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Feeding Practices and Nutritional Status of HIV-Positive Mothers and Exposed-Infants in Abeokuta, Ogun State, Nigeria

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A b s t r a c t

A major problem in the management of infants whose mothers are HIV-positive is that of feeding, which stems from the need to avoid mother-to-child-transmission via breast milk. The safer choice of exclusive breastfeeding for HIV-positive mothers poses a challenge on the nutritional status of their infants and studies have shown that inappropriate infant feeding practices among HIV-positive mothers are associated with severe malnutrition in under-five children. There is a dearth of information on the relationship between infant feeding practices and nutritional status of HIV-positive mothers. This study sought to determine the infant feeding practices and nutritional status of HIV-positive mothers and their infants in Abeokuta, Ogun State. An hospital-based cross-sectional study was conducted from June to August, 2013. HIV- positive mothers (N = 145) aged 19-49 years and their infants (0-12 months) were included in the study. These mothers and infants attended post-natal HIV- clinics of three purposively selected hospitals with highest antenatal clinics attendance and prevention-of-mother-to-child-transmission facilities in Abeokuta. A semi-structured, interviewer-administered questionnaire was used to obtain information on socio-demographic characteristics, nutrition counselling, infant feeding choices and practices. A 24-hour dietary recall was done and nutrient adequacy of mothers was assessed using the total dietary assessment (TDA) software. Body mass index (BMI) of mothers which was classified as underweight (BMI < 18.5), normal weight (BMI = 18.5 – 24.9), overweight (BMI = 25.0 – 29.9) and obese (BMI ≥ 30) was determined. Anthropometric indices for stunting, wasting and underweight were derived for infants using WHO Anthro software. Data were analyzed using descriptive statistics and Chi-square test at p = 0.05.Eighty-five percent of respondents practiced exclusive breastfeeding (EBF), while 10.4% and 4.8% practiced exclusive replacement feeding (infant formula only) and mixed feeding (MF) (breast milk and infant formula), respectively. The respondents' mean intake of 3203.9±1142.88 Kcal, 86.9±41.50g, 3048.2±2187.29µg/dl, 487.3±377.13mcg, and 38.8±37.17mg satisfied WHO recommendations for energy, protein, vitamin A, folate, and iron respectively. There was no relationship between infant feeding practices and nutritional status of HIV-positive mothers but exclusive breastfeeding was found to be associated with good nutritional status of the exposed-infants. Therefore, adherence to exclusive breastfeeding as recommended by World Health Organization should be emphasized for HIV-positive mothers.

Keywords: *Infant feeding, Exclusive breastfeeding, HIV-positive mothers, Mother-to-child-transmission, Nutritional status*

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Background to the Study

Globally, there were 3.3 million children living with HIV in 2011 and more than 90% is estimated to have acquired their infection through Mother-To-Child-Transmission (MTCT). MTCT can take place during pregnancy, labour and delivery, and breastfeeding. Studies have shown that between 25 and 40% of MTCT of HIV occurs through breastfeeding (UNAIDS, 2012). Evidence-based research suggests that antiretroviral (ARV) drugs given to pregnant women and their new-born babies reduce the risk of MTCT of HIV (Lallemant et al, 2004).

The rate of MTCT of HIV varies from region to region and country to country. MTCT rate of 45% was found among HIV-infected pregnant women within Ibadan metropolis of South-Western Nigeria before ARV intervention therapy became available (Odaibo et al., 2006). However, in a study carried out in Lagos and Benin, Nigeria, a lower MTCT rate of 11% was reported among HIV-infected pregnant women who had ARV intervention, and MTCT rate of 30% among HIV-infected women without ARV intervention (AuduR. A. et al., 2006).

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 (FMOH ANC REPORT Nigeria, 2008). 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) (FMOH Nigeria, 2011). The importance of PMTCT in reducing paediatric morbidity and mortality cannot therefore, be over-emphasized

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There are about 1,216 PMTCT service points across Nigeria presently (UNGASS, 2010). In 2009, 18.7% of pregnant women living with HIV received antiretroviral (ARV) agents to reduce the risk of 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 (Charurat M. et al., 2009). 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 (UNAIDS, 2014).

The 2010 World Health Organization (WHO) guideline on HIV and infant feeding recommends that decisions on appropriate infant feeding options for specific populations should be made at national or sub-national level by health authorities. Recommended feeding options are breastfeeding with ARV interventions during the entire breastfeeding period, or replacement feeding (WHO, 2010). According to WHO recommendations, of all the infant feeding options, the best feeding option (gold standard) that is economically affordable, socially acceptable, culturally recognized, sustainable, feasible and most beneficial to the health of infants and mothers alike especially in resource-constrained settings is exclusive breastfeeding (WHO, 2010).

Breast-feeding poses a dilemma for HIV-positive mothers who live in low-resource settings because the practice can transmit HIV but it is the source of optimal nutrition and protection against other serious infectious diseases (Wilfert and Fowler, 2006). Early cessation of breast-feeding has been recommended to balance these competing risks favorably reducing postnatal transmission of HIV while preserving the nutritional and immunologic benefits of breast-feeding at the time when they are needed most (Piwoz and Ross, 2005). However, since breast milk may contain some virulent pathogens; replacement feeding is advised-only if it is Acceptable, Feasible, Affordable, Sustainable, and Safe (AFASS) but in resource-constrained conditions, in the absence of free formula feed and portable water, exclusive breastfeeding is advised (WHO, 2010).

Mother-to-child-transmission (MTCT) of HIV can occur in uterine (in-utero), during delivery (intrapartum), or after birth (postnatally) through breastfeeding. Strategies to reduce MTCT focus on these periods of exposure and include the use of ARVs, caesarean section before onset of labour or rupture of membranes, and complete avoidance of breastfeeding (Charurat M. et al., 2009). These combined interventions when followed effectively, reduce the risk of MTCT to as low as 1-2% (Violari et al., 2008). Without intervention 30-45% of all infants born to HIV positive mothers will be infected and 10-20% will be infected through breastfeeding (Global Health Observatory, 2011). Early infant diagnosis (EID) programs can be used to evaluate the impact of PMTCT, as well as substantially improve the survival rates.

The Nigerian prevention of mother-to-child transmission (PMTCT) programme adapted the 2010 WHO guideline on HIV and infant feeding. Exclusive breastfeeding is promoted but adequate counselling is given to the mother and choice of infant feeding suitable for her is made.

Statement of Problem

A major problem in the management of infants whose mothers are HIV positive is the issue of feeding, which stems from the need to avoid transmission of the virus via breast milk. Studies have shown that inappropriate infant feeding practices among HIV positive mothers are associated with severe malnutrition in the under five children, lack any advantage in terms of weight gain and are associated with growth faltering (Onayade*et al*., 2004). HIV/AIDS prevalence is still high and the epidemic continues to have devastating effect among which the HIV-infected nursing mothers face severe morbidity (UNAIDS, 2002).

In a study conducted in Ethiopia (Muluye*et al*., 2012), the proportion of HIV-positive mothers practicing exclusive breastfeeding (83.7%) for the first 6 months of age was comparatively higher than the findings reported from Nigeria (68.3%), Uganda (24%), India (44%) and South Africa (35.6%) [Adejuyigbe E. *et al*., 2008; Fadnes L.T. *et al*., 2009; Suryavanshi*et al*., 2003; Rendani*et al*., 2011]. Though some of these studies assessed the infant feeding practices of HIV-positive mothers, none of them assessed the nutritional status of HIV-positive mothers and their infants. Odida, (2011) reported that the

consequence of infant feeding choices and practices of HIV-positive mothers reflects on or is evident on the nutritional status of their infants, whereas, there is a dearth of information on the relationship between infant feeding practices and nutritional status of HIV- positive mothers and their infants.

Objectives of Study

The main objective of this study is to assess infant feeding practices and nutritional status of HIV-positive mothers and infants in Abeokuta, Ogun State, Nigeria, while the specific objectives were as thus:

1. Identify the factors influencing infant feeding practices of HIV-positive mothers.
2. Assess the nutritional status of HIV-positive mothers and their infants.
3. Determine the association between infant feeding practices and nutritional status of the mothers and infants.

Hypothesis

1. There is no significant difference between feeding practices and nutritional status of HIV-positive mothers.
2. There is no significant difference between feeding practices and nutritional status of infants.

Literature Review

Human immunodeficiency virus (HIV) causes acquired immunodeficiency syndrome (AIDS) a condition in humans in which progressive failure of the immune system allows life-threatening opportunistic infections and cancers to thrive (Douek et al., 2009). Major routes of transmission are unsafe sex, contaminated needles and transmission from an infected mother to her baby during pregnancy, at birth and through breast milk.

Sub-Saharan Africa remains the worst-affected region, with 22.5million people currently living with HIV (67% of the global total) and 4.4million children infected. In Sub-Saharan Africa, HIV has resulted in the death of 3.2million children and 90% of the world's 16.6 million children orphaned by HIV (Ronald and Russell, 2013). Among new-born infants testing HIV-positive within 48 hours after birth, approximately 50% die within six months, primarily due to infectious diseases such as pneumonia (75%) and diarrhea (40%), diseases which occur more frequently and with more severe consequences when infants are not exclusively breastfed (Ronald and Russell, 2013). The HIV epidemic threatens the child survival and development gains of the past decades.

Vertical transmission, which is the transmission from mother-to-child, is the leading source of human immunodeficiency virus (HIV) in children under the age of 15years (WHO, 2010). Without intervention 30-45% of infants born to HIV-positive mothers in developing countries will become infected during pregnancy, childbirth and breastfeeding, out of which 5-20% of infants born to HIV-infected women will be infected through breastfeeding (De Cock et al., 2000). Interventions to prevent mother-to-child transmission during childbirth and breastfeeding have been shown to reduce infections in

infants to less than 5% in low and middle income countries (Iliff et al., 2005; Coovadia et al., 2007; Thomas et al., 2011).

The superiority of breastfeeding over artificial feeding is well documented and exclusive breastfeeding remains one of the most valuable interventions for improving child survival, especially in resource poor settings (WHO, 2003). The transmission of HIV through breastfeeding was first identified in 1985 (Ziegler et al., 1985) and since then the issue of breastfeeding within the context of HIV and prevention of mother to child transmission (PMTCT) has continued to be at the centre of much debate and policy. The World Health Organization (WHO) recommends all mothers, regardless of their HIV status practice exclusive breastfeeding for the first six months of an infant's life.

In the absence of antiretroviral therapy (ART) the risk of mother-to-child transmission of HIV through breastfeeding is between 20-45% (Dunn et al., 1992). However, with the use of ART by the mother, this risk can be reduced to less than 5%, even among infants who are breastfed (WHO, 2010; Kesho 2010; Kesho 2011), because ART reduces the HIV viral load in the mother's milk (Shapiro et al., 2007). While breastfeeding is associated with risk of transmission of HIV (Mepham et al., 2010), exclusive breastfeeding for the first six months is associated with a lower risk of HIV transmission when compared to mixed feeding, even without ART (Iliff et al., 2005; Coovadia et al., 2007). The risk of infants acquiring HIV through breastfeeding, therefore needs to be weighed against the increased risk of death from causes other than HIV, in particular malnutrition and serious illnesses such as diarrhoea, among non-breastfed infants (Bahl et al., 2005).

In order to continue encouraging and promoting breastfeeding while at the same time reducing the risk of HIV transmission, global infant feeding guidelines relating to HIV-exposed infants have been developed and subsequently amended as knowledge and understanding of HIV and its biomedical management has advanced (WHO, 1987; WHO, 2001; WHO, 2007; WHO, 2009; WHO 2010). These guidelines are particularly relevant for HIV-positive mothers in low income countries. While clearly favouring breastfeeding, the guidelines note that in some situations replacement feeding may be more appropriate, provided it is "acceptable, feasible, affordable, sustainable and safe". If these provisions cannot be met, exclusive breastfeeding in the first few months of life (currently the first six months) is recommended (WHO, 2001; WHO, 2009). While earlier WHO guidelines (2001) recommended abrupt cessation of breastfeeding at six months(WHO, 2001), their most recent guidelines (2009) support the continuation of breastfeeding up to twelve months, after six months of exclusive breastfeeding (WHO, 2009), along with the introduction of other foods and fluids. Additionally, at this time, breastfeeding should only be stopped if an alternative nutritionally adequate diet can be provided (WHO, 2010).

Exclusive Breastfeeding (EBF)

In 1999, Coutsoudis et al., reported the striking finding that the risk of MTCT transmission with EBF was significantly lower than that associated with mixed feeding. In 2001, they reported that cumulative probability of HIV detection in infants was similar for babies

never breastfed and those EBF (0.194), whereas the risk of HIV infection in infants fed breast milk and other foods was much higher (0.261) (Coutsoudis et al., 2001). The greatly elevated risk of MTCT associated with mixed feeding and the protective benefits of EBF were subsequently demonstrated in other studies (Coovadia and Bland, 2007; Kuhn et al., 2009). Furthermore, lower non-HIV morbidity and mortality rates are observed among HIV-exposed, EBF infants compared to their mixed fed counterparts (Piwoz et al., 2007, Taha et al., 2006).

EBF promotes maintenance of the integrity of the infant's gastrointestinal barrier, which is thought to be the primary mode of infection. The immunological factors in breast milk likely reduce viral activity in human milk. Additionally, EBF maintains the integrity of the mammary epithelial lining and promotes overall breast health. For all these reasons, the 2010 Guidelines recommend 6 months of EBF in the absence of AFASS replacement feeding.

Abrupt Cessation of Breastfeeding

Because of the relatively low risk of HIV transmission during EBF compared to mix feeding, it was thought that abrupt cessation of breastfeeding might offer infants the maximum health benefit with minimum risk. However, the sole randomized trial to investigate the effects of abrupt weaning indicated that the health risks of rapid weaning (e.g. higher viral load in milk with abrupt weaning, inadequate nutritional intake thereafter, death) outweighed the health benefits of PMTCT (Kuhn et al., 2009; Kuhn et al., 2008, Thea et al., 2006). Data from a number of other studies also support these findings (Onyango-Makumbi et al., 2009; Kafulafula et al., 2010). Women are now advised to stop breastfeeding gradually within a month (WHO, 2010).

Another change in the 2010 guidelines is the recommended duration of breastfeeding in the absence of AFASS conditions. The recommended duration of breastfeeding for HIV-exposed infants is slowly approaching that for the general population. Women are now encouraged to breastfeed for a minimum of 12 months and breastfeeding "should then only stop once a nutritionally adequate and safe diet without breast milk can be provided" (WHO, 2010). Infants given replacement foods after a period of breastfeeding also suffered increased serious infections, including diarrhoea and pneumonia, growth faltering, and death (Onyango-Makumbi et al., 2009; Kafulafula et al., 2010; Doherty et al., 2011). The importance placed on maximizing an infant's continued access to breast milk in the 2010 recommendations reflects the immunological benefits of breast milk as well as the importance of breast milk in providing adequate nutrition to infants greater than 6 months of age.

Antiretroviral (ARV) Prophylaxis during Breastfeeding

In low-income settings, ARV has been used to reduce the risk of prenatal and peripartum transmission for more than a decade (Guay et al., 1999). The mainstay of ARV prophylaxis for PMTCT in most countries has been single-dose nevirapine (sdNVP), a regimen that consists of a maternal dose intrapartum and an infant dose within 72 h postpartum.

Indeed, the testing, counselling, and ARV provided by these PMTCT programs are largely responsible for the steady decrease in the incidence of paediatric (<15 years old) HIV over the past decade from 800,000 in 2001 (UNAIDS, 2002) to 430,000 in 2008 (UNAIDS/WHO, 2009). The use of extended ARV in the postnatal period, however, is relatively new, and is an exciting area for discovery.

In the 2010 guidelines, the WHO recommended that all pregnant, HIV-1–infected women with CD4+ T-cell counts of ≤350 cells/mm^3 initiate lifelong, highly activated antiretroviral therapy (HAART) for their own health (WHO, 2010). These guidelines also recommended that ARV be administered prophylactically to pregnant women with CD4+ T-cell counts > 350 cells/mm^3; the recommended regimen is either a 2-drug regimen (antepartum azidothymidine (AZT) plus intrapartumnevirapine) or HAART, which is a combination of at least 3 ARV. After delivery, it is recommended that women receiving HAART (either for their own health or to prevent HIV transmission) continue on ARV throughout the breastfeeding period and that their infants receive nevirapine for 6 weeks. Those women on HAART for their own health should continue on ARV indefinitely.

At the time these recommendations were written, these recommendations are based on strong evidence from clinical trials that ARV interventions for infants and mothers significantly reduce HIV transmission through breastfeeding (Sturt et al., 2010), with little evidence of diminished protection over time, no evidence of significant drug-related adverse events, and no increased adverse events with prolonged ARV intervention. Studies in Malawi (Kumwenda et al., 2008), Tanzania (Kilewo et al, 2008), Kenya (Kesho, 2010), and Botswana (Shapiro et al., 2010) have all observed low rates (<5%) of HIV transmission (via all routes combined, i.e. intrauterine, intrapartum, and postpartum) in breastfeeding women receiving therapeutic regimens initiated during pregnancy and then continued thereafter in the context of a scientific study.

Mother-to-Child-Transmission (MTCT) of HIV

The mother-to-child-transmission (MTCT) of HIV refers to the transmission of HIV from an HIV-positive woman to her child during pregnancy, labour, delivery or breastfeeding. MTCT is by far the most common way that children become infected with HIV (90 percent) (AIDS info, 2014). Without treatment, the likelihood of HIV passing from mother-to-child is 15-45 percent. However, antiretroviral treatment (ART) and other effective interventions for the prevention-of-mother-to-child-transmission (PMTCT) can reduce this risk to below 5 percent (WHO 2014).

A Comprehensive Approach to PMTCT

Effective PMTCT programmes require women and their infants to receive a cascade of interventions including uptake of antenatal services and HIV testing during pregnancy, use of antiretroviral treatment (ART) by pregnant women living with HIV, safe childbirth practices and appropriate infant feeding, uptake of infant HIV testing and other post-natal healthcare services (Padian*et al*., 2011). The World Health Organization (WHO) promotes a comprehensive approach to PMTCT programmes which includes:

1. Prevention of new HIV infections among women of childbearing age
2. Preventing unintended pregnancies among women living with HIV
3. Preventing HIV transmission from a woman living with HIV to her baby
4. Providing appropriate treatment, care and support to mothers living with HIV and their children and families (WHO 2010).

HIV and Breastfeeding

"Breastfeeding, which is essential for child survival has posed an enormous dilemma for mothers living with HIV. Now, WHO says mothers may safely breastfeed provided that they or their infants receive ARV drugs during the breastfeeding period. This has been shown to give infants the best chance to be protected from HIV transmission in settings where breastfeeding is the best option (WHO, 2010)."

How is the HIV Virus Transmitted through Breastfeeding?

It is still not completely understood how HIV becomes present in breast milk. There is evidence to suggest that HIV-infected CD4 cells have a greater capacity to replicate themselves in breast milk than in blood (UNICEF/UNFPA/WHO, 2007). Once an infant digests this HIV-infected milk, the virus enters the infant's body through breaches in the infant's mucous membranes - the lubricating membranes lining all body passages and cavities. The most likely part of the body where this happens is in the gut. It is also considered likely that HIV transmission can happen through the tonsils as they contain cells that are capable of HIV replication (UNICEF/UNFPA/WHO, 2007). In 2012, a study found that HIV-neutralizing antibodies were released by some B cells, that are present in breast milk; explaining why breastfeeding can protect most infants from transmission (UNICEF/UNFPA/WHO, 2007). Whilst this is a positive finding that may be useful for HIV vaccine development, WHO breastfeeding guidelines should continue to be followed (Friedman et al., 2012).

For most babies, breastfeeding is without question the best way to be fed, but unfortunately breastfeeding can also transmit HIV. If no antiretroviral drugs are being taken, breastfeeding for two or more years can double the risk of the baby becoming infected to around 40 percent (De Cock et al., 2000). Breast milk provides all of the nutrients needed during the first few months of life, and it also contains agents that help to protect against common childhood illnesses such as diarrhoea and respiratory infections.

Benefits and Risks of Breast Milk

The short-term and long-term benefits of breastfeeding have been well documented for both the mother and her infant. In the short-term, breastfeeding decreases postpartum blood loss and promotes bonding between mother and child (Coutsoudis et al., 2010; Labbok, 2001). Longer term, for women, it is associated with reduction in risks of breast and ovarian cancers, retained gestational weight gain, type 2 diabetes, myocardial infarction, and metabolic syndrome as well as delayed resumption of menses (lactational amenorrhea), which is important for birth spacing (Labbok, 2001; Stuebe, 2009; Perez, 1992). For infants, breastfeeding is unequalled in its role in reducing morbidities and

improving child growth, development, and survival in developing (Victora et al., 1987; WHO, 2000; Black et al., 2003) and industrialized (Stuebe, 2009; Ip et al., 2009) countries. In addition to the well-established role of breast milk in preventing infectious diseases in infants, it reduces the risks of childhood obesity, type 1 and type 2 diabetes, leukaemia, and sudden infant death syndrome (Ip et al., 2009).

Breast milk typically provides most of the protein and energy needs of infants even in the latter part of the first year of life as well as a majority of several critical micronutrients such as vitamins A, C, and B-12 and folate and copper (Gibson et al., 1998). These nutrients are not easily replaced by complementary feeding in the best of circumstances and less so in low-income populations (Brown et al., 1998).

Human milk is also beneficial because of its important and myriad immunological and anti-infective factors (Chirico et al., 2008). They include, among many others, proteins with antimicrobial properties such as secretory Ig A, lysozyme, and lactoferrin; lactoferrin provides immune-modulating properties in addition to its better-known anti-infective properties. Oligosaccharides in breast milk inhibit bacterial adhesion, further protecting against pathogens, and white blood cells provide passive immune protection. Nucleotides and cytokines also assist with T-cell maturation and immune system modulation, evidenced by, e.g., the more robust immune response that breast-fed infants exhibit after vaccination (Pabst and Spady, 1990). Breast milk also promotes healthful gastrointestinal microbiota (Mackie et al., 1999; Zivkovic et al., 2010).

However, there was initial concern that breastfeeding could be deleterious to HIV-infected mothers' health because lactation is a metabolically expensive process (Nduati et al., 2001). Several studies have since been unable to demonstrate any adverse consequences for maternal health (Coutsoudis et al., 2001; Kuhn et al., 2005; Sedgh et al., 2004; Otieno et al., 2007). Furthermore, a meta-analysis conducted by the Breastfeeding and HIV International Transmission Study Group indicated that mothers' mortality during the 18-months period after delivery did not differ significantly according to children's feeding modality (ever vs. never breast-fed). The apparent mortality and other health risks in HIV-infected breastfeeding women were explained by confounding. That is, HIV-infected women with lower CD4 counts were less likely to initiate breastfeeding and healthier women were able to breastfeed longer. However, because greater fat loss (Papathakis et al., 2006) and micronutrient deficiencies (Papathakis et al., 2007) have been observed during lactation among HIV-infected compared to uninfected women, some concerns remain about potentially unmet nutritional requirements of lactating HIV-infected women. However, in general, the major risk of breastfeeding is vertical transmission of HIV and not adverse health effects for the mother.

In 2008, approximately 430,000 (240,000–610,000) children became infected with HIV; 90% of these were due to vertical transmission (UNAIDS/WHO, 2009). Vertical transmission can take place during pregnancy, labour, and delivery, as well as postpartum, through breastfeeding. The risk of transmission depends on many factors, including the timing of

maternal infection, maternal viral load, immune function, nutritional status of both the woman and baby, antiretroviral (ARV) use, breast health (nipple pathology, mastitis), type of breastfeeding (exclusive, mixed, or replacement feeding), duration of any breastfeeding, and presence of oral lesions in the infant (Coutsoudis et al., 2004; De Cock et al., 2000; Embree et al., 2000; Coovadia and Bland, 2007; Liang et al., 2009; Lunney et al., 2010).

In the absence of interventions to prevent transmission, 5–10% of infants born to HIV-positive mothers become infected with HIV during pregnancy and 10–20% become infected around the time of delivery (UNAIDS/WHO, 2009; De Cock et al., 2000). Estimates of the risks of HIV infection via breast milk have varied due to the multifactorial nature of risk of transmission, including the difficulty of quantifying the instantaneous hazard rate of infection (Kuhn and Aldrovandi, 2010). In 2000, De Cock et al., calculated that between 5 and 20% of infants would become infected if breastfed beyond 18 months (De Cock et al., 2000). A meta-analysis by the

Infant Feeding Practices among HIV-Positive Mothers

Several studies reported the practice of feeding infants in the context of HIV-positive mothers. Based on a Zambian study, infant-feeding practices of mothers of known HIV status that were counselled, 35% of them exclusively breastfed their infants for 4 months and below. 52% HIV-positive mothers practiced mixed feeding and more HIV-positive mothers reported commencing alternative liquids below the age of 2 months (Aika and Omari, 2007). Another study in Cameroon demonstrated that about 87.2% of the HIV positive mothers opted for ERF since birth, 8.5% chose EBF, while the rest 4.3% practiced mixed feeding (Senyonga *et al*., 2004).

Effects of Antiretroviral Treatment

Current antiretroviral drug treatments control HIV infection and prevent severe wasting, as well as other AIDS-related conditions. Emaciated people tend to regain weight once they begin treatment and stunted children start to grow faster. Nevertheless, the drugs do not eliminate wasting. Studies have found that relatively small weight loss (between 5% and 10% over 6months) is quite common not trying to lose weight (Tang *et al*, 2005). Although, this might not seem like much, losses of this size have been linked to an increased risk of illness or death.

In addition, some antiretroviral drugs have been linked to a problem called lip dystrophy. Whereas HIV-related wasting tends to deplete lean tissue, lip dystrophy involves changes in fat distribution. Prolonged treatment is sometimes associated with losing fat from the face, limbs or buttocks, or gaining fat deep within the abdomen, between the shoulder blades or on the breasts. Antiretroviral treatment can also contribute to lipid abnormalities by raising LDL cholesterol, lowering HDL cholesterol and raising triglyceride levels in the blood. This may result in higher risks of heart disease, stroke and diabetes. Other side effects of antiretroviral treatments include insulin resistance which can occasionally lead to diabetes.

HIV Transmission

The chance of someone transmitting HIV is linked to the amounts of virus in their bodily fluids, which is known as the viral load. In theory, micronutrient deficiencies may increase viral load by enabling HIV to replicate faster, or by weakening the immune system. Similarly, someone whose immune system has been weakened by micronutrient deficiencies may be more likely to acquire HIV. Research in this area has however been largely inconclusive. The strongest evidence links low levels of retinol (the animal form if vitamin A) in women's blood with increased rates of mother-to-child-transmission (WHO, 2005). Poor nutrition may also affect the spread of HIV in a very different way: by altering sexual behaviour. One study of 2000 people in Botswana and Swaziland found that women lacking enough food to eat were less likely to use condoms and more likely to engage in risky activities such as exchanging sex for money or resources (Weiser *et al*, 2007).

Advice for HIV-Positive People

Dietary advice should be tailored to individual circumstances. However, in general, the recommendations for people living with asymptomatic HIV infection are much the same as for everyone else, meaning a healthy, balanced diet (WHO, 2003). Only three (3) differences are worth noting:

i. Because people with untreated HIV tend to burn more energy, the total number of calories is about 10% higher than the usual guideline amounts, and up to 30% higher during recovery from illness. The balance of fat, protein and carbohydrate should remain the same.
ii. Many experts recommend a daily multivitamin (usually without iron, except in menstruating women or people with iron deficiency).
iii. The WHO recommends vitamin A supplements every 4-6 months for young children living with HIV in resource-poor settings.

HIV-positive people suffering loss of appetite may need to make an extra effort to ensure they are eating enough. Helpful suggestions include eating several small meals per day, taking exercise to food to ease swallowing and seeking advice from health provider or dietician. If other approaches have failed to reverse wasting then doctors may recommend a liquid food supplement, an appetite stimulant, or resistance exercise to build muscle. Other possibilities include steroids and hormone treatments, though these can be expensive and have serious side effects (Dudgeon, 2006).

Methodology of Study

The study involved HIV-positive mothers (19 - 49years) with infants (0 - 12months) who were attending post-natal/paediatric HIV clinics of the selected hospitals. All HIV seropositive mothers (19 - 49years) of infants aged 0-12 months that enrolled in the PMTCT services and also gave their informed consent to participate in the study, were eligible to participate in the study. HIV-positive mothers who did not satisfy the inclusion criteria and were not able to give an informed consent were excluded from the study.

The sample size for this study was determined using the formular below and the prevalence of HIV among pregnant women in Ogun State (FMOH, 2010).

$$N = \frac{Z^2pq}{d^2}$$

Where,

N = sample size

Z is the z score value at 95% confidence interval (CI) = 1.96

P is the prevalence of HIV among pregnant women in Ogun State = 3.8%

q = 1- P = 1- 0.038 = 0.962

d = Desired precision = 0.05 (5%)

Therefore, $N = \frac{1.96^2(0.038)(0.962)}{(0.05)^2} = 56.17$

However, 20% (11.23) non-response rate was added which makes the sample size approximately 70. Therefore, 145 participants were recruited, with at least 45 participants from each hospital.

All mothers-infants pairs that satisfied the inclusion criteria were included in the study. Anthropometric indices such as weight, length and age in months of the infants were used to assess their nutritional status such as stunting, wasting and underweight using WHO Anthro. Body mass index (BMI), (weight/height^2) was calculated to determine underweight, normal weight, overweight and obesity among the mothers. Also, 24hour dietary recall method was used to assess the adequacy of the nutrient intake of the HIV-positive mothers.

The height of the women was taken with a stadiometer with the backs of their head, their buttocks and heels in contact with the tall block of the stadiometer and both hands hanging loosely on both sides and their eyes looking straight ahead. The weight of mothers was taken with a weighing scale. The weight and length of the infants were taken in an incumbent position with an infant meter. Data was cleaned, entered and cross-checked on a daily basis. Statistical analysis was done using SPSS version 16.0 software. Data were summarized using descriptive statistics such as mean, frequency tables, percentages and pie charts. Inferential statisticwas used to determine whether there were statistical differences and associations between variables. There are several limitations to the present study. The retrospective design may introduce recall bias, but it has been shown that mothers are able to recall duration of breast-feeding accurately; they may, however, not remember the age of introduction of other liquids and foods as well. The retrospective design may have caused the infants who were most malnourished to be under-represented, as many may have died before the age at which this survey was conducted. Nor did we perform an assessment of the AFASS criteria to determine the appropriateness of replacement feeding in the infants who were never breastfed.

The study findings are limited in terms of overall generalization due to the small study sample size and it was hospital-based. There is a possibility that study participants who received counselling on recommended way of infant feeding practice may simply

answered questions accurately. This bias may underestimate the proportion of mixed feeding practice. Maternal since-birth recall of feeding patterns was also used which has its own limitations of long recall. Despite these limitations, I believe the study findings provide essential input on appropriate infant feeding decisions.

Ethical Considerations

Ethical approval for the study was obtained from the Ethical Review Committees of University of Ibadan/University College Hospital Ethical Review Committee. The procedure, potential benefit/risks were explained to the participants at the beginning of the study, after which informed consent was obtained from each study participant. The participants were assured of strict confidentiality with regards to all information obtained from them. They were informed about voluntary participation and right to withdraw from the study anytime without affecting their treatment in the hospitals.

Data Analysis and Presentation

Table 1: Infant feeding practices of HIV-positive mothers

Infant feeding practices	Frequency	Percentage
Exclusive Breastfeeding (EBF)	123	84.8
Exclusive Replacement feeding (ERF)	15	10.4
Mixed feeding (MF)	7	4.8
Total	**145**	**100.0**

Source: Authors Computation, SPSS 24.0 2013

Table 2: Association between Infant feeding practices of HIV-positive mothers and HIV status of infants

	Infant Feeding Practices			Total	Chi-Square (X^2)	P-Value
HIV status of infants	**EBF**	**ERF**	**MF**			
	n (%)	**n (%)**	**n (%)**	**n (%)**		
Positive	10 (58.8)	3 (17.6)	4 (23.5)	17 (100)	15.77	0.002
Negative	90 (88.2)	10 (9.8)	2 (2.0)	102 (100)		

*EBF = Exclusive breastfeeding, ERF = Exclusive replacement feeding; MF = Mixed feeding

Source: Authors Computation, SPSS 24.0, 2013

Table 3: Nutritional Status of HIV-Positive Mothers

Body Mass Index (BMI)	Frequency	Percentage
<16.5 – 18.49 (Underweight)	18	12.4
18.5 – 24.9 (Normal weight)	82	56.6
25.0 – 29.9 (Overweight)	39	26.9
30.0 – 40.0 and above (Obese)	6	4.1
Total	**145**	**100.0**

Source: Authors Computation, SPSS 24.0, 2013

Table 4A: Energy and macro-nutrient intake per day of HIV-positive mothers

Nutrient	Mean Intake	Standard Deviation	Minimum Intake	Maximum Intake
Energy (kcal)	3203.86	1142.88	350.44	6834.16
Protein (g)	86.92	41.50	12.31	201.33
Carbohydrate (g)	421.20	159.05	44.59	874.88
Fat (g)	127.97	76.05	4.74	354.82

Source: Authors Computation, SPSS 24.0, 2013

Table 4B: Micro-nutrient intake per day of HIV-positive mothers

Nutrient	Mean Intake	Standard Deviation	Minimum Intake	Maximum Intake
Vitamin A (RE)	3048.15	2187.29	16.95	6965.97
Folate(mcg)	487.26	377.13	5.10	1635.00
Calcium (mg)	337.05	306.64	6.50	862.19
Zinc (mg)	20.59	12.75	2.42	82.24
Iron (mg)	38.80	37.17	3.57	106.57

Source: Authors Computation, SPSS 24.0, 2013

Table 5: Association between infant feeding practices and nutritional status of HIV-positive mothers

	Nutritional Status				Total	Chi-Square (X^2)	P-Value
Feeding Practice	Under-weight n (%)	Normal-weight n (%)	Over-weight n (%)	Obese n (%)	n (%)		
EBF	12 (9.8)	71 (57.7)	34 (27.6)	6 (4.9)	123 (100)	8.42	0.209
ERF	3 (20.0)	8 (53.3)	4 (26.7)	0 (0.0)	15 (100)		
MF	3 (42.9)	3 (42.9)	1 (14.3)	0 (0.0)	7 (100)		

Source: Authors Computation, SPSS 24.0, 2013

Table 6: Association between infant feeding practices and nutritional status of infants of HIV-positive mothers

	Nutritional Status		
Infant Feeding Practices	Wasting n (%)	Stunting n (%)	Underweight n (%)
Exclusive breastfeeding (EBF)	13 (10.6)	45 (36.9)	18 (14.6)
Exclusive replacement feeding (ERF)	3 (20.0)	5 (33.3)	7 (46.7)
Mixed feeding (MF)	3 (42.9)	4 (57.1)	5 (71.4)
Total	19	54	30
Chi-square (x^2)	7.29	1.28	19.90
P – Value	0.121	0.526	0.000

Source: Researchers data output, 2013

Results and Discussion

Most HIV-positive mothers (84.8%) practiced exclusive breastfeeding (EBF), while 10.4% and 4.8% practiced exclusive replacement feeding (ERF) and mixed feeding (MF) respectively (Table 1).

A significant association was observed between feeding practices of HIV-positive mothers and HIV status of infants ($X^2 = 15.77$, $p<0.05$). Twenty-four percent of infants who were mixed fed and 17.6% of infants who were fed with infant formula were HIV-positive (Table 2).

The mean BMI of HIV-positive mothers was 23.1± 3.78. Fifty-seven percent of the mothers had normal weight, and 31% were either overweight or obese (Table 3). Age and marital status were observed to be significantly associated with the nutritional status of HIV-positive mothers ($p<0.05$). Overweight, 16 (40.0%) and obesity, 4 (10.0%) were prevalent

among older mothers (35-44years), while underweight, 7 (50%) was prevalent among younger mothers (15-24years). The mean energy and protein intakes of HIV-positive mothers were 3203.9±1142.88kcal/day and 86.92±41.50g/day respectively (Table 4A), and the mean vitamin A, folate and iron intakes were 3048.2±2187.29RE/day, 487.3±377.13mcg/day and 38.8±37.17mg/day respectively (Table 4B).

Hypotheses Testing

Two hypotheses were formulated in the study to establish the relationship between infant feeding practices and the nutritional status of HIV-positive mothers and infants. The hypotheses were tested as follows:

Hypothesis 1: There is no significant difference between feeding practices and nutritional status of HIV-positive mothers. This hypothesis was tested by cross tabulating the infant feeding practices and the nutritional status of HIV-positive mothers as indicated in table 5. The result showed no significant difference between infant feeding practices and nutritional status of HIV-positive mothers. The null hypothesis is thereby accepted.

Hypothesis 2: There is no significant difference between feeding practices and nutritional status of infants. This hypothesis was also tested by cross tabulating the infant feeding practices of HIV-positive mothers and the nutritional status of infants as indicated in table 6. A significant difference was observed comparing nutritional status between infants who were exclusively breastfed and those on replacement feeding. Exclusive breastfeeding was associated with good nutritional status of the infants. This indicated that there was a significant difference between infant feeding practices and nutritional status of HIV-exposed infants. The null hypothesis is thereby rejected.

Summary/Conclusion

Based on the results from the findings in this study, the following conclusions were made: A higher proportion of the HIV-positive mothers practiced exclusive breastfeeding which is the recommended way of infant feeding by WHO irrespective of their socio-economic status. The higher prevalence of EBF for the first 6months of life in this study suggests that infant feeding counselling for HIV-positive mothers has been successful in increasing EBF practices among HIV-positive mothers. Moreso, higher level of awareness about the current recommendation of WHO for feeding HIV-positive infants may be responsible for higher prevalence of EBF.

The major factors which influenced the infant feeding practices of the HIV-positive mothers are availability of ARV prophylaxis, counsel received from health care personnel and opinion on infant feeding of family members. Availability of ARV prophylaxis and counsel received from health care personnel were found to be significantly associated with recommended infant feeding practice, while opinion of family members was significantly associated with mixed feeding. About half of the HIV-positive mothers had poor nutritional status and the energy and macro-nutrient, in terms of adequacy, of the HIV-positive mothers in this study was in excess. This could be attributed increased

requirements for HIV-patients. The nutritional status of the HIV-exposed infants was generally poor. Stunting was observed to be prevalent among the infants. There was no significant difference between infant feeding practices and nutritional status of HIV-positive mothers but exclusive breastfeeding was found to be associated with good nutritional status of their infants.

Recommendations

The following recommendations were made on the basis of the observations from this study.

1. Most HIV-positive mothers practiced exclusive breastfeeding which is in line with WHO recommendation. Therefore, higher level of awareness about the current recommendation of WHO for feeding HIV-positive infants should be encouraged.
2. For those that indeed desire to practice formula feeding, it is necessary to address affordable, safe and acceptable interventions to reduce MTCT of HIV and to also determine how best HIV-positive mothers could handle or overcome criticisms and stigmatization by others.
3. Mixed feeding, an undesirable practice in infant feeding was also reported in the study, and opinion of family members was observed to be the influencing factor; this highlights the need for the community – not only the mother herself or the infant feeding counsellor – to be aware of the most up-to-date infant feeding recommendations in order to properly support the breastfeeding mother.
4. Nutritional recommendations for HIV-positive mothers should emphasize on the critical role of adequate nutrition for the health and survival of all HIV-patients regardless of their HIV stage.
5. Finally, exclusive breastfeeding was observed to be associated with good nutritional status of the HIV-exposed infants, adherence to exclusive breastfeeding as recommended by WHO for HIV-positive mothers on infant feeding should be emphasized in the study area and other parts of the country to ensure good nutritional status of infants of the HIV- positive mothers.

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