



# Breastfeeding Practice among HIV Positive Mothers Receiving Care for PMTCT at the University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt, Nigeria

Nsirimobu Ichendu Paul<sup>1\*</sup> and Balafama Abinye Alex-Hart<sup>1</sup>

<sup>1</sup>Department of Paediatrics, University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria.

## **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

## **Article Information**

DOI: 10.9734/ACRI/2019/v19i330160

### Editor(s):

(1) Amal Hegazi Ahmed Elrefaei, Division of Radioisotope Production, Hot Lab and Waste Management Center, Atomic Energy Authority, Egypt.

### Reviewers:

(1) Alexandrina Cardoso, Escola Superior de Enfermagem do Porto, Portugal.

(2) Ikpeme Enobong, University of Uyo, Nigeria.

(3) Tabe Franklin Nyenty, University of Yaounde 1, Cameroon.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/53819>

**Original Research Article**

**Received 01 November 2019**

**Accepted 06 January 2020**

**Published 13 January 2020**

## **ABSTRACT**

**Background:** Exclusive Breastfeeding (EBF) is the recommended feeding method for HIV exposed infants in resource limited settings. This study aimed to evaluate the feeding practices and possible determinants among HIV-positive mothers receiving care for prevention of mother-to-child transmission programme (PMTCT) in Port Harcourt, Nigeria.

**Methods:** This was a cross-sectional study among HIV positive mothers who were receiving care for PMTCT. A structured questionnaire was self-administered to mothers whose babies were at least one year old. Information obtained included the sociodemographic characteristics of the mothers, the choice of feeding practiced by the mothers, reason for the choice of feeding, duration of breastfeeding and reason for breastfeeding. Obtained data was analysed and a p-value of <0.05 was considered statistically significant.

**Results:** A total of 234 mothers participated in the study. Exclusive breastfeeding (EBF) was the predominant type of feeding practiced by the mothers with an EBF rate of 91.4%. Prevention of HIV transmission to the child (85.5%) and the nutritional benefits of the milk (70.9%) were the main underlying reason for the mother's choice of feeding. One hundred and sixty eight (76.4%)

\*Corresponding author: Email: nsypaul@yahoo.co.uk;

breastfed for 7-12 Months, 156 (70.9%) practiced breastfeeding because of personal choice, while 42 (19.9%) breastfed for fear of HIV status being disclosed. Significantly more of the married mothers exclusively breastfed their children than the unmarried counterparts ( $\chi^2 = 23.99$ ,  $p = 0.0001$ ).

**Conclusion:** Breastfeeding is the commonest feeding practice among HIV positive mother and the EBF rate among these mothers is high and must be encouraged. Regular and consistent use of ART among HIV positive mothers must be encouraged and supported since the desire to prevent MTCT was the commonest motivation for the feeding choice among these mothers.

*Keywords: Breastfeeding practice; HIV positive mothers; PMTCT; Port Harcourt.*

## 1. INTRODUCTION

Human breast milk is the superior and ideal form of nutrition for the human infant because it is rich in essential nutrients which support proper growth and development of infants [1,2]. Additionally, breast milk confers lifesaving protection against infectious childhood illnesses because it contains antibodies such as immunoglobulin A, G, M and E which act as first line defense against some common childhood illnesses such as diarrhoea, pneumonia and ear infections [3]. Breastfeeding therefore plays a key role in reducing infant morbidity and mortality [3]. Available data suggests that breastfeeding also has beneficial effects on later cardiovascular risk factors including blood pressure and lipid profile. It reduces the risk of childhood obesity, improves cognitive development and reduces the incidence of atopy [4]. For these reasons exclusive breastfeeding for the first six months of life is the recommended way of feeding infants, followed by continued breastfeeding with appropriate complementary foods with continued breastfeeding for up to two years and beyond [5].

However, mothers known to be infected with the Human Immunodeficiency Virus (HIV) stand the risk of transmitting the virus to their babies through breastfeeding. Without treatment with antiretroviral drugs; the estimated risk of HIV transmission through breastfeeding is 5-20%; with breastfeeding to six months 20-35% and to 18 to 24 months 30-45% [6]. It follows to reason that refusing to breastfeed will prevent the postnatal mother to child transmission of the HIV virus. However, available data have shown that in places such as Sub-Saharan Africa with high infant mortality, the infant mortality associated with HIV infection acquired through breastfeeding is estimated to be lower than the mortality associated with the diseases of infancy such as malnutrition, diarrhoea and pneumonia should breastfeeding be withheld [7]. Therefore, the decision of whether a HIV positive mother should breastfeed or not is not an easy one.

However, according to WHO, increasingly evidence have shown that giving antiretroviral drugs to the mother or to the infant can significantly reduce HIV transmission through breastfeeding [8]. WHO therefore recommended that mothers known to be HIV infected should be provided with lifelong antiretroviral therapy or antiretroviral prophylaxis intervention to reduce mother to child HIV transmission through breastfeeding [5]. Other WHO recommendations include: In settings like Nigeria, where national health authorities are recommending breastfeeding for HIV-infected mothers, mothers known to be HIV-infected (and whose infants are HIV uninfected or of unknown HIV status) should exclusively breastfeed their infants for the first 6 months of life, introducing appropriate complementary foods thereafter, and continue breast feeding; Mothers living with HIV should breastfeed for at least 12 months and may continue breastfeeding for up to 24 months or longer (similar to the general population) while being fully supported for ART adherence; In settings where health services provide and support lifelong ART, including adherence counseling, and promote and support breastfeeding among women living with HIV, the duration of breastfeeding should not be restricted. Breastfeeding should then only stop once a nutritionally adequate and safe diet without breast milk can be provided [5].

A study done in Enugu among HIV positive women who were receiving care in both public and private health facilities showed a breastfeeding rate of 77.8% [2]. A similar study done in Oyo State in South West Nigeria showed exclusive breastfeeding rate of 61.0%. In both studies reasons for breastfeeding included fear of stigmatization, cultural norms and pressure from family members. Very few studies have looked at breastfeeding practices among HIV positive mothers in Port Harcourt, Nigeria. This study aimed to evaluate the feeding practices and possible determinants among HIV-positive mothers receiving care for prevention of mother-

to-child transmission (PMTCT) programme in Port Harcourt, Nigeria.

**2. METHODOLOGY**

**2.1 Study Area**

This study was carried out at the Paediatric HIV clinic of the University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt, Nigeria. The Paediatric HIV clinic which operates once every week, attends to all HIV exposed and infected children who are on care for prevention of mother to child transmission (PMTCT) and treatment for HIV disease.

**2.2 Study Design/Study Population**

This was a cross-sectional study carried out over two and a half years, from January 2017 to June 2019 among HIV positive mothers who were receiving care for PMTCT. A structured questionnaire was self-administered to mothers whose babies were at least one year old and who gave a verbal consent for the study. Information obtained included the sociodemographic characteristics of the mothers, the choice of feeding practiced by the mothers, reason for the choice of feeding, duration of breastfeeding and reason for breastfeeding.

**2.3 Inclusion Criteria**

All mothers who brought their children for PMTCT and whose children have been followed up for at least one year were eligible for the study. The purpose of the study was explained to the mothers but only those who gave a verbal consent were recruited for the study. Ethical approval for the study was obtained from the Research and ethics committee of the UPTH.

**2.4 Data Analysis**

Obtained data was entered into an excel sheet and analysed using epi info version 7 and presented in prose and frequency tables. Chi square was used to compare for categorical variables while a p-value of <0.05 was considered statistically significant.

**3. RESULTS**

**3.1 Sociodemographic Characteristics of Respondents**

A total of 234 mothers participated in the study, 72 (30.8%) were aged 30-34 years, 104 (44.5%) had secondary education, 137 (58.5%) were self-

employed, while 207 (88.5%) were married Table 1.

**3.2 Type/Reason for Choice of Feeding and Duration of Breastfeeding Practiced by Mothers**

Table 2 shows that exclusive breastfeeding (EBF) was the predominant type of feeding practiced by the mothers with an EBF rate of 91.4%. Only 6 (2.6%) of the mothers practiced mixed feeding. Prevention of HIV transmission to the child in 85.5% and the nutritional benefits of the milk in 70.9% were the main underlying reasons for the mothers' choice of the type of feeding that they practiced. One hundred and sixty eight (76.4%) breastfed for 7-12 months, while 11(5.0% breastfed for more than 12 months.

**Table 1. Demographic characteristics of respondents: n= 234**

Variables	No	Percentage
<b>Age category (Years)</b>		
<24	73	31.2
25-29	55	23.5
30-34	72	30.8
35 and above	34	14.5
<b>Highest level of education</b>		
Primary	78	33.3
secondary	104	44.5
Tertiary	52	22.2
<b>Employment status</b>		
Unemployed	56	24.0
Paid employment	41	17.5
Self-employment	137	58.5
<b>Marital status</b>		
Married	207	88.5
Unmarried	27	11.5

**3.3 Reason for Breast Feeding**

Of the 220 mothers that breastfed their children, 156 (70.9%) practiced breastfeeding because of their personal choice, while 42 (19.9%) breastfed for fear of HIV status being disclosed Table 3.

**3.4 Exclusive Breastfeeding Practice and Demographic Variables**

Table 4 shows that age, educational level and the employment status of the mothers did not significantly affect the exclusive breastfeeding rate among them. However, significantly more of the married mothers exclusively breastfed their children than the unmarried counterparts ( $X^2 = 23.99, p = 0.0001$ ).

**Table 2. Type/reason for choice of feeding and duration of breastfeeding practiced by mothers in the first six months**

Type of feeding in the first 6 months	No	Percentage (%)
Exclusive Breast feeding (EBF)	214	91.4
Exclusive Breastmilk substitutes (EBMS)	14	6.0
Mixed feeding	6	2.6
<b>Total</b>	<b>234</b>	<b>100.0</b>
<b>Reason for choice of feeding **</b>		
To prevent transmission of HIV to child	200	85.5
Due to nutritional benefits to the child	166	70.9
To prevent other infections	58	24.8
It is normal to breastfeed	54	23,1
<b>Duration of breastfeeding</b>		
6 months	41	18.6
7– 12 Months	168	76.4
>12 Months	11	5.0
<b>Total</b>	<b>220</b>	<b>100.0</b>

\*\* Many had multiple responses

**Table 3. Reason for breast feeding**

Reason for breast feeding	No	Percentage
Personal Choice (benefits of breastfeeding)	156	70.9
Cultural norm	54	24.5
Since I am taking my drugs regularly my baby will not have HIV if I breastfeed	48	21.8
Fear of status being disclosed	42	19.9
Husband and other family member insisted	34	15.5
My last child was breastfed and is negative	31	13.6
My husband could not sustain BMS only	5	2.3

\*\* Many had multiple responses

**Table 4. Exclusive breastfeeding practice and demographic variables**

Variables	No of persons (N)	No of children exclusively breastfed (N)	Percentage of children exclusively breastfed (%)	Chi-square (p-value)
<b>Age category (Years)</b>				
<24	73	68	93.2	2.17
25-29	55	50	90.9	(0.5366)**
30-34	72	67	93.1	
35 and above	34	29	85.3	
<b>Highest Level of education</b>				
Primary	78	71	91.0	0.06
secondary	104	95	91.3	(0.9664)**
Tertiary	52	48	92.3	
<b>Employment Status</b>				
Unemployed	56	50	89.3	1.72
Paid employment	41	36	87.8	(0.4231)**
Self-employment	137	128	93.4	
<b>Marital status</b>				
Married	207	196	94.7	23.99
Unmarried	27	18	66.7	(0.0001)*

\*Significant, \*\*Not significant

#### 4. DISCUSSION

This study found that exclusive breast feeding (EBF) was the predominant type of feeding practiced by the mothers in the first six months of life with an EBF rate of 91.4%. This is similar with findings from other recent studies [9,10]. However, Umeobieri et al. [11] and Mukerem et al. [12] found an EBF rate of 75.0% and 73.0% in South East Nigeria and Addis Ababa, Ethiopia respectively. However, the study by Umeobieri was carried out when the policy on feeding practices in Nigeria was an option between exclusive breast milk substitute (EBMS), where sustainability is guaranteed, or exclusive breastfeeding for 6 months and continuing with complementary feeds till 12 months [13] and there were still fears of increased MTCT with breastfeeding and so EBF and breastfeeding generally were not encouraged among HIV positive mothers. The change in feeding option among babies born to HIV positive mothers in the recent National guideline is promoting EBF among HIV positive mothers. Studies [9,12] have shown no increased risk of MTCT of HIV among mothers who received lifelong anti retroviral therapy (ART) pre or from early in pregnancy, are virally suppressed and exclusively breastfeed their children. The high EBF rate among HIV positive mothers found in this study is highly commendable and probably stems from the knowledge among mothers that breastfeeding is beneficial to their children and that mixed feeding increases the risk of MTCT.

Few mothers (6.0%) practiced exclusive breast milk substitute (EBMS) or replacement feeding as their feeding option. This method of feeding eliminates postpartum risk of MTCT, however, effective EBMS is not feasible among many mothers in this locale due to high cost of infant formula, lack of portable clean water and poor sanitation which predisposes the children to diarrhoeal diseases and malnutrition, and could lead to early infant mortality [14]. For this, many mothers are unable to sustain EBMS and therefore opt for EBF especially with the fact that MTCT rate among exclusively breastfed children is low. In our environment therefore, the benefits of exclusive breastfeeding for the first six months for many mothers outweigh those of replacement feeding despite replacement feeding being the ideal way of feeding infants of HIV-positive mothers [7]. It is, therefore, important that exclusive breastfeeding be promoted among HIV-positive mothers living in resource-poor settings.

Some mothers who start with EBMS and who are unable to sustain it eventually mix feed their children and this portend an increased risk of MTCT among these children. Other HIV positive mothers start mixed feeding because they are self-employed and have to fend for their families doing menial jobs which require long working hours and have no privilege of a paid leave like their counterparts in salaried jobs. Many of these women have cultural reservations on expressing breast milk for the child to consume while they are away at work. Six (2.6%) of the mothers in this survey, mix fed their children. Studies have shown that infants who were mixed fed were seven times more likely to acquire HIV compared to those who were exclusively breastfed [9,15,16]. Mixed feeding is said to be associated with local gastrointestinal inflammation and small sites of damage from pathogens and dietary antigens in formula. Once the integrity of the baby's gut has been compromised, there is increased gut permeability of the virus across the intestinal mucosa [9].

The underlying motivation for the choice of infant feeding for most mothers in this study was "The desire to prevent the transmission of HIV to their babies and the nutritional benefits of the milk to the children". Oladokun et al. [17] in their study also found that reduction of HIV transmission to the children was an underlying factor for many HIV positive mothers in their choice of feeding for their children. Many mothers/parents who transmit HIV infection to their children live with the guilt and in this era of effective ARTs where many children survive into adulthood, children blame their parents for their predicament. It is therefore not surprising that this desire is paramount among these mothers.

Some mothers understood the role of breastfeeding in the control of other childhood infections and this formed part of the reason for their choice of feeding. Breastfeeding have been shown to boost a child's immunity and reduce the rate and incidence of respiratory tract infections and diarrhoeal diseases [18,19].

A significant proportion (76.4%) of the mothers in this study breastfeed for up to a year. This is very encouraging as the benefits of breastfeeding cannot be overemphasized; the concomitant health risk of lack of it with or without HIV is far overwhelming especially in the sub Saharan region where malnutrition and childhood infections are rife. The recent guideline allows for breastfeeding for up to 2 years and

beyond among HIV exposed children with limited fear of MTCT, however, Paul et al. [9] found an increased infection rate among children who were breastfed beyond one year. The explanation that was given for this finding in the study was that few children were represented among those breastfed beyond one year.

Several reasons were proffered by the mothers why they breastfed their children. Many (70.9%) of the mothers who breastfed did so for personal reasons because they understood the benefits of breastfeeding to their children. Breastfeeding of infants is a cultural norm among Africans, and some studies have reported that since mothers who failed to breastfeed their babies were suspected of having HIV, many HIV positive mothers choose to breastfeed their infants to prevent this suspicion and the resultant stigma [17,20,21]. The current policy on feeding among HIV positive mothers is addressing this area of stigma especially with the fact that MTCT among breast fed HIV exposed infants is not any worse for as long as mothers are virally suppressed.

Some mothers in this study breastfed their children because they were certain that being consistent on ART is a guarantee to having an HIV negative child. This notion is quite correct but must be balanced with the knowledge of a negligible risk of MTCT of HIV among breastfeeding mothers. A previous study [9] on outcome of PMTCT services at this centre showed an MTCT rate of zero percent among mothers who accessed all the services, so it is not surprising for mothers in this centre to be certain that taking their ART is a surety for an HIV negative child even when they breastfeed.

It is not uncommon to find discordant couples who are reluctant to disclose their HIV status to their spouses in our practice. Studies have shown a prevalence rate of over 60% among married and cohabiting partners who are discordant [22-24]. Where this happens, there may be an honest lack of support from the spouse or family members if she opts for EBMS since he bears the financial burden of providing for the infant formula. Mothers in this circumstance may be pressured by their spouse and family members to breastfeed or mixed feed if BMS had been started. It is actually an area of ethical dilemma in practice where women have refused to disclose their HIV status to their spouse despite repeated focused counselling due to their feared risk of being blamed, stigmatized, abused or abandoned and marital

dissolution. One is now torn between breaching the patient's confidentiality by disclosing to her spouse and causing possible "marital disharmony" when this disclosure is done by the health care provider. Disclosure of HIV status to sexual partners may have some immediate risk as outlined above, but it eventually leads to improved partner support. It is also an important HIV prevention strategy [25] and is associated with a reduced risk of HIV transmission by 18% to 41% [26] and increased use of condoms from 4% to 57% [27,28]. Appropriate counseling approaches to facilitate HIV positive persons in discordant relationships to disclose their status to their HIV-uninfected partners is thus central to HIV prevention in couples and the community at large.

In our study, similar to findings from a Malawian study [29], prior breastfeeding experience was associated with an intention to exclusively breastfeed. Experience they say is the best teacher, when mothers have a firsthand experience of breastfeeding their children who eventually turn out to be HIV negative, nothing can beat that experience. It reinforces their resolve to breastfeed and exclusively breastfeed their subsequent children.

Mothers in this study breastfed and exclusively breastfed their babies irrespective of their ages, educational level and employment status. This further supports the cultural norm associated with breastfeeding in the African setting. However, this study found a statistically significant association between the practice of EBF (and invariably breastfeeding) and the marital status of the mothers. More of the married mothers exclusively breastfed their children. Despite the benefits associated with breastfeeding, mothers need motivation and support to be able to carry on. Support from a spouse and family members are quite reassuring especially at nights when some nocturnal active babies require more attention. Umeobieri et al. [14] also found a statistically significant association between breastfeeding and the marital status as was found in this study.

## 5. CONCLUSION

In conclusion, breastfeeding is the commonest feeding practice among HIV positive mothers at UPTH, Port Harcourt and the EBF rate among these mothers is high and should be encouraged. Regular and consistent use of ART among HIV positive mothers must be encouraged and supported since the desire to

prevent MTCT was the commonest motivation for the feeding choice among these mothers.

### CONSENT AND ETHICAL APPROVAL

Ethical approval for the study was obtained from the Research and ethics committee of the UPTH. Informed written consent was recruited for the study.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

### REFERENCES

1. Lawrence PB. Breast milk: Best source of nutrition for term and preterm infants. *Pediatric Clinics of North America*. 1994;41(5):925-941.
2. AK, Mbachu C, Uzochukwu BSC, Elias A, Omotowo B, Agunwu C, Obi I. Perception and practice of breastfeeding among HIV positive mothers receiving care for prevention of mother to child transmission in South-East Nigeria. *International Breastfeeding Journal*. 2018;13:50
3. Newman J. How breast milk protects newborns. *Scientific Amer*. 1995;273(6):76-79.
4. Fewtrell MS. The long-term benefits of having been breast-fed. *Current Paediatrics*. 2004;14(2): 97-103.
5. World Health Organisation (WHO). *Guideline: Updates on HIV and infant feeding: The duration of breastfeeding and support from health services to improve feeding practices among mothers living with HIV*. Geneva, WHO; 2016. Available: <https://apps.who.int/iris/bitstream/handle/10665/246260/9789241549707eng.pdf;jsessionid=C980274A4993D300092B62180D1D507D?sequence=1> [Accessed 22<sup>nd</sup> December 2019]
6. Belay GM, Wubneh CA. Infant feeding practices of HIV positive mothers and its association with counseling and HIV disclosure status in Ethiopia: A systematic review and meta-analysis. *AIDS Research and Treatment*. 2019;Article ID 3862098:1-13.
7. Kennedy K, Fortney JA, Bonhomme MG, Potts M, Lamptey P, Carswell W. *Trop Doct*. 1990;20(1):25-29.
8. World Health Organisation (WHO). *Infant feeding for the prevention of mother-to child transmission of HIV*. Available: [https://www.who.int/elena/titles/hiv\\_infant\\_feeding/en/](https://www.who.int/elena/titles/hiv_infant_feeding/en/) [Accessed 22<sup>nd</sup> December 2019]
9. Paul NI, Ugwu RO. Outcome of prevention of mother to child transmission (PMTCT) of HIV Services at the University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt, Nigeria. *Asian Journal of Medicine and Health*. 2019;17(2):1-11. [Article no. AJMAH.53046] [ISSN: 2456-8414]
10. Muluye D, Woldeyohannes D, Gizachew M, Tiruneh M. Infant feeding practice and associated factors of HIV positive mothers attending prevention of mother to child transmission and antiretroviral therapy clinics in Gondar Town health institutions, Northwest Ethiopia. *BMC Public Health*. 2012;12:240. Available: <http://www.biomedcentral.com/1471-2458/12/240>
11. Umeobieri A, Mbachu C, Uzochukwu BSC, Elias A, Omotowo B, Agunwa C, Obi I. Perception and practice of breastfeeding among HIV positive mothers receiving care for prevention of mother to child transmission in South-East, Nigeria. *International Breastfeeding Journal*. 2018;13:50.
12. Mukerem M, Jemal Haidar J. Assessment of the prevalence and factors influencing adherence to exclusive breast feeding among HIV positive mothers in selected health institution of Addis Ababa, Ethiopia. *J. Health Dev*. 2012;26(3):169-175.
13. Federal Ministry of Health. *National HIV sero-prevalence sentinel survey among pregnant women attending antenatal clinics in Nigeria*. Abuja: Federal Ministry of Health; 2014.
14. UNICEF. *Nutrition; HIV and Infant Feeding*; 2011. Available: [http://www.unicef.org/nutrition/index\\_24827.html](http://www.unicef.org/nutrition/index_24827.html)
15. Coovadia H, Rollins N, Bland R, Little K, Coutsoydis A, Bennis M, et al. *Lancet*: Mother-to-child transmission of HIV-1 infection during exclusive breast feeding in the first 6 months of life: An intervention cohort study. *Breastfeeding Review*. 2008;16(1):30-2.
16. Ngwende S, Gombe NT, Midzi S, Tshimanga M, Shambira G, Chadambuka A. Factors associated with HIV infection among children born to mothers on the prevention of mother to child transmission

- programme at Chitungwiza hospital, Zimbabwe. 2008 BMC Public Health. 2013;13(1):1181.
17. Oladokun RE, Brown BJ, Osunusi K. Infant-feeding pattern of HIV-positive women in a prevention of mother-to-child transmission (PMTCT) programme. AIDS Care. 2010;22(9):1108–14.
  18. Tromp I, Kieffe-de Jong J, Raat H, Jaddoe V, Franco O, Hofman A, et al. Breastfeeding and the risk of respiratory tract infections after infancy: The Generation R Study. PLoS One. 2017; 12(2):e0172763. Available: <https://doi.org/10.1371/journal.pone.0172763>
  19. Lamberti LM, Fischer Walker CL, Noiman A. et al. Breastfeeding and the risk for diarrhea morbidity and mortality. BMC Public Health. 2011;11:S15. DOI: 10.1186/1471-2458-11-S3-S15
  20. Tariq S, Elford J, Tookey P, Anderson J, Annemiek de Ruiter A, O'Connell R, et al. It pains me because as a woman you have to breastfeed your baby: Decision-making about infant feeding among African women living with HIV in the UK. Sex Transm Infect. 2016;92(5):331–6.
  21. Oguta T, Omwega A, Sehmi J. Infant feeding alternatives for HIV positive mothers in Kenya. Field Exch. 2004;22:25. Available: [www.enonline.net/fex/22/infant](http://www.enonline.net/fex/22/infant)
  22. Carpenter LM, Kamali A, Ruberantwari A, Malamba S, Whitworth JA. Rates of HIV-1 transmission within marriage in rural Uganda in relation to the HIV sero-status of the partners. AIDS. 1999;13(9):1083–1089. [PubMed: 10397539]
  23. De Walque, D. Discordant couples: HIV infection among couples in Burkina Faso, Cameroon, Ghana, Kenya and Tanzania. Washington, D.C: Development Research Group, the World Bank; 2006.
  24. Gray RH, Wawer MJ, Brookmeyer R, Sewankambo NK, Serwadda D, Wabwire-Mangen F, et al. Probability of HIV-1 transmission per coital act in monogamous, heterosexual, HIV-1-discordant couples in Rakai, Uganda. Lancet. 2001; 357:1149–1153. [PubMed: 11323041]
  25. Guthrie BL, De Bruyn G, Farquhar C. HIV-1-discordant couples in Sub-Saharan Africa: Explanations and implications for high rates of discordance. Current HIV Research. 2007;5(4):416–429. [PubMed: 17627505]
  26. Medley A, Garcia-Moreno C, McGill S, Maman S. Rates, barriers and outcomes of HIV serostatus disclosure among women in developing countries: Implications for prevention of mother-to-child transmission programmes. Bulletin of the World Health Organization. 2004;82(4):299–307.
  27. Pinkerton DS, Galletly LC. Reducing HIV transmission risk by increasing serostatus disclosure: A mathematical modeling analysis. AIDS and Behaviour. 2007;11(5): 698–705.
  28. Allen S, Tice J, Van de Perre P, Serufulira A, Hudes E, Nsengumuremyi F, et al. Effect of serotesting with counselling on condom use and seroconversion among HIV discordant couples in Africa. British Medical Journal. 1992;304(6842):1605–1609. [PubMed: 1628088]
  29. Kafulafula UK, Hutchinson MK, Gennaro S, Guttmacher S, Kunitawa A. Exclusive breastfeeding prenatal intentions among HIV-positive mothers in Blantyre, Malawi: A correlation study. BMC Pregnancy Childbirth. 2013;13:203.

© 2019 Paul and Alex-Hart; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:  
The peer review history for this paper can be accessed here:  
<http://www.sdiarticle4.com/review-history/53819>