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Original Article

Breastfeeding practices of HIV-positive and HIV-negative women in Kabarole district, Uganda

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Abstract

Ugandan policy regarding infant feeding for HIV-positive mothers is replacement feeding (RF), if feasible; otherwise, exclusive breastfeeding (EBF) for 3 months is advised (or EBF for 6 months, if RF is still not feasible). HIV-negative mothers should practise EBF for 6 months. The study objective was to explore the association between maternal HIV status and breastfeeding practices in Kabarole, Uganda. Data were collected from questionnaires administered at home to 182 women (44 HIV-positive and 138 HIV-negative) 3 months post-partum and from medical charts. The HIV-negative women were matched on delivery date to HIV-positive women at a ratio of 3:1. Interviewers were blinded to HIV status. There was no statistically significant association between adherence to Ugandan national feeding guidelines and maternal HIV status in bivariate analysis [odds ratio (OR) = 1.52; confidence interval (CI): 0.76–3.04]. Multivariate analyses showed a significant association between adherence to feeding guidelines and child illness (OR = 0.40; CI: 0.21–0.79) and between adherence to feeding guidelines and rural residence in Burahya county (OR = 2.43; CI: 1.15–5.13). Many mothers do not follow the feeding guidelines for HIV infection. This region-specific information on breastfeeding practice determinants will be used to inform local Prevention of Mother-to-Child Transmission (PMTCT) programmes. The nature of the association between child illness and EBF should be further explored.

Keywords: breastfeeding duration, breastfeeding knowledge, HIV and infant feeding, infant feeding decisions, policy.

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Introduction

Breastfeeding, although a mode of vertical HIV transmission, reduces other causes of infant mortality, such as diarrhoeal diseases (WHO HIV and Infant Feeding Technical Consultation 2007). Replacement feeding (RF), therefore, despite virtually eliminating post-delivery HIV acquisition risk, is not recommended for most low-income countries. While a Ugandan study demonstrated a 6-month global transmission rate of 16.0% for exclusively breastfed children whose mothers followed short course antiretroviral therapy (Magoni *et al*. 2005), current research supports 6 months exclusive breastfeeding (EBF) for HIV-positive mothers in resource-poor settings (Coovadia & Kindra 2008). Partial breastfeeding (feeding the child breast milk and supplementary foods) is not supported as studies show higher rates of transmission (20.4% at 6 months post-partum) (Magoni *et al*. 2005). 'The World Health Organization (WHO)

recommends HIV-infected women breastfeed their infants exclusively for the first 6 months of life, unless RF is acceptable, feasible, affordable, sustainable and safe [AFASS] for them and their infants before that time. When those conditions are met, WHO recommends avoidance of all breastfeeding by HIV-infected women' (WHO/UNICEF/UNFPA/UNAIDS 2008). According to the Policy for Reduction of the Mother-to-Child HIV Transmission in Uganda, mothers who are HIV-positive should replacement feed or should practise EBF for 3 months, if not feasible (Ministry of Health, Uganda 2003). If RF after 3-month EBF is not feasible, then the EBF duration is extended to 6 months. The different durations of EBF in the international and national guidelines are often viewed as confusing by health care workers (HCWs). The recommendation for HIV-negative mothers is for 6 months EBF followed by the addition of complementary foods.

HIV-positive mothers should receive counselling while making, or reconsidering, their infant feeding choice, to adopt the best mode of breastfeeding or RF for their circumstances (WHO/UNICEF/UNFPA/UNAIDS 2003; WHO HIV and Infant Feeding Technical Consultation 2007). HCWs should perform AFASS assessments, reviewing the criteria with each woman to evaluate her locally available, sustainable and financially viable alternatives, taking into consideration her family support system, water and sanitation, to determine whether these alternatives are appropriate for her situation. Infant feeding was only thoroughly discussed in 5.5% of Prevention of Mother-to-Child Transmission (PMTCT) counselling sessions observed in Botswana, Malawi, Kenya and Uganda (Chopra & Rollins 2008), indicating a need for strengthening of counselling services. Counselling should target all mothers, and include HIV prevention messages, as prevention of HIV acquisition for a breastfeeding HIV-negative mother is essential to the infant's HIV-free survival. Socio-cultural norms affect adherence to recommendations and create the need for region-specific guidelines.

A study in Rakai district, Uganda, found that only approximately 36% of HIV-positive women were adhering to feeding guidelines within 3 days after delivery, and for those with infants 5 months or younger, adherence to guidelines was 30% (14% EBF; 16% RF) (Fadnes *et al*. 2009). Positive correlations have been observed between EBF and the following variables: health centre delivery and standard vaginal delivery (Ssenyonga *et al*. 2004); the child's father and family's support, consulting HCWs, attending infant feeding counselling, early breastfeeding initiation, maternal perception of sufficient breast milk, mother's formal education and her awareness that EBF can prevent transmission (Matovu *et al*. 2008). Ssenyonga *et al*. (2004) found a negative association between EBF and sex (being male) and children over 3 months of age, and no association between EBF and the mother's knowledge of her HIV status.

Our study objective was to explore the association between maternal HIV status and breastfeeding practices in Kabarole district, Uganda. Specific research questions were:

- At 3 months post-partum, are there differences in breastfeeding practices between HIV-positive and HIV-negative women?
- What factors are associated with adherence to national infant feeding guidelines (ATG) at 3 months post-partum?

Key messages

- Adherence to national infant feeding guidelines (ATG) in Kabarole district was low, especially for HIV-positive mothers (56.8%).
- Child illness, at least once between birth and 3 months, was associated with ATG.
- Rural residence (in Burahya county) was positively associated with ATG at 3 months.
- Future interventions could specifically target urban areas.

Materials and methods

Participants and sites

This prospective cohort study involved home-based interviewer-administered questionnaires and hospital-based medical chart reviews in Kabarole district, Uganda. Kabarole district is situated in Western Uganda and is made up of three counties: Fort Portal Municipality (urban), Burahya and Bunyangabu (rural). The HIV prevalence rate among pregnant women, as studied over a 14-year period (1991–2004) in Western Uganda, was 15.3% throughout the study area but 21.3% in urban Fort Portal (Kipp *et al.* 2009). PMTCT programmes are run in all levels of health facilities offering services ranging from group information sessions to individual HIV testing and counselling. Women in this district were not offered free formula during the study period.

The study population comprised a cohort of new mothers, aged 16 years and older who delivered a live singleton baby at Fort Portal Regional Referral Hospital (FPRRH) in Kabarole district between June 20 and September 21, 2007; had a known HIV status (previous HIV-positive confirmed test or current HIV-positive or HIV-negative test result in medical chart); resided in Kabarole district; and had provided informed consent. No participant had a medical condition or had an infant with a medical condition which prohibited breastfeeding.

Sample size

Sample size estimation was based on proportions of HIV-positive and HIV-negative women adhering to guidelines documented in published literature and discussions with local and Canadian physicians. It was expected that with a power of 90% and an alpha of 0.05, 44 HIV-positive and 132 HIV-negative (1:3 ratio) mothers would be required to detect a 20% difference in adherence to guidelines proportions between HIV-positive and HIV-negative mothers given the expectation that approximately 90% of HIV-positive mothers and 70% of HIV-negative mothers would EBF for 3 months (STATA 9.1 1984–2005). Based on conservative estimates of 8% HIV prevalence and 700 deliveries in a 3-month period and to allow for 20% loss-to-follow up, the study aimed to recruit 56 HIV-positive mothers.

Recruitment

Women who delivered at FPRRH during the study period were offered HIV testing. Although national guidelines stipulate HIV testing for women who present to deliver, HIV testing was not routinely provided before study initiation because of logistical problems. Therefore, financial incentives were given to nurses (approved by the Uganda National Council of Science and Technology), and the researchers made HIV test kits available, to ensure that testing was done. Nurses were encouraged to provide Nevirapine (as per national PMTCT guidelines) to women and newborns, and to inform women of their HIV test results. Sixty-one HIV-positive women delivered at FPRRH within the study period. To obtain a 1:3 ratio of HIV-positive to HIV-negative women, 183 HIV-negative women, matched on delivery date, were selected. All 61 HIV-positive women and the 183 HIV-negative women were given information pertaining to the study and provided an initial consent to be contacted (stage 1 consent). A list of addresses and delivery dates was compiled and used to schedule data collection visits. About 3 months post-delivery, a research assistant (RA) visited the study participants in their homes (or a more convenient location for the participant). Each participant was read an information letter and final consent (stage 2 consent) was obtained.

Data collection and entry

Structured questionnaires were administered to participating women between October 3, 2007 and January 8, 2008. The questionnaires, constructed in English, were based on Modules 2 and 6 of the 'Breastfeeding and Replacement Feeding Practices in the Context of Mother-to-Child Transmission of HIV' (WHO 2001). The questionnaires consisted of both closed and open-ended questions to ascertain specific infant feeding information: preferred and actual infant feeding choice, all foods or liquids the infant had been given since birth (with age of introduction and duration), breastfeeding interruption, use of wet

nurses, current breastfeeding status, intention to stop breastfeeding, timing and reason, if breastfeeding cessation had already occurred, source of advice, family support and infant feeding problems. Other information from questionnaires included the following variables: HIV knowledge, antenatal attendance, child illness, child immunizations, child survival and demographic data (age, marital status, household composition, education, occupation). In order to verify the type of breastfeeding responses (to obtain a reliable representation of ATG), additional questions were asked on complementary feeding. EBF status was attributed to participants who had fed their child only breast milk from birth to 3 months of age. Questionnaires were translated into Rutooro and back-translated by a different translator to verify accuracy. The questionnaires were pre-tested in two Kabarole subcounties to ensure proper interpretation and cultural appropriateness. Each woman was interviewed once between 91 and 121 days post-delivery. A retest was conducted with 13 randomly selected women as a reliability check approximately 1 week later. The principal investigator (EL) checked questionnaires daily for completeness. RAs also collected socio-economic information based on fuel source, wall, floor and roof materials, and household possessions. EL and the RAs who administered the questionnaires were blinded to HIV status (unless revealed voluntarily) during participant selection and during the interview process. Questionnaire data were double-entered into a Microsoft Access 2007 database (Microsoft Corporation, Redmond, WA, USA) to increase accuracy and then transferred to STATA 9.1 (1984–2005). Medical chart reviews were subsequently conducted by the principal investigator (EL) to maintain confidentiality. Data retrieved from the charts related to delivery method, HIV status, parity, gestational age and birthweight of the newborn, and were double-entered to ensure accuracy. All medical chart data were used in bivariate analyses, but of the medical chart data, only HIV status was used for the multivariate analyses.

Statistical analyses

Analyses included descriptive frequency distributions, chi-squared tests for categorical variables, *t*-tests for continuous variables and multivariate analyses (logistic regression) using STATA 9.1 (1984–2005). For the logistic regression analyses, the dependent variable was adherence to guidelines at 3 months (yes/no). ATG was defined as EBF since birth (or exclusive formula feeding since birth, but no participant met this criterion). The main covariate of interest (and included in all models) was mother's HIV status (positive or negative); other covariates assessed for inclusion were variables from the questionnaires: demographic variables, health information, socio-economic characteristics, infant feeding information and medical chart information. If these variables had $P \leq 0.20$ on bivariate analyses, they were selected and fit into a multivariate model with HIV status. Variables not included in the model were EBF preference (as this would overshadow all other variables) and variables that were subsets of other variables. For example, respiratory tract infection is a subset of child illness at least once since birth, so the multivariate model included the variable 'child ever sick' instead of each significant illness. Covariates were added to the original model (i.e. model with HIV status) one by one. The model was checked for effect modification and confounding of all combinations of variables, by including them in the model and assessing changes in odds ratios of variables previously included. Variables found to be statistically significant in the multivariate model ($P < 0.05$) were kept in the final model.

Ethics

Ethics approval was obtained from the University of Alberta's Health Research Ethics Board Panel B and the Uganda National Council of Science and Technology. Approval was also obtained from Kabarole's District Health Officer (DHO).

Results

During the study period, 336 women were identified as potential study participants. All were offered HIV tests; only three refused. Two hundred seventy-six (61 HIV-positive) initially met the inclusion criteria. A total of 183 HIV-negative women, matched on deliv-

ery date, were subsequently chosen at random from the total of 215 eligible. These women all agreed to be contacted 3 months post-delivery. Of these, 182 (74.6%) completed questionnaires (44/61 (72.1%) HIV-positive and 138/183 (75.4%) HIV-negative). Of the 62 initially recruited women who subsequently did not participate, 15 (24.2%) were HIV-positive and 47 (75.8%) were HIV-negative. The main causes were inability to find the women because of wrong contact information (29%), failing to meet inclusion criteria (19.3%: 6 did not reside in Kabarole district during the study period, 1 claimed to have delivered at a different hospital, 1 delivered twins, 1 was 15 years of age, 1 had a child who was born before the study period, 1 had a baby who died during delivery and 1 did not know her HIV status) or relocation during the study period (14.5%). The proportion of HIV-positive women approximates that of the remaining participants in the study. Two women thought to be HIV-positive at selection were subsequently found to be HIV-negative, based on a comparison of the breastfeeding logbook and medical charts (verified following questionnaire administration to maintain confidentiality). Therefore, the correct HIV prevalence in the study population recruited during Stage 1 was 21.4%. Seven women (four HIV-positive) were subsequently excluded before questionnaire administration because of infant death.

The characteristics of the 182 study participants are shown in Table 1.

At 3 months post-partum, 180 women (98.9%) were still breastfeeding, including 117 (64.3%) who were ATG at 3 months. Therefore, at 3 months post-partum, 65 (35.7%) were partially breastfeeding and not adhering to the guidelines, including 19 HIV-positive mothers (43.2% of all HIV-positive mothers).

Table 2 documents the bivariate analysis results for ATG at 3 months post-partum with important covariates.

The association between HIV status and adhering to feeding guidelines was not statistically significant. Significant variables were residence in Burahya county ($P = 0.012$), illness of the child at least once since birth ($P = 0.009$) and preference of the mother to exclusively breastfeed at 3 months ($P < 0.001$). A multivariate model (shown in Table 3) was constructed using the most significant variables from Table 2 and from the literature.

There was no association between HIV status and adherence to guidelines. ATG was significantly associated with the child being sick at least once since birth ($P = 0.008$), and with residence in Burahya ($P = 0.020$). No confounding by delivery method, age of mother and type of flooring was identified, nor was there any statistical interaction between HIV status and child illness.

Fifteen women whose preferred intended method of infant feeding was EBF for at least 3 months were not practising EBF at 3 months post-partum. The reasons given for the difference in practice were insufficient breast milk ($n = 9$, 60.0%), mother's absence ($n = 4$, 26.7%) and health of the mother or baby ($n = 2$, 13.3%). Two study participants interrupted breastfeeding. One explained the cause as lack of breast milk due to illness. One woman's mother-in-law acted as wet nurse during her caesarean section recovery.

Of the 65 women who introduced food before 3 months, 61 (93.8%) introduced animal milk, shown in Table 4. The other foods introduced were millet porridge, tinned milk, soya porridge and water. The average age of introduction was 7 weeks for animal milk. The duration of supplementary feeding was ongoing in all but one case.

Nevirapine information was noted in 33 medical charts (75% of HIV-positive participants). Breastfeeding information was present in only 5 of the 44 HIV-positive mothers' medical charts. When comparing demographic data between questionnaires and medical charts, discrepancies were found in approximately 28% of cases. These discrepancies were either a difference of 4 or more years in the mother's reported age [$n = 39$ (21.4%)] or a difference in infant sex [$n = 24$ (13.2%)]. To ascertain the cause of discrepancies, a verification of 21 study participants was conducted. Several causes were identified, including wrong information in the medical chart and wrong person interviewed. The RA offered explanations that women were reluctant to be honest and often unsure of their exact age. Sensitivity analyses were also performed by omitting participants with discrepancies in (1) mother's age; (2) differences in infant's

Table 1. Characteristics of the study population by human immunodeficiency virus (HIV) status in Kabarole district, Uganda, 2007–2008 (chi-squared and *t*-tests). $n = 182$, unless otherwise indicated

Variables*	All ($n = 182$)	HIV+ ($n = 44$)	HIV– ($n = 138$)	*P*-value
Age (in years)	24.1 ± 5.8	24.1 ± 5.3	24.1 ± 6.0	0.992
Tribe†				
Batooro	129 (83.8)	30 (68.2)	99 (71.7)	0.722
Religion†				
Christian	159 (97.0)	40 (100.0)	119 (96.0)	0.197
Other	5 (3.1)			
Marital status				
Married/living with partner	121 (66.5)	32 (72.7)	89 (64.5)	0.314
County				
Fort Portal (urban)	44 (24.2)	18 (40.9)	26 (18.8)	0.007
Burahya (rural)	112 (61.5)	23 (52.3)	89 (64.5)	
Bunyangabu (rural)	26 (14.3)	3 (6.8)	23 (16.7)	
Education				
No formal education	14 (7.7)	3 (6.8)	11 (8.0)	0.671
Some elementary	102 (56.0)	28 (63.6)	74 (53.6)	
Completed elementary	29 (15.9)	5 (11.4)	24 (17.4)	
More than elementary	37 (20.3)	8 (18.2)	29 (21.0)	
Employment				
Employed at home	147 (80.8)	35 (79.6)	112 (81.2)	0.813
Partner employment†				
Employed at home	73 (41.5)	16 (36.4)	57 (43.2)	0.427
Electricity – yes	11 (6.0)	2 (4.6)	9 (6.5)	0.632
Household possessions‡				
Radio	85 (46.7)	24 (54.6)	61 (44.2)	0.231
Telephone	36 (19.8)	6 (13.6)	30 (21.7)	0.240
Lantern	39 (21.4)	10 (22.7)	29 (21.0)	0.809
Bicycle	41 (22.5)	8 (18.2)	33 (23.9)	0.428
Cupboards	28 (15.4)	3 (6.8)	25 (18.1)	0.071
Fuel				
Only firewood	155 (85.6)	36 (83.7)	119 (86.2)	0.682
Other than firewood	26 (14.4)	7 (16.3)	19 (13.8)	
House composition				
Cement floor	40 (22.0)	5 (11.4)	35 (25.4)	0.051
Iron sheet roof	168 (92.3)	42 (95.5)	126 (91.3)	0.368
Brick wall	40 (22.0)	6 (13.6)	34 (24.6)	0.125
Number of household occupants	4.2 ± 1.9	3.7 ± 1.4	4.4 ± 2.0	0.020
Gender of child				
Female	109 (59.9)	28 (63.6)	81 (58.7)	0.560
Mothers who have had children who died	6 (3.3)	1 (2.3)	5 (3.6)	0.662
Child sickness‡				
Sick ≥ once since birth	108 (59.3)	24 (54.6)	84 (60.9)	0.457
RTI	81 (44.5)	17 (38.6)	64 (46.4)	0.368
Fever	35 (19.2)	10 (22.7)	25 (18.1)	0.499
GI	7 (3.9)	2 (4.6)	5 (3.6)	0.782
Other/unknown	9 (5.0)	4 (9.1)	5 (3.6)	0.145
Immunizations‡				
Visit 1	180 (98.9)	44 (100.0)	136 (98.6)	0.422
Visit 2	166 (91.2)	41 (93.2)	125 (90.6)	0.596
Visit 3	71 (39.0)	19 (43.2)	52 (37.7)	0.515
Antenatal session attendance	181 (99.5)			
Number of antenatal visits†	3.5 ± 1.4	3.7 ± 1.8	3.5 ± 1.3	0.407

Table 1. *Continued*

Variables*	All ($n = 182$)	HIV+ ($n = 44$)	HIV– ($n = 138$)	*P*-value
Knowledge of HIV transmission through breastfeeding				
Yes	163 (89.6)	38 (86.4)	125 (90.6)	0.295
No	7 (3.9)	1 (2.3)	6 (4.4)	
Don't know	12 (6.6)	5 (11.4)	7 (5.1)	
Source of breastfeeding advice				
HCW	148 (81.3)	37 (84.1)	111 (80.4)	0.799
Grandmother	12 (6.6)	2 (4.6)	10 (7.3)	
Other	22 (12.1)	5 (11.4)	17 (12.3)	
Preferred EBF at 3 months	123 (67.6)	29 (65.9)	94 (68.1)	0.785
3 months EBF	117 (64.3)	25 (56.8)	92 (66.7)	0.235
Support of family†				
Yes	175 (96.7)	41 (95.4)	134 (97.1)	0.575
Delivery method				
Vaginal delivery	160 (87.9)	36 (81.8)	124 (89.9)	0.154
Gestational age†	37.2 ± 1.3	36.8 ± 1.7	37.3 ± 1.2	0.026
Parity†				
Primigravida	61 (34.3)	18 (40.9)	43 (32.1)	0.285
Birthweight†	3.2 ± 0.4	3.1 ± 0.4	3.2 ± 0.4	0.130

RTI, respiratory tract infection; GI, gastrointestinal illness; HCW, health care worker; EBF, exclusive breastfeeding; *Continuous variables are expressed as mean ± SD; discrete variables as *n*(%). †Variables having missing values. Denominators (total *n*; *n* for HIV-positive; *n* for HIV-negative) are as follows: tribe (154; 35; 119); religion (164; 40; 124); partner employment (176; 44; 132); number of antenatal visits (179; 43; 136); support of family (181; 43; 138); gestational age (162; 41; 121); parity (178; 44; 134); weight (175; 42; 133). ‡Not mutually exclusive.

sex; and (3) both. As with the main analysis, these multivariate models demonstrated no association between HIV status and adherence to guidelines but adherence to guidelines was associated with no child illness since birth. Residence in Burahya was associated with adherence to guidelines when all inconsistencies were omitted and also in the model with only infant sex inconsistencies omitted. In the analyses where sex differences were omitted, and where both sex and age differences were omitted, the presence of cement flooring, which was associated with EBF, became statistically significant, suggesting that socioeconomic status may also affect adherence.

Discussion

The findings show that HIV-positive women are practising partial breastfeeding; which raises a concern that they are increasing their children's risk of acquiring HIV. In contrast with the assumptions used to calculate the original sample size, adherence was found to be higher in the HIV-negative group by approximately 10% (as compared with 20%). Adherence rates were lower than expected and the difference between the two groups was of smaller magnitude and in the opposite direction. The majority of study participants (81%) listed HCWs as their source of breastfeeding information, and almost all had attended at least one antenatal session, therefore HCWs remain a vital source for interventions. A Ugandan study of HIV-positive mothers found the most frequent reason for cessation of breastfeeding was HIV-positive diagnosis (64%), while fewer mothers cited advice from HCWs (47%) and illness (45%), among other reasons (Fadnes *et al*. 2009). Further research is needed to ascertain reasons for non-adherence to guidelines, to determine whether breastfeeding education requires strengthening (i.e. better emphasizing partial breastfeeding risks and teaching proper latching technique), or if women are taught correctly but choose not to follow feeding guidelines because of other factors. Fadnes *et al*. (2009) observed no difference in EBF rates between PMTCT programme participants and non-participants, but non-participants breastfed longer. In a case–control study based in a Kampala hospital,

Table 2. The association between human immunodeficiency virus (HIV) status and other covariates, and adhering to national infant feeding guidelines (ATG) at 3 months post-partum, Kabarole district, Uganda, 2007–2008 (bivariate analysis)*

Variables ($n = 182$, unless otherwise indicated)	n (%) ATG at 3 months	OR (95% CI)	P-value
HIV			
Positive	25 (56.8)	1.00 (Reference)	
Negative	92 (66.7)	1.52 (0.76–3.04)	0.239
County			
Fort Portal (urban)	21 (47.7)	1.00 (Reference)	
Burahya (rural)	78 (69.6)	2.51 (1.23–5.14)	0.012
Bunyangabu (rural)	18 (69.2)	2.46 (0.89–6.84)	0.084
House composition			
Cement floor	22 (55.0)	0.60 (0.30–1.24)	0.170
Iron sheet roof	109 (64.9)	1.39 (0.46–4.18)	0.566
Brick wall	25 (62.5)	0.91 (0.44–1.87)	0.790
Child sickness			
Sick ≥ once since birth	61 (56.5)	0.42 (0.22–0.80)	0.009
RTI	46 (56.8)	0.56 (0.30–1.02)	0.059
Fever	19 (54.3)	0.59 (0.28–1.25)	0.175
GI	2 (28.6)	0.21 (0.04–1.11)	0.050
Other/unknown	6 (66.7)	1.12 (0.27–4.62)	0.878
Breastfeeding advice			
HCW	95 (64.2)	1.00 (Reference)	
Grandmother	10 (83.3)	2.79 (0.59–13.21)	0.423
Other	12 (54.5)	0.67 (0.27–1.65)	0.175
Preferred to EBF at 3 months	108 (87.8)	40 (16.40–97.58)	<0.001

RTI, respiratory tract infection; GI, gastrointestinal illness; HCW, health care worker; EBF, exclusive breastfeeding; OR, odds ratio; CI, confidence interval; *Variables listed include HIV status and variables where $P \leq 0.2$.

Table 3. Determinants of adherence to guidelines at 3 months post-partum, Kabarole district, Uganda, 2007–2008 (multivariate logistic regression)

Determinants ($n = 182$)	OR	95% CI	P-value
Human immunodeficiency virus status – negative	1.36	0.64–2.89	0.418
Child sick ≥ once since birth	0.40	0.21–0.79	0.008
Residence in Burahya	2.43	1.15–5.13	0.020
Residence in Bunyangabu	2.18	0.75–6.34	0.152

OR, odds ratio; CI, confidence interval.

Table 4. Number and proportion of mothers who introduced different foods before the age of 3 months with respective mean age at introduction ($n = 65$)

Food introduced	n (%)	Mean time of introduction (weeks)
Animal milk	61 (93.8)	7
Millet porridge	5 (7.7)	9
Tinned milk	1 (1.5)	10
Soya porridge	1 (1.5)	8
Water	1 (1.5)	3

researchers found that EBF was significantly lower in women enrolled in PMTCT than those not in the PMTCT programme (Magezi *et al*. 2009), suggesting the need for strengthening of PMTCT counselling to ensure the right messages are being conveyed.

Experiencing at least one illness between birth and 3 months was negatively associated with guideline adherence. It may be because mothers introduce additional foods when a child is sick, because of beliefs that breast milk is insufficient for children who are ill. Alternatively, it may be that children whose mothers introduce additional food before 3 months for other reasons (i.e. absence of mother, cultural norms, etc.), are at higher risk of illness, as other foods have greater risks of contamination, and the child would be acquiring fewer antibodies from breast milk

to assist in fighting off infection. This is a well-researched phenomenon with partially breastfed children being at significantly higher risk of diarrhoeal diseases, among other illnesses (Koyanagi *et al.* 2009). Further studies could confirm that illness of the child follows introduction of other foods. Research to document reasons for introducing each specific food would enable a greater understanding of cultural norms surrounding infant feeding and could inform additional interventions. However, if illness preceded food introduction for a significant number of infants, interventions could target mothers of sick children who visit clinics or hospitals to remind them of the importance of continuing EBF.

Residence in Burahya county was positively associated with adherence to guidelines at 3 months. As Burahya is a peri-urban county, as compared with Bunyangabu, residents may have better access to infant feeding information. Mothers in urban settings, such as Fort Portal Municipality, may be away from their infants more often than mothers in rural communities, and therefore introduce complementary foods at an earlier age. More research could be focused in urban areas to determine reasons for EBF cessation. These results also demonstrate that it may be appropriate to target urban centres for specific infant feeding interventions. The findings are similar to those of another study in Uganda which found that for mothers between 26 and 35 years of age, urban residence was associated with earlier cessation of EBF (Poggensee *et al.* 2004). However, a study in Malawi found the opposite association where rural residents were more likely to stop EBF sooner [odds ratio (OR) = 1.87; confidence interval (CI): 1.26–2.76] compared with semi-urban residents (Kamudoni *et al.* 2007). The most common reason for cessation of EBF in mothers who had chosen to EBF was insufficient breast milk (60%). A Ugandan peer education study found that most of these situations were improved by correct positioning of the infant (Nankunda *et al.* 2006), which suggests that EBF could be improved by emphasizing latching and positioning during counselling.

According to the medical charts reviewed during this study, only 75% of HIV-positive women received Nevirapine. This may reveal quality issues in maternity services either in record keeping, Nevirapine administration or availability. All HIV-positive mothers should receive Nevirapine or another form of antiretroviral therapy, as per Ugandan PMTCT guidelines. Most HCWs did not have a copy of the national or international infant feeding guidelines, which may explain why these numbers are low. HCWs should combine PMTCT within the context of maternal and child health services to ensure that the importance of proper prevention tools such as Nevirapine is recognized.

The HIV prevalence in the study population was 21.4%, which corresponds to the prevalence among pregnant women observed in Fort Portal between 1991 and 2004 (Kipp *et al.* 2009). As breastfeeding information was only present in 11% of HIV-positive women's charts, counselling at delivery may be rare or not routinely recorded. The post-delivery time may be an important missed opportunity for breastfeeding counselling as this is when women make their first decisions regarding infant feeding. Future interventions could target this time for delivering infant feeding messages.

Limitations

Participants were recruited from a district hospital and may therefore not be representative of Kabarole district's new mother population. Participating women were able to travel to Fort Portal for delivery, which may indicate higher socio-economic status or residence closer to the city. Women whose contact information was not adequately recorded at delivery or those who relocated during the study were not represented. There may also be recall bias for certain variables as participants were asked to recall feeding practices over a 3- or 4-month time period. The discrepancies observed between the medical charts and questionnaires were important to consider but the complete results are shown because the sensitivity analyses resulted in the same main conclusions.

Conclusions

In both HIV-positive and HIV-negative women, there was low adherence to EBF guidelines. This is of special concern for HIV-positive mothers, as non-

adherence carries the increased risk of HIV transmission to their children. Reasons for non-adherence to recommendations should be further explored. Support should be given to HCWs with updated training, emphasizing tailoring of infant feeding choices from the guidelines to each woman's individual situation and proper positioning of the child. Illness of the child at least once within the first 3 months of life was associated with adherence to guidelines. This provides an important area of further study, and suggests interventions such as reminder infant feeding counselling upon presentation at a health care facility with a sick child. Residence in rural areas was positively associated with ATG, suggesting a need to target infant feeding activities in urban areas. Although PMTCT services are available, staff members do not have copies of the feeding guidelines. Adherence to infant feeding guidelines could be enhanced by regular training sessions and distribution of these guidelines to the HCWs involved in PMTCT and antenatal counselling.

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Conflicts of interest

No conflicts of interest have been declared.

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