

# Mothers' knowledge of mother-to-child transmission of HIV and infant feeding practices in Juba, South Sudan

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## Abstract

**Introduction:** While exclusive breastfeeding for the first six months of life is recommended for HIV-infected mothers, this may not be practiced fully in South Sudan; exclusive formula feeding, which is the best alternative to breastfeeding, may not be practical.

**Objective:** To assess the knowledge of mother-to-child transmission of HIV (MTCT) and practices of feeding infants in the first six months of life among HIV-infected mothers attending Antiretroviral Therapy Centres in Juba Teaching Hospital (JTH) and Juba Military Hospital (JMH).

**Method:** A cross-sectional study in which 304 HIV-infected mothers with children aged 6-18 months were interviewed between October and December 2016 using structured questionnaires. Key informant interviews (KIIs) and focus group discussions (FGDs) were also conducted using interview guides. Quantitative data was analysed using Statistics Package for Social Sciences software. Chi-square test was used to test the presence of significant association between the variables and the association is statistically significant when the p-value is < 0.05. Multiple logistic regression analysis was used to identify which predictor variables have major effect on the dependent variable. Qualitative data was transcribed in English and summarized according to the key themes, and the information obtained was used to supplement and interpret the findings of the quantitative data.

**Results:** Only 120 (40%) of the HIV-infected mothers had a good knowledge of MTCT; 213 mothers (70.1%) practiced mixed feeding, 70 (23.0%) practiced exclusive breastfeeding and 20 (6.6%) practiced exclusive formula feeding.

The factors that were found to have a positive effect on choice of infant feeding methods were having more than one child (odds ratio = 0.303, 95% Confidence interval: 0.161-0.571, p = 0.001) and participation in the prevention of mother-to-child transmission of HIV programme (PMTCT) (odds ratio = 2.260, 95% Confidence interval: 1.251-4.084, p = 0.007). Stigma (p = 0.248) and mothers' knowledge of MTCT (p = 0.072) were not statistically significantly associated with the mothers' infant feeding practices.

**Conclusion:** Knowledge of MTCT is low. Mixed feeding before six months of age is predominant among the HIV-infected mothers. It is therefore recommended that HIV-infected mothers receive adequate information from counsellors regarding MTCT and exclusive breastfeeding for the first six months of an infant's life.

**Key words:** Knowledge, infant feeding, HIV-infected mothers, Juba.

## Introduction

According to the United Nations Programme on HIV and AIDS (UNAIDS), new HIV infections in children aged below 15 years was 160,000 children in 2018.<sup>[1]</sup> The absolute risk of HIV transmission from mother to child without intervention is 5% to 10% during pregnancy, 10% to 20% during labour and delivery and 5% to 20% during breastfeeding.<sup>[2]</sup> Factors that increase the risk

of transmission through breastfeeding include mixed feeding,<sup>[3]</sup> duration of breastfeeding,<sup>[2]</sup> sores in the baby's mouth and conditions of the breasts and nipples.<sup>[4]</sup>

According to the World Health Organization (WHO) guidelines on HIV and infant feeding, the most appropriate infant feeding options in the first six months of life for babies of HIV-infected mothers are exclusive breastfeeding and exclusive formula feeding. Breast milk alternatives include commercial infant formula milk, expressed heat-treated breast milk, and breast milk from a healthy wet nurse. Inappropriate infant feeding options include mixed feeding, and home-modified animal milk.<sup>[5]</sup>

Exclusive breastfeeding in the first six months of life is associated with a 3-4-fold decreased risk of HIV transmission compared to mixed feeding.<sup>[6]</sup> Mixed feeding, which is the practice of giving other liquids and/or foods together with breast milk to infants under six months of age carries a higher risk of HIV transmission than exclusive breast feeding. This is because the other liquids and foods damage the epithelial lining of the baby's stomach and intestines which allows the virus in the breast milk to infect the baby more easily.<sup>[7]</sup> Exclusive formula feeding has no risk of postnatal HIV transmission.<sup>[4]</sup> Studies have found gaps in knowledge of infant feeding options among HIV-infected mothers which were attributed to gaps in counselling in PMTCT programmes.<sup>[8]</sup> In developed countries, rates of MTCT have reduced to 1-2% due to routine HIV testing of pregnant women, provision of antiretroviral drugs, elective caesarean delivery, and avoidance of breastfeeding.<sup>[9,10]</sup>

The objectives of this study were to assess HIV-infected mothers' knowledge of MTCT of HIV, to determine the feeding practices of their infants in the first six months of life, to identify the factors that influence their choice of infant feeding methods, and to establish the relationship between level of knowledge on MTCT and infant feeding practices.

### Method

The cross-sectional study was conducted in the only two Antiretroviral Therapy (ART) centres in Juba, South Sudan (estimated, mostly rural, population was 12 million in 2015). These were at Juba Teaching Hospital (JTH) and Juba Military Hospital (JMH); quantitative and qualitative data were collected between October and December 2016. The participants were consenting HIV-infected mothers aged between 15-49 years with children aged 6-18 months. The mothers were purposively sampled until the sample size, determined using Daniel's formula with finite population correction, of 304 was reached.

One-to-one interviews were conducted using structured questionnaires with closed-ended questions to collect the quantitative data. Two key informant interviews and two focus group discussions were conducted to collect the

qualitative data.

The level of knowledge was measured using a scoring system adopted from the Stanford Institute for Research in the Social Sciences as used in a similar study conducted in Kiambu, Kenya.<sup>[11]</sup> Six questions with 15 correct responses were asked. A score of 1 was awarded for each correct response and 0 for incorrect response. A summary indicator for knowledge was calculated as follows: 0 correct response = No knowledge, 1-5 correct responses = Poor knowledge, 6-10 correct responses = Average knowledge, 11-15 correct responses = Good knowledge.

The infant feeding practices were assessed using close-ended questions and responses were classified using WHO definitions<sup>[5]</sup> of as appropriate (i.e. exclusive breastfeeding and exclusive formula feeding for the first six months of age) and inappropriate (e.g. mixed feeding before six months of age and home-modified animal milk).

Quantitative data were analysed using Statistics Package for Social Sciences software. Chi-square test was used to test the presence of significant association between the variables and the association is statistically significant when the p-value is < 0.05. Multiple logistic regression analysis was used to identify which predictor variables have major effect on the dependent variable. Qualitative data were summarized according to the key themes, and the information obtained was used to supplement and interpret the findings of the quantitative data.

Approval to conduct the study was obtained from Kenyatta National Hospital - University of Nairobi Ethics and Research Committee, and from the Ministry of Health, Republic of South Sudan Ethics and Research Committee.

## Results

### Demographic characteristics

Table 1 shows the demographic characteristics of the HIV-infected mothers.

### Social characteristics of the mothers

Most of the mothers 265 (87.2%) had disclosed their HIV status to their relatives, 198 (65.1%) did not experience stigma/discrimination from relatives, friends or the community because of their HIV status, and 191 (62.8%) had participated in PMTCT programmes.

### Level of knowledge of MTCT among mothers

Table 2 shows the mothers' level of knowledge of MTCT, the risk factors associated with HIV transmission through breastfeeding, breast milk alternatives and PMTCT. Only 40% of the mothers scored a good knowledge of MTCT (Figure 1).

From the FGDs, almost all the mothers agreed that an infected mother can transmit the virus to her baby but

they do not understand when and how transmission occurs; most reported infant formula milk as the best alternative to breast milk in the first six months of infant's life, but they could not afford it. Regarding PMTCT, the majority of the mothers were convinced that giving the baby medicine for HIV is the only way to prevent

him getting the virus. Some mothers did not agree with giving the baby medicine for HIV when they do not know whether the baby has the virus or not, but they do not mind giving their babies these medicines when they were

**Table 1 shows the demographic characteristics of the HIV-infected mothers.**

Characteristics	n (%)
<b>Age (years)</b>	
15-19	26 (8.6)
20-29	129 (42.4)
30-39	120 (39.5)
40-49	29 (9.5)
<b>Marital status</b>	
Married	154 (50.7)
Cohabiting	38 (12.5)
Divorced	14 (4.6)
Separated	34 (11.2)
Widowed	30 (9.8)
Single	34 (11.2)
<b>Number of children</b>	
One	76 (25.0)
Two	69 (22.7)
Three or more	159 (52.3)
<b>Level of education</b>	
None	47 (15.5)
Primary	166 (54.6)
Secondary	83 (27.3)
Tertiary	8 (2.6)
<b>Main source of income</b>	
Self	160 (52.6)
Spouse/partner	144 (47.4)
<b>Monthly income</b>	
<50 USD	290 (95.4)
50-100 USD	8 (2.6)
101-150 USD	4 (1.3)
>300 USD	2 (0.7)
<b>Religion</b>	
Christian	291 (95.7)
Muslim	13 (4.3)

**Table 2. Level of knowledge of MTCT and associated risk factors among HIV-infected mothers**

Characteristics	n (%)
<b>Can MTCT occur?</b>	
Yes	268 (88.2)
No	1 (0.3)
Do not know	35 (11.5)
<b>When can MTCT occur?</b>	
During pregnancy	89 (29.3)
During labour and delivery	227 (74.7)
During breastfeeding	254 (83.6)
When carrying the baby	1 (0.3)
Do not know	36 (11.8)
<b>Can MTCT occur through breastfeeding?</b>	
Yes	254 (83.6)
No	0 (0.0)
Do not know	50 (16.4)
<b>Risk factors for MTCT through breastfeeding are:</b>	
Breast milk contaminated with HIV	59 (19.4)
Broken skin on the breast	254 (83.6)
Sores in the baby's mouth	172 (56.6)
Do not know	50 (16.4)
<b>Safe breast milk alternatives in the first six months of life are:</b>	
Infant formula milk	263 (86.5)
Animal milk (cow/goat)	96 (31.6)
Water and/or porridge, tea, juice, food	180 (59.2)
Expressed heat-treated breast milk	0 (0.0)
Breast milk from a wet nurse/another woman	0 (0.0)
Do not know	5 (1.6)
<b>MTCT can be prevented by:</b>	
Caesarean section	43 (14.1)
Not breastfeeding the baby at all	92 (30.3)
Taking medicines for HIV by mother	189 (62.2)
Giving the baby medicine for HIV	263 (86.5)
Do not know	35 (11.5)

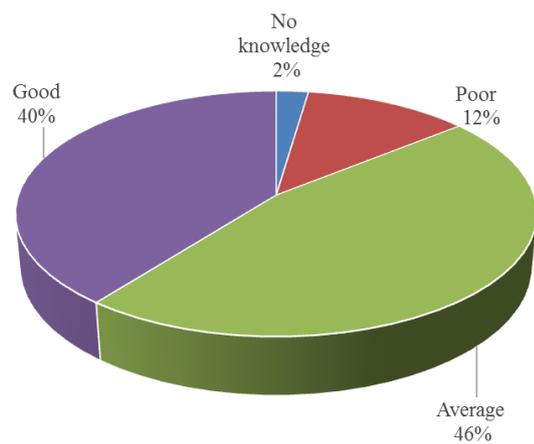


Figure 1. Level of knowledge on MTCT score

Table 3. Infant feeding practices of the mothers

Appropriate	n (%)	Inappropriate	n (%)
Exclusive breastfeeding	70 (23.0)	Mixed feeding	213 (70.1)
Exclusive formula feeding	20 (6.6)	Home-modified animal milk	1 (0.3)
Total	90 (29.6)	Total	214 (70.4)

known to be HIV infected.

*“I heard that the baby can get HIV even if the mother’s breast is ok, but I don’t understand how the bad blood from the mother will reach the baby if the mother’s breast is ok, it is confusing.”*

Only one mother reported that taking HIV medicines by the mother can also help the baby, she said,

*“Everything that the mother eats or drinks come in the breast milk including medicines, so the baby can benefit from the HIV medicines coming from the mother during breastfeeding.”*

### Infant feeding practices

Table 3 shows the mothers’ feeding practices during their babies first six months of life. The majority mix fed their babies, giving breast milk, water and/or infant formula milk, porridge, juice, soups and mashed foods.

The main reasons for choosing an appropriate method were that they have less risk of transmitting HIV, and that the breast milk is cheap, readily available and nutritious for the baby. The main reasons for choosing inappropriate methods were that the mother had to go to work and leave the baby in other people’s care, that the mother was too

ill or weak to breastfeed, and/or perceived that she did not have enough milk or that exclusive feeding with formula milk was too expensive.

Mothers from the FGDs reported that they were told at the clinic to exclusively breastfeed their babies for six months and stop completely by the end of six months. So, they started giving other liquids and foods from as early as 2 to 3 months for their babies to get used to them. Other mothers reported that they normally gave their babies water in the first days of life, even from 3 days, porridge from 3 to 4 months, juice and food from 4 to 5 months.

*“We were told at the clinic to breastfeed for six months only and stop completely by the end of six month, as for me, I started giving my baby powder milk from three months old, and porridge and soup from three and half so that he can get used to them early enough.”*

*“A tin of the baby’s milk is very expensive, some of us even don’t earn that money in a whole month, leave alone other children in the house who also need to be fed, I don’t think I will buy that milk if I ever get pregnant again.”*

### Factors influencing choice of infant feeding methods

The bivariate analysis showed that there was a statistically significant association between number of children ( $p = 0.0003$ ), level of education ( $p = 0.035$ ) and religion ( $p = 0.010$ ), mothers’ participation in the PMTCT programme ( $p = 0.001$ ) and infant feeding practices (Tables 4 and 5). Stigma was found not be statistically significantly associated with the mothers’ infant feeding practices ( $p = 0.248$ ) and there was no relationship between maternal level of knowledge on MTCT and their infant feeding practices ( $p = 0.072$ ).

Table 6 shows the logistic regression coefficient (B), standard error of the regression coefficient, Wald chi-square test, degree of freedom for the Wald chi-square test, significance level/p value, exponentiation of the B coefficient/odds ratio for the predictor, and 95% confidence interval for odds ratio respectively.

Mothers with one child were 0.303 less likely to practice appropriate infant feeding methods compared to those with three or more children, and mothers who participated in the PMTCT programmes were 2.260 more likely to practice appropriate infant feeding methods compared to those who did not participate.

## Discussion

### Knowledge of MTCT

Poor knowledge of MTCT might be because the majority of the mothers had little education and so had less access to health information. It might also be due to poor counselling in the antenatal care clinics and PMTCT programmes. The lack of knowledge may make mothers reluctant to take antiretroviral drugs during pregnancy

because of their side effects and exacerbation of pregnancy symptoms, thus putting their babies at risk of HIV during pregnancy.

From key informant interviews, the gap in counselling in PMTCT programmes could be attributed to a shortage in number of counsellors and support staff which led to multi-

tasking, and increased workload among the counsellors, and consequently lack of time to counsel effectively. Lack of training opportunities for the counsellors to keep up dated with the new guidelines and recommendations on HIV and infant feeding might have also led to lack of confidence among them to deliver the information

**Table 4. Association between demographic characteristics and infant feeding practices**

	n (%)		Total n (%)	P value
	Appropriate	Inappropriate		
<b>Age of mother - years</b>				
15-19	9 (10.0)	17 (7.9)	26 (8.6)	p = 0.59
20-29	45 (50.0)	84 (39.3)	129 (42.4)	
30-39	33 (36.7)	87 (40.7)	120 (39.5)	
40-49	3 (3.3)	26 (12.1)	29 (9.5)	
<b>Marital status</b>				
Married	47 (52.2)	107 (50.0)	154 (50.7)	p = 0.713
Cohabiting	13 (14.4)	25 (11.7)	38 (12.5)	
Divorced	3 (3.3)	11 (5.1)	14 (4.6)	
Separated	9 (10.0)	25 (11.7)	34 (11.2)	
Widowed	6 (6.7)	24 (11.2)	30 (9.9)	
Single	12 (13.3)	22 (10.3)	34 (11.2)	
<b>Number of children</b>				
One	35 (38.9)	41 (19.2)	76 (25.0)	p = 0.0003
Two	22 (24.4)	47 (22.0)	69 (22.7)	
Three or more	33 (36.7)	126 (58.9)	159 (52.3)	
<b>Level of education</b>				
None	9 (10.0)	38 (17.8)	47 (15.5)	p = 0.035
Primary	44 (48.9)	122 (57.0)	166 (54.6)	
Secondary	34 (37.8)	49 (22.9)	83 (27.3)	
Tertiary	3 (3.3)	5 (2.3)	8 (2.6)	
<b>Main source of household income</b>				
Self	41 (45.6)	119 (55.6)	160 (52.6)	p = 0.109
Spouse/partner	49 (54.4)	95 (44.4)	144 (47.4)	
<b>Monthly Income</b>				
Less than 50 USD	84 (93.3)	206 (96.3)	290 (95.4)	p = 0.684
50-100 USD	3 (3.3)	5 (2.3)	8 (2.6)	
101-150 USD	2 (2.2)	2 (0.9)	4 (1.3)	
More than 300 USD	1 (1.1)	1 (0.5)	2 (0.7)	
<b>Religion</b>				
Christian	82 (91.1)	209 (97.7)	291 (95.7)	p = 0.010
Muslim	8 (8.9)	5 (2.3)	13 (4.3)	

Table 5. Association between social characteristics and infant feeding practices

	n (%)		Total n (%)	P value
	Appropriate	Inappropriate		
<b>Disclosure of HIV status</b>				
Yes	77 (85.6)	188 (87.9)	265 (87.2)	p = 0.585
No	13 (14.4)	26 (12.1)	39 (12.8)	
<b>Experienced stigma</b>				
Yes	27 (30.0)	79 (36.9)	106 (34.9)	p = 0.248
No	63 (70.0)	135 (63.1)	198 (65.1)	
<b>Socio-cultural practices or beliefs</b>				
Yes	1 (1.1)	13 (6.1)	14 (4.6)	p = 0.059
No	89 (98.9)	201 (93.9)	290 (95.4)	
<b>Participation in PMTCT program</b>				
Yes	69 (76.7)	122 (57.0)	191 (62.8)	p = 0.001
No	21 (23.3)	92 (43.0)	113 (37.2)	
<b>Level of knowledge</b>				
No knowledge	0 (0.0)	7 (3.3)	7 (2.3)	p = 0.072
Poor knowledge	10 (11.1)	26 (12.1)	36 (11.8)	
Average knowledge	36 (40.0)	105 (49.1)	141 (46.4)	
Good knowledge	44 (48.9)	76 (35.5)	120 (39.5)	

to HIV-infected mothers. Poor knowledge of MTCT and its prevention among mothers may lead to under-utilization of PMTCT services and increased risk of HIV transmission from mothers to children. Similar facility based cross-sectional studies from Kenya, and Southwest Ethiopia showed higher proportion of mothers 66.7% and 65.9% respectively with good level of knowledge of MTCT.<sup>[12,13]</sup>

### Infant feeding practices

Mixed feeding was the predominant method of infant feeding. Most mothers mix fed their infants in the first six months of their lives, usually mixing breast milk with water and/or infant formula milk, porridge, juice, or other food. This is consistent with findings from Kenya and southern Ghana.<sup>[8,12]</sup> The fact that most mothers mix fed despite knowing that exclusive breastfeeding and exclusive formula feeding prevent MTCT could be explained by existing social norms such as giving water to babies from the first days of life believing that babies, in South Sudan's hot weather, are thirsty. It could also be explained by the financial challenges facing the mothers as 95% of them earned less than 50 US dollars per month, half of them were the main breadwinners in the family, so, although many mothers breastfed, they had to go to work leaving other people to feed the baby.

This mixed feeding could also be attributed to a gap in counselling in PMTCT programmes because most of the mothers reported that they were told by the counsellors to stop breastfeeding at six months, but they were not told about the risk of mixed feeding before six months and correct timing of starting complementary foods, so they started giving porridge, juice and food earlier for their babies to get used to other liquids and foods other than the breast milk to make weaning easier at six months. Mothers also reported that they could not afford to buy the infant formula milk because of its high cost and the fact that they also had other children to feed.

### Conclusion

Knowledge and understanding of when and how MTCT occurs and its prevention are low among the mothers interviewed. Knowledge on infant feeding options in the context of HIV and breast milk alternatives in the first six months of infant's life is also low. Maternal level of knowledge on MTCT does not however affect their feeding practices.

Mixed feeding before six months of age is the predominant method of infant feeding among HIV-infected mothers attending antiretroviral therapy centres in Juba.

## Recommendations

1. HIV-infected mothers should receive adequate information from counsellors regarding MTCT, its prevention and various infant feeding options in the context of HIV to help them make decisions that are best for their children.
2. Exclusive breastfeeding in the first six months of infant's life should be promoted at the PMTCT and ART centres with emphasis on continuation of breastfeeding for at least one year or beyond for HIV-infected mothers to increase child survival.
3. HIV-infected mothers should be encouraged to actively participate in PMTCT programme activities.

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