mother who only breastfeeds and takes ARVs: the transmission hazard is moved downwards for all breastfeeding mothers yet the pattern of higher risk or hazard remains for the mixed-fed infants. In this way, proceeded with accentuation should be put on demoralizing blended bolstering. Therefore continued emphasis needs to be placed on discouraging mixed feeding in the first six months.

Conclusion

The use of ARV drugs during the period of breast feeding by the mother and or the infant has been associated with reduced vertical transmission of HIV in a program setting, this can be an effective and safety mode of infant feeding pattern in HIV exposed children. Public health programs for protection, promotion, and support of exclusive breastfeeding can have real advantages for HIV-positive women and their children as well as for the populace.

Recommendation

Commencement of HAART in HIV-positive mothers before pregnancy and administration of Nevirapine to exposed babies for the first 6 weeks of life significantly reduced transmission of HIV from mothers to children. Pregnant known to be HIV-infected should be provided with lifelong antiretroviral therapy or antiretroviral prophylaxis interventions to reduce HIV transmission through

breastfeeding. Factors that have been shown in vitro to have antiviral and anti-HIV effects.[56,57] In supporting the findings of this present study, Ahmed reported that exclusive breastfeeding for the first six months is associated with a 3-4 fold lower risk of HIV transmission as compared.

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Conflicts of interest

The author declares there are no conflicts of interest.

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