

Feeding Practices and Nutritional Status of HIV-Exposed Infants seen in a Tertiary Hospital in Sokoto, North-western Nigeria

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Abstract

Background: Adequate and proper infant feeding is an effective lifesaving strategy, especially for HIV-exposed infants. The feeding practices and nutritional status of HIV-exposed infants are critical components in ensuring their optimal growth and development. In the context of Sokoto, a state located in north-western Nigeria, several factors influence how these infants are fed and their nutritional outcomes. The need to explore the dynamics of HIV exposure, maternal care, socio-economic conditions, and local healthcare practices is vital for assessing the situation. This study was aimed at determining feeding practices and nutritional status in HIV-exposed infants in a Tertiary hospital, Sokoto, Nigeria.

Methodology: A cross-sectional study conducted among HIV-exposed infants attending the Paediatric ART clinic, UDUTH, Sokoto. The demographics, infant feeding practices, weight, and length of the randomly selected HIV-exposed infants attending the clinic were documented. The nutritional status was determined using the WHO classification of malnutrition. Data were analysed using SPSS version 27.0. A p-value of ≤ 0.05 was taken as significant.

Results: One hundred and seventy were studied. One hundred and two (60%) were aged 12.1 – 18.0 months with a mean ($\pm$ SD) age of 16.9($\pm$ 3.6) months. There were 90 males with 104(61.2%) from low socio-economic class One hundred and thirty-four (78.8%) were exclusively breastfed, 115(67.6%) were initiated on complementary feed at 6 months of age and 84(49.4%) had plain pap as complementary feed. Sixty-seven (39.4%) were undernourished with stunting, underweight and wasting seen in 46(27.1%), 30(17.6%), and 27(15.9%) of the children respectively. There was a statistically significant association between the complementary feeding practices and the nutritional status of HIV-exposed infants.

Conclusion: The majority of HIV-exposed infants had breastmilk with suboptimal complementary feeding practices and attendant poor nutritional status. Efforts should be geared towards improving appropriate complementary feeding practices for infants to enhance their nutritional status.

Keywords: Feeding practices, Nutritional status, HIV-Exposed

Introduction

The World Health Organization (WHO) and the United Nations Children's Fund established a global strategy for optimal

infant and young child feeding. These include exclusive breastfeeding (EBF) for the first 6 months of life, the introduction of appropriate, adequate, and safe complementary foods at 6 months, and

continued breastfeeding for children up to age 2 years and beyond.¹ Early commencement of proper childhood feeding practices is fundamental in a child's healthy growth, development, and attainment of full potential.² Human Immunodeficiency Virus (HIV)-exposed infant or child is an infant or child born to a mother living with HIV until the infant or child is reliably excluded from being HIV infected.³ Appropriate infant feeding practice is an effective lifesaving strategy, especially for HIV-exposed infants.⁴

HIV remains a major global public health problem claiming an estimated 42.3 million lives to date with ongoing transmission in all countries worldwide. African Region at the end of 2023, contributed 65% of an estimated 39.9 million people living with HIV, 1.3 million people acquired the disease, and death of 630 000 people from HIV-related causes.⁵ Nigeria has the world's second-highest burden of HIV/AIDS with extensive regional variations in prevalence. Approximately 260,000 children aged 0-14 years were living with HIV with 41,000 new infections in 2015.⁶ The Nigerian, national prevalence of HIV was estimated to be 2.1% (2023) amounting to 2 million people aged 15–49 years, compared to the previous estimation of 1.8 million in 2022.^{7,8} HIV

prevalence in Nigeria varies by state, highest in Akwa Ibom (5.5%), lowest in Katsina (0.3%), but Sokoto between 0.3 - 1.3%.^{6,9} The percentage of infants born to HIV mothers reported previously was 26.6% and mother-to-child transmission (MTCT) may occur during pregnancy (in-utero), labour, delivery, and breastfeeding.^{9,10}

Exclusive breastfeeding (EBF) for the first six months of life is recommended for HIV-exposed infants, due to its nutritional benefits and immune system support it offers.^{11,12} Antiretroviral therapy (ART) for mothers can reduce the risk of HIV transmission through breastfeeding, especially in poor resource settings where there are concerns regarding the potential transmission of HIV through breast milk.^{11,12,13,14} The World Health Organization (WHO) recommended the option of EBF or exclusive replacement feeding (ERF) such as formula feeding by HIV-infected mothers depending on their viral load and adherence to ART.^{3,11,12} Mixed feeding enhances HIV transmission as it potentiates the inflammation of the infant's delicate digestive system induced by the breast milk substitute which allows easy absorption of the virus from breast milk in the infant's intestines.^{14,15,16}

A common alternative where breastfeeding is not advisable or feasible is formula feeding, though it can be costly and difficult to access, especially in low-income areas. There is often a lack of awareness or resources to ensure proper preparation and hygiene in formula feeding, which can lead to malnutrition and infections if not done correctly.^{4,13,14}

At six months, complementary foods are typically introduced. Cultural practices, economic conditions, and safe, nutritious food availability influence the types of complementary foods given. Cultural preferences may influence the choice of complementary foods, but the foods must meet the nutritional needs of the infant.^{3,13,17,18} Malnutrition is a common concern in the complementary feeding phase, especially if the foods provided lack essential nutrients.

HIV-exposed infants are at higher risk for poor growth and developmental delays compared to non-exposed infants. Growth faltering is often observed, with lower rates of weight gain and stunting.^{17,18,19} Nutritional deficiencies, such as vitamin A and iron deficiency, can further exacerbate growth problems. Infants who are HIV-exposed are at higher risk of anemia, partly due to

compromised immune systems and insufficient nutritional intake. Iron supplements or fortified foods may be necessary to address this issue, but access and adherence to such interventions can be challenging. HIV-exposed infants are vulnerable to micronutrient deficiencies, which can affect their immune function, growth, and cognitive development. Common deficiencies include vitamins A, D, and E, as well as iron and zinc.^{20,21} Regular monitoring of their nutritional status and timely supplementation is crucial to prevent long-term effects.^{22,23} HIV-exposed infants often suffer from recurrent infections, which can worsen their nutritional status. Malnutrition, in turn, makes them more susceptible to infections, creating a cycle of health issues that affect their overall well-being. This current study, therefore, was aimed at determining the feeding practices and the nutritional status of HIV-exposed infants seen in UDUTH, Sokoto, a tertiary health facility in North-Western Nigeria.

Hypothesis

1. There is no significant difference between infant feeding practices and nutritional status of HIV-exposed infants (H_0 null hypothesis)

2. There is a significant difference between infant feeding practices and the nutritional status of HIV-exposed infants (*H1* alternate hypothesis)

Methodology

Study Area, Study Design, Study Period

A cross-sectional hospital-based study, conducted at the Paediatric ART clinic, Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto from June to December 2022.

Study Population

The mother-infant pairs of HIV-positive mothers and HIV-exposed infants, 6 months – to 2 years attending PMTCT of the Paediatric ART clinic, Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto. The mother-infant pairs who were eligible and consented, participated in the study. Mothers who were too sick and children with congenital anomalies/disability and no result of PCR were excluded.

Sample Size Determination, Sampling Technique

Sample size in health studies for a single population was used to determine the sample size for the present study, using the formula

below,²⁴ and 20% non-respondent rate was added. The mother-infant pairs were recruited consecutively as they presented to the clinic.

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

Where,

N = sample size

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

P is the prevalence of exclusive breastfeeding rate in Sokoto = 17.7%.²⁵

$$q = 1 - P = 1 - 0.177 = 0.823$$

d = Desired precision = 0.05 (5%)

$$n = \frac{(1.96)^2 \times 0.177 \times (1 - 0.823)}{(0.005)^2} = 223.8 = 224$$

Adjustment/reduction formula for a target population of 216 who are less than 10,000

$$nf = \frac{n}{10,000} \quad nf = \text{the desired sample size when the population is less than 10,000}$$

$1 + (n/N)$ $n =$ the desired sample size when the population is more than 10,000

$N =$ the estimate of the population size (216 HIV mothers enrolled $P = 110$ into PMTC clinic in UDUTH)

Adding 20% (22) non-respondents' rate = 132

170 mother-infant pairs who are actively attending PMTC/ART clinic was used over the six months study period.

Data Collection, tools, and variable measurement

Relevant documents and published literature on similar topics were reviewed in developing the data collection tools for this study. Data were collected by a pretested, validated, structured self-administered questionnaire by the researchers. The demographics of the mother-infant pair, socio-economic status of the parents using Oyediji classification,²⁶ infant feeding practices, weight and length of the HIV-exposed infants attending the clinic were documented. Feeding practices were assessed using the core indicators including Early initiation of breastfeeding (initiation of breastfeeding within one hour after birth),

Exclusive breastfeeding under 6 months, Continued breastfeeding at 1-year, Exclusive replacement feeding (Breast milk substitutes/Infant formula only under 6 months) and initiation/type of complementary feeds as well as the history of nutritional counseling. The weight was measured using a digital scale placed on a hard, flat surface and taken with minimum clothing recorded to the nearest 0.1Kg while the length was measured using a measuring board while the child was lying supine and was recorded to the nearest 0.1 cm. The nutritional status was determined using the WHO classification (WHO growth standards) of malnutrition.²⁷ Undernutrition was defined by the presence of either stunting (length-for-age), wasting (weight-for-length), or underweight (weight-for-age) below -2 SD of the WHO growth standards each respectively.

Data Analysis

Data were entered and analysed using SPSS version 27.0. the results were summarised and presented in frequencies, proportion/percentages, texts, tables and figures respectively. Logistic regression was used to determine whether there were statistically significant differences and associations between dependent and

independent variables. A p-value of ≤ 0.05 was taken as significant.

Ethical Consideration

Ethical Approval for the study was sought and obtained from the UDUTH Sokoto's ethics and research committee as well as informed and verbal written consent from the participating mothers. They were informed about the objectives, significance/ benefits, risks, and voluntary participation of the study as well as rights to withdraw at any time without affecting their treatment. Privacy and full confidentiality were ensured.

Results

One hundred and seventy mother-infant pairs were recruited in the study and all participated making a response rate of 100%. The majority of the mothers, 106 (62.4%) were in the age group of 25-35 years (age range 15-39 years). All mothers were married but only 50 (27%) had primary or secondary education. Most of the study subjects 104 (61.2%) mother-infant pairs were from low socio-economic status. Of the 170 infants studied 102 (60%) were aged 12.1 – 18.0 months with the mean ($\pm$ SD) age of 16.9($\pm$ 3.6) months. There were 90 males and

80 females, making a Male-Female ratio of 1.1:1. (Table 1)

One hundred and forty (82.4%) of the mother, initiated breastfeeding within the first hour after delivery, 134(78.8%) infants were exclusively breastfed, 5(3%) had exclusive replacement feeding, 115(67.6%) were initiated on complementary feed at 6 months of age and 84(49.4%) had plain pap as complementary feed and 104 (61.2%) were on continued breastfeeding up to 1 year. (Table 2).

Sixty-seven (39.4%) were undernourished with stunting, underweight, and wasting seen in 46(27.1%), 30(17.6%), and 27(15.9%) of the children respectively. (Figure I).

Table 1: Socio-demographic characteristics of the participants (N=170)

Parameter	Number (n)	Percentage (%)
Age Groups (months)		
Mean $\pm$ SD = 16.9 $\pm$ 3.6		
6.0 – 12.0	23	13.5
12.1 – 18.0	102	60
18.1 – 24.0	45	26.5
Gender		
Male	90	52.9
Female	80	47.1
Socioeconomic Status		
Upper	24	14.1
Middle	42	24.7
Lower	104	61.2

Table 2: Feeding practices among the participants (N=170)

Variable	Frequency (n)	Percentage (%)
Early initiation of breast feeding		
Yes	140	82.4
No	30	17.6
Exclusive breast feeding		
Yes	134	78.8
No	36	21.2
Continued breast feeding		
Yes	104	61.2
No	66	38.8
Exclusive replacement feeding		
Yes	5	3
No	165	97
Complementary feeding		
Yes	115	67.6
No	55	32.4

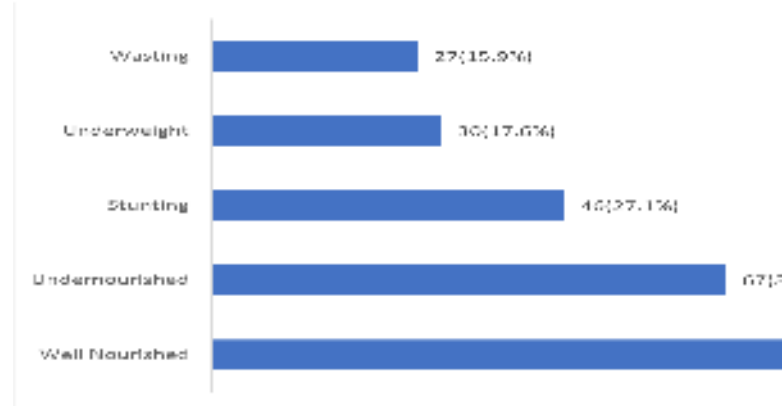


Fig. 1: Nutritional statuses of the participants

There was no significant difference in the likelihood of stunting among infants on EBF to those on ERF (OR=0.97; p=0.150; 95% CI 0.07-2.14). In contrast, infants on EBF were 3.31 times less likely to be stunted than those on CF (OR=3.31; p=0.001; 95% CI 0.87-4.53) as shown in Table 3 below. The hypothesis (H0) which stated that there is no significant relationship between infant feeding practices and nutritional status (stunting) among HIV-exposed infants was therefore, rejected.

Table 3: Association between Stunting and infant feeding practice (N=170)

Infant Feeding practice	Odd Ratio (OR)	95% Confidence Interval (CI)		P-value
		Lower limit	Upper limit	
Exclusive breastfeeding	1	-	-	-
Exclusive replacement feeding	0.97	0.07	2.14	0.150
Complimentary feeding	3.31	0.87	4.53	0.001

Table 4: Association between Underweight and infant feeding practice (N=170)

Infant feeding practice	Odd Ratio (OR)	95% Confidence Interval (CI)		P-value
		Lower limit	Upper limit	
Exclusive breastfeeding	1	-	-	-
Exclusive replacement feeding	0.75	0.25	4.88	0.601
Complimentary feeding	2.08	0.28	6.53	0.001

Table 5: Association between Wasting and infant feeding practice

Infant Feeding practice	Odd Ratio (OR)	95% Confidence Interval (CI)		P-value
		Lower limit	Upper limit	
Exclusive breastfeeding	1	-	-	-
Exclusive replacement feeding	0.10	0.06	3.14	0.781
Complimentary feeding	1.31	0.87	4.75	0.001

Likewise, there was no significant difference in the likelihood of underweight among infants on EBF compared to those on ERF (OR=0.75; $p=0.601$; 95% CI 0.25-4.88). In contrast, infants on EBF were 2.08 times less likely to be underweight than those on CF (OR=2.08; $p=0.001$; 95% CI 0.28-6.53 (Table 4). The hypothesis (H_0) which stated that there is no significant relationship between infant feeding practices and nutritional status (underweight) among HIV-exposed infants was therefore, rejected.

Similarly, there was no significant difference in the likelihood of wasting among infants on EBF compared to those on ERF (OR=0.10; $p=0.781$; 95% CI 0.06-3.14). In contrast, infants on EBF were less likely to be wasted than those on CF (OR=1.31; $p=0.001$; 95% CI 0.87-4.75) (Table 5). The hypothesis (H_0)

which stated that there is no significant relationship between infant feeding practices and nutritional status (wasting) among HIV-exposed infants was therefore, rejected

Discussion

Appropriate infant feeding is a persistent challenge for HIV-infected mothers, particularly in poor-resource settings, in which HIV-positive mothers do not comply with the WHO feeding recommendations.^{15,23,28} This present study has demonstrated the feeding practices and nutritional status of HIV-Exposed infants in a Tertiary Hospital, Sokoto, North-Western Nigeria.

Almost all the mothers (97%) that participated in this study breast fed their

infants and more than two-third (82%) of them commenced early or initiated breast feeding in the first 1 hour of life. A similar trend was recorded in the study area in 2017 (5 years ago)²⁹ and early initiation of breastfeeding in the 1st hour of 91.7% and 95.3% was obtained in other studies done in Maseru/Shashemene, Nairobi, and Bomet County, both in Kenya, each respectively.^{30,31} Furthermore, high percentages of breastfeeding rates (84.4%) and early initiation of breastfeeding (74.6%) were also reported by Daniel *et al* in Wolaita, Ethiopia.¹⁸ The very high breastfeeding rate and early initiation of breastfeeding seen in this study may be attributed to the intense and consistent nutritional counseling given to the participating mothers during pregnancy and after delivery.

The majority of the infants 78.8% in this current study were exclusively breastfed (EBF) for the first 6 months, whereas very few 3% had Exclusive replacement feeding (ERF) but none received mixed feeding under 6 months of age. Similarly, a high proportion of 77.5% and a higher of 85.8% of HIV-Exposed infants had EBF as reported in similar studies in Lira, Uganda, and a Referral Hospital, in East Gojam, Ethiopia respectively.^{32,33} In Nigeria, EBF rate among HIV-Exposed infants documented by Akpan

*et al*²⁸ of 73.6% was in the same range obtained in this present study but lower compared to the prevalence of 61% recorded in South-Western Nigeria and much lower (46%) reported in Abuja, Nigeria.^{34,35} On the other hand, our study recorded very low ERF with no mixed feeding in the first six months similar low ERF of 6.5% but a high (19.9%) of mixed feeding reported in Calabar, Nigeria,²⁸ in contrast to a very much high percentage (40%) of ERF and 14% mixed feeding reported in Abuja, Nigeria³⁵ and 19.9% of ERF with 45% mothers practicing mixed feeding in Wolaifa, Ethiopia.¹⁸ The differences in the rates of EBF, ERF, and mixed feeding obtained in this present study compared to others reported earlier may be variability of infant feeding among HIV-positive mothers from one country to another and region by region coupled with socio-economic and cultural factors.

The prevalence of undernutrition in our present studied infants was high (39.4%) with stunting being the highest (27.1%), followed by underweight (17.6%) and then wasting (15.9%). Other studies showed lower rates of undernutrition of 22.9% in Tanzania³⁶ and 20.2% in St Francis Hospital, Central Uganda.³⁷ Similar patterns of nutritional status of stunting (36.9%), underweight (14.6%), and wasting (10.6%), highest to

lowest were also recorded in Abeokuta, particularly among EBF HIV-Exposed children. The high rate of undernutrition and attendant nutritional status of our infants' subject in this study, may be explained by the poor complementary feeds given to more than two-thirds of the children.

The present study has demonstrated that EBF infants were one to three times less likely to become stunted, underweight, and wasted respectively. Likewise, those infants that were on ERF were less prone to be stunted, wasted, or underweight. In contrast, infants on CF had up to three times more likelihood of developing stunting, underweight, and wasting respectively. Similar findings with some modifications worst with mixed feeding were reported on feeding practices, (EBF, ERF, Mixed feeding and CF) and their effects on the nutritional status of HIV-exposed infants respectively in previous studies.^{18,28,32,35-37}

Maternal sociodemographic factors that include education, poverty as well as maternal viral load, nutrition, ART adherence, and cultural norms may be the determinants of these associations. These will require subsequent and further evaluations locally.

Some limitations of the study included: recall bias on the history of infant feeding practice,

single-center sampling/ hospital-based study, and determining the association of maternal viral load and nutrition with ART adherence were some of the limitations of the study

Conclusion

The majority of HIV-exposed infants had breastmilk with suboptimal complementary feeding practices and attendant poor nutritional status. Efforts should be geared towards improving the complementary feeding practices for infants to enhance their nutritional status via health education nutritional counselling, improved health access and interventions.

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