Associations between breastfeeding intention, practice, and determinants among pregnant and postpartum women living with HIV and without HIV in western Kenya

Betelhem Aklilu Muno

A thesis submitted in partial fulfillment of the

requirements for the degree of

Master of Public Health

University of Washington

2024

Committee:

Daniel Enquobahrie

Rena Patel

Program Authorized to Offer Degree:

Epidemiology

©Copyright 2024

Betelhem Aklilu Muno

University of Washington

Abstract

Associations between breastfeeding intention, practice, and determinants among pregnant and postpartum women living with HIV and without HIV in western Kenya

Betelhem Aklilu Muno

Chair of Supervisory Committee:

Dr. Daniel A. Enquobahrie

Department of Epidemiology

Background: Infant morbidity and mortality remain high in sub-Saharan Africa (SSA). Not exclusively breastfeeding (BF) during the first six months of life contributes to 1.5 million child deaths per year . However, the prevalence of exclusive BF during the first six months is only 53.5% in East Africa (between 2010-2015) and 61% in Kenya specifically (2016). Many of these same settings with high infant morbidity and mortality and low rates of exclusive BF also have a high burden of human immunodeficiency virus (HIV). Understanding potential factors that may influence BF intention and practice can inform future interventions to better support women's desires to BF and for as long as they wish. To help address these gaps, we leveraged existing data collected as part of the Measuring Adverse Pregnancy and Newborn Congenital Outcomes (MANGO) study between September 2020 and March 2024 and conducted a secondary analysis to investigate associations of HIV status with BF intention during pregnancy and practice during the postpartum period in western Kenya. We also examined whether these associations are modified by employment status or parity.

Methods: For the current analyses, we used data from Cohort 1 (C1) of the MANGO study which is a multifaceted prospective and retrospective cohort study (with two sub-studies) conducted to strengthen the pregnancy outcomes surveillance system of the current Kenya Ministry of Health among women living with and without HIV. The total analytic population consisted of 1003 participants. The primary exposure was having a positive HIV status while the two co-primary outcomes were BF intent and exclusive BF practice during the first six months of life. We used unadjusted and adjusted (for age, education, employment, education, marital status and parity) logistic regression models with robust standard errors to estimate odds ratios (ORs) and corresponding 95% confidence intervals (CIs). We also fitted stratified logistic regression models (described above) to examine potential effect modification by employment status and parity. In addition, we fitted interaction models that included exposure, outcome, adjustment, and effect modifier variables, as well as an interaction term for exposure and effect modifier.

Results: Among study participants, 506 (50.45%) were pregnant women living with HIV (WLWHIV) while 497 (49.55 %) were pregnant women not living with HIV (WNLWHIV). A little over a third of the participants were self-employed and around 40% were not employed across both groups. About 22% of participants in the WLWHIV group and 27.6% in the WNLWHIV group were nulliparous. Slightly higher percentage of WLWHIV intended to exclusively BF (N: 379; 50.8%) compared with WNLWHIV (356; 47.8%). WLWHIV had a statistically insignificant 55% higher odds of exclusive BF intent compared with WNLWHIV in the adjusted model (OR: 1.55; 95% CI 0.41, 5.83). WLWHIV had a statistically insignificant 20% higher odds of exclusive BF practice compared to WNLWHIV in the adjusted model (OR: 1.20; 95% CI 0.72, 2.00). The HIV status-exclusive BF intent associations were stronger among employed participants (vs. unemployed participants) while the HIV status-exclusive BF practice associations were stronger among unemployed participants (vs. employed participants) and nulliparous (vs. parous) participants. However, none of the associations (and interaction p-values) were statistically significant.

Conclusion: Our findings suggest that WLWHIV had higher odds of intending to exclusively BF and practicing exclusive BF compared to WNLWHIV. Our findings also suggest that employment may modify association of HIV status with exclusive BF intent while employment and parity may modify associations of HIV status with exclusive BF practice. Future, larger studies are warranted to better understand relationships between HIV status and BF, and related determinants. Knowledge gained from these studies can influence practice and policy related to promoting BF in SSA.

INTRODUCTION

Infant morbidity and mortality remain high in low- and middle-income countries (LMICs), including in parts of sub-Saharan Africa (SSA). The role of exclusive breastfeeding (BF) during the first six months of life on the infant's health in reducing infections, morbidity, and mortality has been well documented [5]. According to the United Nations Children's Emergency Fund (UNICEF), not exclusively BF during the first six months of life contributes to 1.5 million child deaths per year [1]. Additionally, any BF has marked benefits for bonding and lowering rates of breast and ovarian cancer for mothers while supporting emotional growth [5]. Despite significant efforts to promote exclusive BF in SSA, prevalence of exclusive BF during the first six months is only 53.5% in East Africa (between 2010-2015) [2] and 61% in Kenya (2016) [3]. Therefore, understanding BF intent, practice, and factors related to BF practice is of utmost importance.

Many of these same settings with low rates of exclusive BF and high infant morbidity and mortality also have a high burden of human immunodeficiency virus (HIV). While BF continues to be recommended for mothers living with HIV in these resource-constrained settings, the benefits of BF have to be weighed against the potential risk of vertical transmission of HIV [5]. Due to the advent of universal antiretroviral therapy (ART) for pregnant and BF women living with HIV (WLWHIV) and a high number of pregnant women living with HIV being on ART (77-95% in East and Southern Africa) [3], there has been a significant reduction of vertical transmission of HIV [1]. As new data emerge and guidelines change, it will be important to know which modifiable factors influence BF practices in these settings. Various barriers to exclusive BF during the first six months of life may exist in SSA that range from individual factors (such as primigravida status or maternal age) to social support and cultural norms, such as limited maternity leave [4]. Pregnant WLWHIV may face additional unique barriers to exclusive BF during the first six months after delivery including fear of disclosure of their HIV status, fear of vertical transmission, and stigma associated with early cessation of BF [3,6,7]. In a qualitative study in Kenya, HIV-related stigma, experienced as fear of discrimination, was identified as a barrier to exclusive BF [3].

As the risk/benefit considerations of BF in HIV changes in the setting of universal ART, data on BF intentions and practices among women living with HIV are sparse [8,9]. Understanding potential factors that may influence BF intention, practice and decision-making could inform future interventions to better support women's desires to BF and for as long as they wish. To help address these gaps, we leveraged existing data collected as part of the Measuring Adverse Pregnancy and Newborn Congenital Outcomes (MANGO) study and conducted a secondary analysis of data on BF intention during pregnancy, practice during the postpartum period, and related risk factors (sociodemographic, and various psychosocial factors) among women living with and without HIV in western Kenya. We hypothesized that intention to BF (e.g., exclusively during the first six months of life) is strongly correlated with actual BF practice, and that HIV status is inversely associated with exclusive BF intent and practice. We also hypothesized that associations of HIV status with exclusive BF intent and practice are modified by employment status and parity.

METHODS

Study Setting and Participants

The current study was based on data collected as part of MANGO. MANGO is a multifaceted prospective and retrospective cohort study (with two sub-studies) conducted to strengthen the pregnancy outcomes surveillance system of the current Kenya Ministry of Health (MOH) among people living with and without HIV. The objective of the MANGO study is to understand the association between exposure to HIV and ART among pregnant WLWHIV with adverse pregnancy and newborn outcomes. The MANGO study is based at Moi Teaching and Referral Hospital (MTRH), in Eldoret, a city located in western Kenya, within the capital of the Uasin Gishu county. Over 4 million people of all ethnic and culturally different backgrounds, across the surrounding region, are referred to MTRH for care. Partnerships of MTRH with Academic Model for Providing Access to Healthcare (AMPATH) and East Africa International Epidemiology Databases to Evaluate AIDS (EA-IeDEA) were leveraged to implement the MANGO study.

For the current analyses, we used data from Cohort 1 (C1). In C1, pregnant WLWHIV were recruited at their routine antenatal clinic (ANC) visit at MTRH. In addition, age-matched pregnant women not living with HIV (WNLWHIV) were recruited after their routine ANC at MTRH. The ongoing study started in September 2020. The specific inclusion criteria for the current analyses included participation in C1of the MANGO study (between September 2020 and March 2024), being pregnant, and enrollment at the ANC at MTRH at the time of recruitment. Participants who were unable or unwilling to provide informed consent were excluded. The total analytic population consisted of 1003 participants. This study was granted ethical approval by the Institutional Research and Ethics Committee at MTRH and Moi University in Kenya and by the Indiana University IRB in the United States.

Data Collection

Data was collected using various approaches throughout the study. At initial recruitment meetings with participants, after obtaining an informed consent, a brief questionnaire was administered to gather

information on demographics and clinical data including intended site of delivery and BF plans. If data was not collected within two weeks of the estimated date of delivery (EDD), data was collected at a follow-up phone call or home visit. During the postpartum period, before discharge, information on medical history, pregnancy, delivery, and BF plans was collected from the participant to clarify any missing or unclear information. Similar information was collected at a follow up phone call a month later for those who didn't deliver at MTRH. Obstetric data, laboratory data, and HIV-related data for all women who delivered at MTRH were collected from the "Maternity Unit Inpatient Record". This information was entered into REDCap. Information collected was cross-linked with AMPATH Electronic Medical Record System (AMRS).

Exposure and outcome assessment

The primary exposure was having a positive HIV status. Participants were asked if they knew their HIV status at the initial meeting after recruitment. Based on their answer, they either were tested for HIV and/or put on ART if they weren't already on it. The HIV status of pregnant individuals was asked as a binary question: "Is mother HIV positive?" Or "Is mother known to be HIV positive?" and the answer was entered across multiple forms: inclusion form, identifier's form, and pregnancy history form. The primary outcome(s) were BF intent and practice. Intent was asked as a choice of exclusive BF, exclusive formula feeding or combination of BF and formula captured in the question "how do you intend to feed your baby for the first six months of your baby's life?". Practice was measured as a binary question dichotomized as yes/no: "Was breastfeeding exclusive?". While there were other BF intent and practice questions covering the first six months of postpartum feeding practices, including the month of the first consumption of food/liquid that was not breastmilk, and categorical age by month that the child stopped receiving breast milk throughout the total duration of the BF, including mixed feeding, they were not used in the current analyses.

Covariates

The covariates that were considered in the current analysis were maternal age (continuous, measured in years), education status (categorical, highest level of education completed encompassing four levels: None, Primary, Secondary, or Tertiary), marital status (categorical, relationship status at time of enrollment to the study: single, cohabiting/married, separated/divorced, or widowed), employment (categorical, employment status at time of enrollment into the study: employed, self-employed, casual worker, farmer, student, other or not employed), parity and gravidity (numerical, counted as single values until ≥10 births or pregnancies), disclosure of HIV status (dichotomous variable, based on the question "Has mother disclosed HIV status to everyone/partner?"), and timing of HIV diagnosis (binary, grouped as prior or during current pregnancy).

Statistical Analyses

We conducted a descriptive analysis to summarize the categorical variables using numbers and percents, while continuous variables were summarized using median and interquartile range (IQR). To understand the correlation between exclusive BF intention and BF practice during the first six months of life, we conducted a Pearson's chi squared test of independence. We used a logistic regression model with robust standard errors, to assess associations of HIV status with exclusive BF during the first six months of life. We fitted both unadjusted and adjusted logistic regression models. Potential confounders and effect modifiers were considered based on prior research [6,10] and the 10% rule for determining confounders [11]. Education and marital status were determined to be potential confounders while parity and employment were found to be potential effect modifiers. The final adjusted logistic regression models included exposure and outcome variables, as well as age, education, employment, education, marital status and parity. Odds ratio (OR) and 95% Confidence Intervals (CIs) were used to determine statistically significant associations. We fitted the same models among subgroups defined by the potential effect modifiers: employment status and parity. In addition, we fitted models that included exposure, outcome, adjustment variables, effect modifier variables, and an interaction term for exposure and effect modifier.

In a sensitivity analysis, we fitted models described above that evaluated associations of HIV status and exclusive BF practice among participants with intention to exclusively BF. The p-value of the interaction term was used to determine statistical significance of multiplicative interactions. Data were managed and analyzed in R version 4.2.2.

RESULTS

Among study participants, 506 (50.45%) were pregnant WLWHIV while 497 (49.55 %) were pregnant WNLWHIV (**Table 1**). Age was distributed similarly across HIV status with WLWHIV having a median (IQR) age of 32 years (26, 37) compared to 31 years (26, 36) for WNLWHIV. Over half of the participants had secondary or tertiary education in both groups. A little over a third of the participants were self-employed and around 40% were not employed across both groups. About 22% of participants in the WLWHIV group and 27.6% in the WNLWHIV group were nulliparous.

Slightly higher percentage of WLWHIV intended to exclusively BF (N: 379; 50.8%) compared with WNLWHIV (N: 356; 47.8%) (**Table 2**). Less than 2% intended to either exclusively formula feed or mix feed (BF and formula feeding) across the two groups. About 38% (N:188) of WLWHIV and 45.2% (N:224) of WNLWHIV practiced exclusive BF for the first month. The correlation between any BF intent and exclusive BF practice was not statistically significant (X^2 (2) = 1.54, p =0.46). Similarly, the correlation between intent to exclusively BF and exclusive BF practice was also not statistically significant (X^2 (1) = 0.55, p =0.46).

WLWHIV had a statistically insignificant 60% higher odds of exclusive BF intent compared with WNLWHIV in the unadjusted model (OR: 1.60; 95% CI 0.45, 5.70) (**Table 3**). Adjustment for covariates slightly attenuated the estimate (OR: 1.55; 95% CI 0.41, 5.83). Among employed participants, we observed similar OR estimates relating HIV status to exclusive BF intent (crude OR: 1.65; 95% CI 0.39, 7.00 and adjusted OR: 1.81; 95% CI 0.40, 8.25). These estimates were different among unemployed participants (crude OR: 1.17; 95% CI 0.07, 18.93 and adjusted OR: 0.80; 95% CI 0.05, 13.46), even though none of the estimates were statistically significant. Among nulliparous women, the crude and adjusted OR comparing odds of exclusive BF intent among WLWHIV to odds of exclusive BF intent among WNLWHIV were 1.48 (95% CI 0.24, 9.08) and 1.90 (95% CI 0.27, 13.24), respectively, which was comparable to similar estimates of crude and adjusted ORs among parous study participants (crude OR: 1.63; 95% CI 0.27, 9.90 and adjusted OR: 1.32; 95% CI 0.21, 8.23, respectively). The interactions

between HIV status and employment (P-value: 0.91) as well as parity (P-value: 0.83) on exclusive BF intent was statistically insignificant.

When considering exclusive BF practice by HIV status, WLWHIV had a statistically insignificant 36% higher odds of exclusive BF practice compared to WNLWHIV in the unadjusted model (OR: 1.36; 95% CI 0.84, 2.21) **(Table 4)**. Adjusting for the covariates reduced the estimate slightly (OR: 1.20; 95% CI 0.72, 2.00). Among employed participants, the ORs relating HIV status and exclusive BF practice in unadjusted (OR: 0.96; 95% CI 0.51, 1.79) and adjusted (OR: 0.78; 95% CI 0.40, 1.50) models suggested inverse relationships even though neither of the estimates were statistically significant. On the other hand, among unemployed participants, WLWHIV had a statistically significant 124% higher odds of exclusive BF practice compared to WNLWHIV (OR: 2.24; 95% CI 1.04, 4.86). In adjusted models, the estimate relating HIV status and exclusive BF practice was reduced slightly and became statistically insignificant (OR: 2.16; 95% CI 0.93, 5.05). Among nulliparous women, the crude and adjusted ORs comparing odds of exclusive BF practice among WLWHIV to odds of exclusive BF practice among WNLWHIV were 2.67 (95% CI 0.83, 8.53) and 1.91 (95% CI 0.57, 6.44), respectively, suggesting positive relationships between HIV status and exclusive BF practice. Similar estimates of crude and adjusted ORs among parous study participants (crude OR: 1.16; 95% CI 0.68, 2.00 and adjusted OR: 1.07; 95% CI 0.60, 1.90, respectively) were closer to the null. The interactions between HIV status and employment (P-value: 0.13) as well as parity (P-value: 0.27) on exclusive BF practice were statistically insignificant.

Findings from our sensitivity analysis examining associations of HIV status with exclusive BF practice (and potential effect modifications by employment status and parity) among participants who intended to exclusively BF were largely similar to our findings of associations of HIV status with exclusive BF practice reported above **(Table 5)**.

DISCUSSION

In the current analysis, our findings suggest that WLWHIV had higher odds of intending to exclusively BF and practicing exclusive BF compared to WNLWHIV. Our findings also suggest that employment may modify association of HIV status with exclusive BF intent while employment and parity may modify associations of HIV status with exclusive BF practice. Findings on analyses examining associations of HIV status with exclusive BF practice among participants who had intention of exclusively BF were generally similar to findings from our primary analyses. Our findings, while suggestive, were not statistically significant.

While there are no published studies, to our knowledge, that investigated associations of HIV status with BF intent or practice, a limited number of studies investigated BF intention and practice among individuals living with HIV. One study conducted in Malawi focused on mothers living with HIV and examined factors that affected their prenatal intent for the duration of exclusive BF and probability of exclusive BF for six months postpartum [9]. Similar to our findings, the majority of WLWHIV intended to exclusively BF (77%). When evaluating factors related to exclusive BF practice, the researchers found that the only statistically significant factors that were associated with exclusive BF practice were normative ($X2 = 8.553$, phi = .279, $p < .01$]) and control beliefs ($X2 = 16.589$, phi = .388, $p < .001$) [9]. In that study, maternal education and disclosure of HIV status were all inversely correlated with duration of exclusive BF while parity was positively correlated with duration of exclusive BF (all p-values of correlation coefficient < 0.05) [9].

In a study conducted in Nigeria, investigators examined infant feeding intentions and practices among mothers living with HIV [8]. In this study, they determined that among WLWHIV, about 70% of the individual's expressed intention to exclusive BF compared to exclusive replacement feeding (about 30%), similar to our observations. Factors associated with this decision included nondisclosure of HIV status to a partner, fear of stigmatization by friends and family, and limited finances [8]. WLWHIV who intended to exclusively BF had a higher concordance (84.5% agreement with exclusive BF practice) compared to 50% concordance for exclusive replacement feeding practice at the 6 month of life mark)

with their BF practice at the 6 month of life compared to those who intended exclusive replacement feed (50% concordance) [8]. This relationship between exclusive BF intent and practice compared to exclusive replacement feeding is generally similar to our findings.

Of the factors assessed in the current study, employment and parity seem to modify associations of HIV status with exclusive BF intent and practice. The potential for these relationships is corroborated by evidence from previous reports on relationships between employment and BF. First, a study conducted in Ethiopia examining the influence of maternal employment on exclusive BF practice among mothers with infants aged 6-12 months old found that mothers who were unemployed were 2.97 times more likely to exclusively BF compared to employed mothers (95% CI 1.71, 5.17) [12]. Similarly, a study in Kenya examining the relationship between formal maternal employment and exclusive BF across various postpartum durations found that by the 14th week in the postpartum period, the prevalence of exclusive BF among mothers who were formally employed was much lower (59%) compared to the prevalence (93.4%) among the non-formally employed [13]. A qualitative study in Kenya highlighting the different perspectives on exclusive BF practice among employed mothers described some of the exclusive BF experiences of employed WLWHIV [14]. Some mothers living with HIV experienced a harder time with exclusive BF for the first six months due to their work, often requiring them to start mixed feeding after three months. Some shared concerns around returning to work and needing to stop due to their HIV status [14]. These studies call attention to the importance of considering maternal employment status in promoting exclusive BF practice. Our findings of stronger HIV status-BF intent associations among employed participants and stronger HIV status-BF practice associations among unemployed participants highlights the complexity of the relationships and warrants further investigations.

Our findings indicate that HIV status-BF practice associations were potentially stronger among nulliparous participants. Findings of the previously mentioned study conducted in Malawi indicate significant positive relationships between intention to exclusively BF and parity among WLWHIV ($r = .213$, $p < .05$) [9]**.** A study evaluating exclusive BF among WLWHIV in Kisumu, Kenya found that mothers who had three or more children were 89.8% as likely to exclusively BF compared to the 77.4%

likelihood of exclusively BF among mothers who had 0-2 children ($p < 0.01$) [15]. The need for more education on exclusive BF practice, especially among first time mothers and WLWHIV was emphasized in a qualitative study in Zambia [16]. While these studies are not directly comparable with the current study, they support the potential role of parity in the relationships between HIV status and BF intent and practice.

The current study fills a significant gap in the literature regarding understanding of the relationships between HIV status and exclusive BF intent and practice. Yet, there are several limitations of the study that need to be considered. First, the questions around the intent of BF were asked during pregnancy while BF interventions are often conducted either closer to delivery or post delivery. Selection bias resulting from the convenient sampling (among attendants of ANC clinics at MTRH) approach used in the study can be a problem. Selection bias can lead to confounding and affect internal validity of the study. The limited number of available variables to control for while examining associations of HIV status with exclusive BF intent and practice can lead to uncontrolled confounding. The size of the study may limit study power and lead of Type 2 error. Additionally, misclassification of variables (including from self-report) which may be either differential or non-differential is a potential concern. Finally, generalizability of observed findings is limited to populations that are similar in characteristics to the study population.

Despite these limitations, study findings highlight the potential importance of HIV status on exclusive BF intent and practice among mothers in western Kenya as well as potential roles of employment and parity. These findings, if corroborated with findings from future, larger studies in diverse populations, can influence practice and policy related to promoting BF.

REFERENCES

1. Elimination of mother-to-child transmission [Internet]. UNICEF DATA. [cited 2023 Nov 7]. Available from: https://data.unicef.org/topic/hivaids/emtct/

2. Issaka AI, Agho KE, Renzaho AM. Prevalence of key breastfeeding indicators in 29 sub-Saharan African countries: a meta-analysis of demographic and health surveys (2010–2015). BMJ Open [Internet]. 2017 [cited 2023 Nov 7];7:e014145. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5665288/

3. Odeny BM. The Stigma of Exclusive Breastfeeding Among Both HIV-Positive and HIV-Negative Women in Nairobi, Kenya. Breastfeed Med [Internet]. 2016 [cited 2023 Nov 4]; Available from: https://www.liebertpub.com/doi/10.1089/bfm.2016.0014

4. Dukuzumuremyi JPC, Acheampong K, Abesig J, Luo J. Knowledge, attitude, and practice of exclusive breastfeeding among mothers in East Africa: a systematic review. Int Breastfeed J [Internet]. 2020 [cited 2023 Nov 5];15:70. Available from: https://doi.org/10.1186/s13006-020-00313-9

5. North K, Gao M, Allen G, Lee AC. Breastfeeding in a Global Context: Epidemiology, Impact, and Future Directions. Clin Ther [Internet]. 2022 [cited 2023 Nov 4];44:228–44. Available from: https://www.sciencedirect.com/science/article/pii/S0149291821004914

6. Makwela MS, Mashaba RG, Ntimana CB, Seakamela KP, Maimela E. Barriers and enablers to exclusive breastfeeding by mothers in Polokwane, South Africa. Front Glob Womens Health. 2024;5:1209784.

7. Gejo NG, Weldearegay HG, W/tinsaie KT, Mekango DE, Woldemichael ES, Buda AS, et al. Exclusive breastfeeding and associated factors among HIV positive mothers in Northern Ethiopia. PLOS ONE [Internet]. 2019 [cited 2023 Nov 4];14:e0210782. Available from: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0210782

8. Adejuyigbe E, Orji E, Onayade A, Makinde N, Anyabolu H. Infant Feeding Intentions and Practices of HIV-Positive Mothers in Southwestern Nigeria. J Hum Lact [Internet]. 2008 [cited 2024 May 19];24:303–10. Available from: https://doi.org/10.1177/0890334408317765

9. Kafulafula UK, Hutchinson MK, Gennaro S, Guttmacher S, Kumitawa A. Exclusive breastfeeding prenatal intentions among HIV-positive mothers in Blantyre, Malawi: a correlation study. BMC Pregnancy Childbirth. 2013;13:203.

10. Caldwell C, Salihu HM, Dongarwar D, Mercado-Evans V, Batiste A, Beal T, et al. Breastfeeding Practices of Women with HIV in Sub-Saharan Africa. Nurs Womens Health. 2023;27:354–61.

11. Bovbjerg ML. Effect Modification. 2020 [cited 2024 May 23]; Available from: https://open.oregonstate.education/epidemiology/chapter/effect-modification/

12. Zewdie A, Taye T, Kasahun AW, Oumer A. Effect of maternal employment on exclusive breastfeeding practice among mothers of infants 6–12 months old in Wolkite town, Ethiopia: a comparative cross-sectional study. BMC Womens Health [Internet]. 2022 [cited 2024 May 27];22:222. Available from: https://doi.org/10.1186/s12905-022-01816-9

13. Ickes S, Oddo V, Sanders H, Nduati R, Denno D, Myhre J, et al. Formal maternal employment is associated with lower odds of exclusive breastfeeding by 14 weeks postpartum: a cross-sectional survey in Naivasha, Kenya. Am J Clin Nutr [Internet]. 2021 [cited 2024 May 27];113:562–73. Available from: https://www.sciencedirect.com/science/article/pii/S0002916522006190

14. Ickes SB, Sanders H, Denno DM, Myhre JA, Kinyua J, Singa B, et al. Exclusive breastfeeding among working mothers in Kenya: Perspectives from women, families and employers. Matern Child Nutr [Internet]. 2021 [cited 2024 May 27];17:e13194. Available from: https://onlinelibrary.wiley.com/doi/abs/10.1111/mcn.13194

15. Okanda JO, Borkowf CB, Girde S, Thomas TK, Lecher SL. Exclusive breastfeeding among women taking HAART for PMTCT of HIV-1 in the Kisumu Breastfeeding Study. BMC Pediatr. 2014;14:280.

16. Petrovic K, Maimbolwa M, Johansson E. Primiparous mothers' knowledge about mother-to-Child transmission of HIV in Lusaka, Zambia. Midwifery [Internet]. 2009 [cited 2024 Jun 5];25:e1–10. Available from: https://www.sciencedirect.com/science/article/pii/S026661380700109X

Table 1: Selected characteristics of pregnant women who received routine antenatal care at Moi Teaching and Referral Hospital in western Kenya

Characteristics	WLWHIV N=506 (50.45%)	WNLWHIV N=497 (49.55%)	Overall N=1003 (100%)
Age at enrollment, years			
Median (IQR)	32 (26, 37)	31 (26, 36)	32 (126, 36)
Education			
None	14 (2.8%)	1 (0.2%)	15 (1.5%)
Primary School	169 (33.4%)	78 (15.7%)	247 (24.6%)
Secondary School	190 (37.5%)	184 (37.0%)	374 (37.3%)
Tertiary Education	132 (26.1%)	234 (47.1%)	366 (36.5%)
Marital Status			
Single	146 (28.9%)	77 (15.5%)	223 (22.2%)
Cohabiting/Married	346 (68.4%)	419 (84.3%)	765 (76.3%)
Separated/Divorced/Widowed	12 (2.4%)	1(0.2%)	13 (1.3%)
Employment Status			
Employed	53 (10.5%)	83 (16.7%)	136 (13.6%)
Self-employed	177 (35.0%)	168 (33.8%)	345 (34.4%)
Casual and Farm Worker	32 (6.3%)	29 (5.8%)	61 (6.1%)
Student	26 (5.1%)	27 (5.4%)	53 (5.3%)
Not Employed	217 (42.9%)	190 (38.2%)	407 (40.6%)
Parity			
0	113 (22.3%)	137 (27.6%)	250 (24.9%)
1	134 (26.5%)	139 (28.0%)	273 (27.2%)
2	117 (23.1%)	88 (17.7%)	205 (20.4%)
3	85 (16.8%)	81 (16.3%)	166 (16.6%)
≥4	56 (11.1%)	52 (10.5%)	108 (10.8%)
Gravidity			
1	106 (20.9%)	124 (24.9%)	230 (22.9%)
2	117 (23.1%)	121 (24.3%)	238 (23.7%)
3	114 (22.5%)	99 (19.9%)	213 (21.2%)
≥4	168 (33.2%)	153 (30.8%)	321 (32.0%)
HIV Status Disclosure to Anyone			
No	115 (22.7%)	-	-
Yes	389 (76.9%)	-	-
HIV Status Disclosure to Partner			
No	62 (12.3%)	-	-
Yes	326 (64.4%)	-	-
Timing of Mother's HIV Diagnosis			
Known Positive	459 (90.7%)	-	-
New Positive	46 (9.1%)	-	-

Note: Numbers may not add up to 100% due to missingness

Abbviations: women living with HIV (WLWHIV), women not living with HIV (WNLWHIV)

Table 2: Breastfeeding intent and practice distribution among pregnant women who received routine antenatal care at Moi Teaching and Referral Hospital in western Kenya

	WLWHIV N=506 (50.45%)	**WNLWHIV N=497 (49.55%)**	**Overall N=1003 (100%)**
BF Intent for the first six months (N = 745)			
Exclusive BF	379 (50.8 %)	356 (47.8%)	735 (98. 6%)
Exclusive Formula Feeding (FF)	2 (0.3%)	1 (0.1%)	3 (0.4%)
Mixed Feeding (BF and FF)	2 (0.3%)	5 (0.8%)	7 (0.9%)
Exclusive BF Practice for the first month (N = 496)			
Yes	188 (37.9%)	224 (45.2%)	412 (83.1%)
No	32 (6.4%)	52 (10.5%)	84 (16.9%)

Note: Numbers may not add up to 100% due to missingness

Abbreviations: women living with HIV (WLWHIV), women not living with HIV (WNLWHIV), breastfeeding (BF)

Table 3: Associations between HIV status and exclusive breastfeeding intent among pregnant women who received routine antenatal care at Moi Teaching and Referral Hospital in western Kenya

	EBF Intent N = 735 (100%)	**Unadjusted OR (95% CI)**	**Adjusted OR* (95% CI)**
Overall			
WNLWHIV	356 (48.4%)	Reference	Reference
WLWHIV	379 (51.6 %)	1.60 (0.45, 5.70)	1.55 (0.41, 5.83)
Associations Stratified by Employment Status			
Employed	**N = 422 (100%)**		
WNLWHIV	212 (50.20%)	Reference	Reference
WLWHIV	210 (49.76%)	1.65 (0.39, 7.00)	1.81 (0.40, 8.25)
Not Employed	**N= 313 (100%)**		
WNLWHIV	144 (46.00%)	Reference	Reference
WLWHIV	169 (54.00%)	1.17 (0.07, 18.93)	0.8 (0.05, 13.46)
Associations Stratified by Parity			
0 Births	**N = 181 (100%)**		
WNLWHIV	91 (50.28%)	Reference	Reference
WLWHIV	90 (49.72%)	1.48 (0.24, 9.08)	1.90 (0.27, 13.24)
1 or More Births	**N = 554 (100%)**		
WNLWHIV	265 (47.83%)	Reference	Reference
WLWHIV	289 (52.17%)	1.63 (0.27, 9.90)	1. 32 (0.21, 8.23)

Note:* adjustment variables: age, education, marital status, employment status and parity

Abbreviations: women living with HIV (WLWHIV), women not living with HIV (WNLWHIV), odds ratio (OR), confidence interval (CI), exclusive breastfeeding (EBF)

Interaction Analysis: Employment: 1.61 (P-value: 0.91); Parity: 1.34 (P-value: 0.83)

Table 4: Associations between HIV status and breastfeeding practice among pregnant women who received routine antenatal care at Moi Teaching and Referral Hospital in western Kenya

	EBF Practice N = 412 (100%)	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)
Overall			
WNLWHIV	224 (54.40%)	Reference	Reference
WLWHIV	188 (45.60%)	1.36 (0.84, 2.21)	1.20 (0.72, 2.00)
Associations Stratified by Employment Status			
Employed	**N=254 (100%)**		
WNLWHIV	143 (56.30%)	Reference	Reference
WLWHIV	111(43.70%)	0.96 (0.51, 1.79)	0.78 (0.40, 1.50)
Not Employed	**N = 158 (100%)**		
WNLWHIV	81 (51.26%)	Reference	Reference
WLWHIV	77 (48.73%)	**2.24 (1.04, 4.86)**	2.16 (0.93, 5.05)
Associations Stratified by Parity			
0 Births	**N = 105 (100%)**		
WNLWHIV	63 (60.00%)	Reference	Reference
WLWHIV	42 (40.00%)	2.67 (0.83, 8.53)	1.91 (0.57, 6.44)
1 or More Births	**N = 307 (100%)**		
WNLWHIV	161 (52.44%)	Reference	Reference
WLWHIV	146 (47.56%)	1.16 (0.68, 2.00)	1.07 (0.60, 1.90)

Note:* adjustment variables: age, education, marital status, employment status and parity

Abbreviations: women living with HIV (WLWHIV), women not living with HIV (WNLWHIV), odds ratio (OR), confidence interval (CI), exclusive breastfeeding (EBF)

Interaction Analysis: Employment: 0.88 (P-value: 0.13); Parity: 1.03 (P-value: 0.27)

Table 5: Associations between HIV status and breastfeeding practice among pregnant women who received routine antenatal care at Moi Teaching and Referral Hospital in western Kenya and who indicated **their intention to exclusively breastfeed**

	EBF Practice N = 294 (100%)	**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI)**
Overall			
WNLWHIV	157 (53.40%)	Reference	Reference
WLWHIV	137 (46.60%)	1.70 (0.97, 3.00)	1.33 (0.74, 2.41)
Associations Stratified by Employment Status			
Employed	**N = 177 (100%)**		
WNLWHIV	97 (54.80%)	Reference	Reference
WLWHIV	80 (45.20%)	1.15 (0.56, 2.38)	0.94 (0.44, 2.01)
Not Employed	**N = 117 (100%)**		
WNLWHIV	60 (51.28%)	Reference	Reference
WLWHIV	57 (48.70%)	**2.98 (1.18, 7.73)**	2.23 (0.83, 6.01)
Associations Stratified by Parity			
0 Births	**N = 74 (100%)**		
WNLWHIV	41 (55.40%)	Reference	Reference
WLWHIV	33 (44.59%)	2.41 (0.71, 8.19)	1.54 (0.41, 5.79)
1 or More Births	**N = 220 (100%)**		
WNLWHIV	116 (52.73%)	Reference	Reference
WLWHIV	104 (47.27%)	1.54 (0.81, 2.92)	1.26 (0.65, 2.45)

Note:* adjustment variables: age, education, marital status, employment status and parity

Abbreviations: women living with HIV (WLWHIV), women not living with HIV (WNLWHIV), odds ratio (OR), confidence interval (CI), exclusive breastfeeding (EBF)

Interaction Analysis: Employment: 0.94 (P-value: 0.15); Parity: 1.27 (P-value: 0.71)