Infant feeding for people living with HIV in high resource settings: a multi-disciplinary approach with best practices to maximise risk reduction

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Summary

Shared decision making for infant feeding in the context of HIV in high-resourced settings is necessary to acknowledge patient autonomy, meet increasing patient requests and address the changing reality of perinatal HIV care. In low-to middle-income countries (LMIC), where the majority of individuals living with HIV reside, persons with HIV are recommended to breastfeed their infants. In the setting of maternal anti-retroviral therapy (ART) use throughout pregnancy, viral suppression and appropriate neonatal post-exposure prophylaxis (PEP) use, updated information indicates that the risk of HIV transmission through breastmilk may be between 0.3 and 1%. While not endorsing or recommending breastfeeding, the United States' DHHS perinatal guidelines are similarly pivoting, stating that individuals should "receive patient-centred, evidence-based counselling on infant feeding options." Similar statements appear in the British, Canadian, Swiss, European, and Australasian perinatal guidelines. We assembled a multi-disciplinary group at our institution to develop a structured shared decision-making process and protocol for successful implementation of breastfeeding. We recommend early and frequent counselling about infant feeding options, which should include well known benefits of breastfeeding even in the context of HIV and the individual's medical and psychosocial circumstances, with respect and support for patient's autonomy in choosing their infant feeding option.

Keywords: HIV; Breastfeeding; Policy; United States; Women living with HIV

Introduction

Current guidance from the Centers for Disease Control and Prevention,[1] the American Academy of Pediatricians[2] and the Department of Health and Human Services (DHHS)[3] for pregnant people living with HIV in high-resourced settings is to avoid breastfeeding due to the risk of HIV transmission through breastmilk. The World Health Organization (WHO) recommends that patients in high-resourced settings (by the WHO's definition of gross national income per capita exceeding $12,056 and related to ART access) avoid breastfeeding, while those in low-to middle-income countries (LMIC) are recommended to breastfeed their infants. Many patients find these recommendations incongruous and confusing.[4–6]

Prior to widespread ART use, the risk of HIV transmission through breastfeeding was estimated approximately 15–20% over the infant's first 2 years of age.[7] However, in the setting of maternal anti-retroviral therapy (ART) use throughout pregnancy, viral suppression and appropriate neonatal anti-retroviral prophylaxis use, more recent information indicates that the risk of HIV transmission through breastmilk may be between 0.3 and 1%.[8,9] By comparison, periconception or first trimester ART initiation and viral suppression throughout pregnancy are associated with perinatal transmission rates of 0–0.2%.[10] Recently, secondary analysis from the Mma Bana study[11] suggest that breastmilk transmission risk may be around or below 1% in the setting of strict maternal ART adherence throughout pregnancy and neonatal post-exposure prophylaxis. Additionally, the PROMISE trial, which compared the efficacy of prolonged infant ART nevirapine (NVP) prophylaxis with three-drug maternal ART,

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demonstrated both strategies safely and effectively at prevented HIV transmission during breastfeeding.[8] However, breastmilk transmissions have still occurred in the setting of non-adherence to ARVs and EBF usually due to lack of support of mothers.[12] Undetectable equals Untransmittable (U=U) cannot be considered applicable to breastmilk transmission yet, given remaining unknowns regarding viral dynamics and ART pharmacokinetics in breastmilk. The recent (2019) DHHS perinatal guidelines are pivoting to reflect the need for a risk-reduction approach and shared decision making with the patient, stating that individuals who have questions about or desire to breastfeed should "receive patient-centred, evidence-based counselling on infant feeding options" (AIII level recommendation).[3]

Our institution and others have seen an increasing number of pregnant people with HIV expressing an interest in breastfeeding.[13–15] As of writing, our centre has assisted 11 patients within the last 3 years to breastfeed. This 11 is out of 19 patients (1 patient breastfed twice) who expressed an interest in breastfeeding. Our specialty HIV-Obstetrics program typically follows 40–50 pregnant people with HIV annually. To address this need, we assembled a multi-disciplinary group to develop a structured shared decision-making process. Perinatal HIV providers should avoid situations where patients are given a strict directive against breastfeeding but ultimately decide to breastfeed regardless and proceed without guidance, thereby potentially placing their infants at higher risk for HIV transmission through breastmilk and risk losing the mother to care. We acknowledge the diverse composition of individuals providing infants with either breastmilk (via breast, chest or body-feeding) or formula that may not identify as women, though data for this group is limited. With the evolving landscape of breastfeeding among individuals with HIV, we outline suggested structured best practices that institutions can take to address this issue safely and effectively, highlighting our institution's experience.

Multidisciplinary team assembly

It is important to assemble a team of key multidisciplinary stakeholders [Table 1]. Our team is comprised of Obstetricians with experience caring for pregnant people with HIV, a Neonatologist, a Paediatric Infectious Disease expert, International Board-Certified Lactation Consultants (IBCLC), representatives from nursing (Labour and Delivery, Postpartum, Newborn nursery staff) and a peer navigator. If an HIV specialist is involved in the prenatal care of the pregnant patient, they would also be important to include. Other important consultants include the legal department as well as social work and/or case management. Numerous pregnant people living with HIV have reported that after expressing their interest/intention to breastfeed, their providers threaten to call child protective services or actually did so. Such engagements are extremely harmful to families and should be avoided by all professionals who serve or care for people living with HIV during the perinatal period.[2] Rare cases may require closer evaluation with social work, for example, if a patient with an elevated HIV viral load (>50 copies/mL) intended to breastfeed/refused prophylaxis.[16]

Social work resources may be used to assist patients in identifying resources, including support groups and Women Infant Children program (WIC) for infant formula. Resources available to patients may vary by country of origin. Additionally, social workers and case managers can assist with care linkage to mental health or substance use treatment resources that may help optimize maternal viral suppression in the postpartum period. The lactation consultants assist with identifying sources for donor breastmilk when desired and support the development of robust milk supply while helping to manage potential risks such as cracked nipples, engorgement and mastitis. Ethics consultants may be considered to advise on how to discuss with the parent(s) the rights of the future child in this shared decision-making process and potential consequences in the event that a breastmilk transmission does occur. Appropriate preparation well in advance of delivery can avoid potentially harmful scenarios where patients are provided mixed messaging, feel that they were "given permission" by some providers only to be shamed or discouraged from following through by other providers uninformed about the plan. This process also allows ample time to formulate plans in case of delayed lactation starts where formula supplementation may be needed and HIV status disclosure to family members or others who may be assisting with infant feeding. The goal of assembling this group is to engage key stakeholders in collaborating and counselling the patient so that unified and clear options are presented well before delivery, as well as assist in streamlining approaches and protocols. Another benefit of assembling the multidisciplinary group is education of staff members on current knowledge in the field and stigma reduction.

Antenatal assessment

The primary objective of counselling during antenatal care should be to a) assess the patient's desires and intentions for infant feeding, b) assess their baseline knowledge of risks/benefits/alternatives to breastfeeding in the context of HIV, c) provide accurate and up-to-date information about the risks/benefits/alternatives, d) set realistic expectations for the patient regarding what breastfeeding may look like for them [Table 1]. In an ideal scenario, a patient will engage in antenatal care as early as possible to allow time for conversations about infant feeding to proceed organically, and for providers to understand the patient's social circumstances and

Department	Role	Comments
Obstetrics	– Explore desires/intentions/rationale and patient's individual circumstance – Review risks/benefits/alternatives to breastfeeding – Set up consultation	– Provide updated recommendations based on delivery timing and maternal factors
Neonatology	– Assist in creation of individualised infant feeding plan	– Provide updated recommendations based on delivery timing and neonatal factors
Paediatric infectious disease	– Assist in creation of individualised infant feeding plan	– Infant follow up care – Infant ART prophylaxis recommendations
Lactation	– Identify sources for donor breastmilk – Support the development of robust milk supply – Emotional support; engagement of family/peers to provide support	– Help with management of potential risks such as cracked nipples, engorgement and mastitis
Nursing	– Staff engagement and education on Labour and Delivery, Postpartum, Nursery units	
Legal	– Assist with the creation of a waiver/documentation that the patient can sign to verify they were counselled about the risks and alternatives to breastfeeding and formula feeding – Provide advice on jurisdictional laws and regulations	Engaging or even mentioning Child Protective Services or any other family regulation system is never, at any point, an appropriate response to a provider's concerns regarding an individual's health choices, for themselves or their children.
Social work/Case management	– Assist with identifying resources, including support groups and WIC for infant formula – Assist with care linkage to mental health or substance use treatment resources that may help optimise maternal viral suppression in the postpartum period	
Peer support	– Assist with establishing patient/partner rapport – Assist with appointment navigation	– Additional linkage to community support group – Assist with 4th trimester care engagement

Table 1: **Composition of multi-disciplinary group to address HIV infant feeding.**

assessment of partner or family support. We recommend the initial conversation about infant feeding intentions and desires happen either at the initial obstetrics visit or initial contact with the antenatal team (e.g., during a nurse history visit). This can be done with open-ended and non-judgmental questions, for example: "What are your plans to feed your baby?" The provider can elaborate with follow-up questions to assess baseline knowledge. For example, "Tell me what you know about breastfeeding and HIV?" or "Tell me what makes you want to breastfeed?" or "Do you know anyone with HIV who has breastfed?" It would also be salient to inquire whether or not the patient has ever breastfed an infant themselves previously. With these initial conversations, we seek to understand the patient's desire to or not to breastfeed and assess their experience, perceptions and knowledge about breastfeeding in the setting of HIV.

Next, the obstetrics team reviews current recommendations for pregnant persons with HIV in the United States as outlined by the DHHS perinatal guidelines[3] while acknowledging that breastfeeding has many benefits to infants and mothers and that patients may find it difficult to ignore the "breast is best" messaging. Regardless of the feeding decision, our goal is to support the patient's choice. When a patient does express a desire to breastfeed or is at least considering doing so, we schedule a multidisciplinary meeting with a core group of consultants (representatives from obstetrics, paediatric infectious disease, nursing and neonatology); the patient's partner is also invited to participate if the woman desires. We try to establish trust and rapport with the patient (and potentially the partner) first before the more formal meeting with the consultants by engaging them in initial conversations to introduce the topic. This discussion should be continued throughout pregnancy to make sure that proper resources are available if the patient's feeding intentions change or new concerns arise. One might inquire, "last time we discussed that you were interested in _____ for feeding your infant; have you had any further thoughts or questions about this? Has anything changed? We want to make sure to be as supportive as possible and can provide information and recommendations to help you decide." Be respectful of patient's decision.

Other areas to "screen" with the patient to inform counselling will include assessing capacity for adherence [Table 2]: HIV factors (e.g., current adherence to ART and history of adherence problems or ART resistance, current viral suppression, CD4 count, presence of opportunistic infections, HIV status disclosure, recency of HIV diagnosis), other maternal medical conditions (e.g., diabetes, thyroid disease, cardiovascular disease, renal disease), social factors (e.g., financial/housing/food insecurity, transportation, work, relationship status,

Assessment of feeding intentions	– Assess baseline patient intentions/desires, rationales and knowledge using open-ended and non-judgmental questions – Begin at entry to prenatal care and continue throughout pregnancy
Ongoing counselling with patient-centred, evidence-based information	– Patient-level factors to evaluate include: prior breastfeeding experience and risk factors for poor breastfeeding outcomes, duration of HIV diagnosis, social support system, substance use history, mental health history, evaluation for food/transportation/social insecurity and intimate partner violence – Review evidence-based guidance (DHHS perinatal guidelines) – Assess for factors that may affect ART adherence and viral suppression in post-partum period
Multi-disciplinary consultation	– Engage key stakeholders: paediatrics/neonatology; infectious disease; lactation; obstetrician/gynaecologist; nursing; social work/case management; legal; HIV counsellors, ethics; peer navigator – Thorough review of risks/benefits/alternatives of infant feeding practices with consideration of individual wishes and circumstances – Assist patient with resources needed for successful infant feeding of their choice
Finalize personalized plan based on patient factors and timing of delivery	– Ideally have a 'plan' in place by third trimester; adjust as needed based on delivery timing
Postnatal follow up plan	– Follow up with appropriate paediatric/paediatric infectious disease care provider for infant assessment and viral load checks – Follow up with OBGYN provider for ongoing maternal (medical/psychosocial) assessment, viral load and adherence check and contraception plan – Maternal linkage to infectious disease care with warm hand-off – Continue to follow for ART adherence and viral suppression

Table 2: **Summary of best practices for assessment of pregnant people with HIV who desire breast feeding.**

other children) and personal factors (e.g., intimate partner violence [IPV], disclosure/stigma, substance abuse, mental health). We primarily use HIV viral load as the primary indicator of viral suppression status over CD4 count. Additional maternal factors that may impact successful breastfeeding include: age, history of infertility, polycystic ovarian syndrome (PCOS), and mode of delivery.[17–19] Poor adherence with ART regimen during pregnancy may increase the risk for non-adherence to a breastfeeding plan. Studies have shown that viral suppression rates and adherence often worsen postpartum,[20–22] thus setting realistic expectations will be helpful for the patient to decide for themselves if safe breastfeeding is possible for them. Those with a new diagnosis of HIV during pregnancy should be cautioned about the increased risk of perinatal transmission related to their viral load at baseline.[23] Additional risk from breastfeeding may be substantial depending on the timing of viral suppression relative to delivery and duration of ART exposure; with shorter duration/exposure associated with lower risk. Ideally, patients with a complex pre-pregnancy ART regimen who have adherence concerns should also have a plan for regimen simplification in early pregnancy or following delivery, though individual cases should be reviewed as regimen switches may increase risk for virologic failure or side effects. Assessing capacity of adherence is ultimately meant to inform the patient's self-assessment for readiness to breastfeed in a safer way.

Patients who have not disclosed their HIV status (to partners, family members, friends) may find additional obstacles in explaining additional medications the infant is being provided and may require assistance with safe disclosure. Patients who opt not to breastfeed but who come from cultures where breastfeeding is expected may be conflicted as this may inadvertently reveal their HIV status to family members.

Regardless of HIV status, we would recommend against providing one's own breastmilk among those actively using illicit substances (including marijuana) within 30–90 days of delivery.[24,25] Programs can refer to their internal drug use policies for more specific guidance on the recommended window of abstinence prior to recommending breast feeding after substance exposure. Our team facilitates referrals for substance abuse care as indicated.

Women living with HIV have higher odds of antenatal (OR: 1.42; 95% CI: 1.12–1.80%) and postnatal depressive symptoms (OR: 1.58; 95% CI: 1.08–2.32%) compared with controls.[26] Among Black peripartum women living with HIV (WLWH), those with lower income, increased childcare burden and IPV were 6.5 times more likely to experience depression.[27] Importantly, perinatal depressive symptoms are associated with decreased ART adherence and viral suppression.[28] We refer patients with a history of or current untreated or unaddressed mental health diagnosis to care and we assess whether these concerns might influence counselling and recommendations around breastfeeding.

Ideally, patients will have a support network available to them in the immediate postpartum period and for the duration of their breastfeeding journey. Those who choose not to breastfeed may experience grief and seek comfort and reassurance from their perinatal team.

Patients at risk for IPV may not have stability in the postpartum period to attend additional appointments for adherence and viral load checks or may be prevented from reaching out for assistance should milk supply or other issues arise. Patients with social determinants of health concerns also need to be counselled about the importance of adherence to medications and follow up visits, and have a needs assessment performed well before delivery. Just as critical, a knowledgeable and compassionate paediatric provider needs to be identified who is willing to manage the HIV exposed infant in the setting of breastfeeding, including more prolonged ARV prophylaxis.

The multi-disciplinary consultation

Once the multidisciplinary team agree regarding the approach and recommendations, a consultation with the patient can be scheduled. Our team aims for a single multi-disciplinary consultation to occur in the early third trimester (ideally 28–30 weeks); the core group of consultants who should be present include the obstetrician/HIV specialist, a representative from Paediatrics or Paediatric Infectious Diseases and the lactation consultant. Tables 2–4 reviews specific discussion points that should be addressed during counselling, which can be individualised to the patient's circumstances. Regarding the feeding intentions, patients need to be informed again of the risks and alternatives of breastfeeding. The primary risk of breastfeeding is HIV transmission, which may still occur in the setting of non-adherence to ART, and continues for the duration of breastfeeding.[29] Follow up discussions are held between the patient and their primary obstetrics team and relayed to the wider team as needed. For those mothers who make a choice to breastfeed the involvement of the lactation consultant antenatally is vital to support and prepare the mother for a good start with breastfeeding by explaining the importance of early initiation of feeds and frequent feeding as encouraged in the UNICEF steps for successful breastfeeding.

Benefits of breastmilk provision

Patients may already be aware of the general benefits of breastfeeding including reduced risk of non-HIV related viral illnesses and allergies; major causes of infant mortality, such as SIDS (sudden infant death), necrotizing enterocolitis and sepsis.[31,32] Breastmilk is the ideal nutrition for newborns and breastfeeding protects infants from gastrointestinal, respiratory and ear infections, type 2 diabetes, asthma, leukaemia and childhood obesity.[33,34] Long term benefits to the breastfeeding parent may include decreased risk of gynaecologic cancers (breast, ovarian, and uterine), cardiovascular disease (high blood pressure, heart attack, stroke), diabetes and obesity; exclusive breastfeeding has a contraceptive effect, helping prevent short interval pregnancies, which puts birth parents and future infants at risk of adverse obstetric outcomes.[35,36] Breastfeeding is also associated with a decrease in postpartum depression.[37,38]

Birth parent-infant bonding is superior as compared to alternative forms of feeding.[39] Infant feeding is a normal and time-consuming part of parenting with different requirements for milk or formula. Patients should be aware of the cost of formula or donor breastmilk and potential formula shortages so that they can plan accordingly and acquire appropriate resources if needed. Alternatives to breastfeeding include formula feeding or donated HIV-negative breastmilk (from milk bank or carefully screened surrogate), though donor milk may not be a feasible long-term solution and should be considered while the patient is building up

Factors that may impact adherence	Assessment/action
Current ART use	– Assess tolerability, efficacy and safety of current regimen – Assess history of adherence problems, ARV resistance – Simplify ART regimen, if possible, in postpartum period to ensure ongoing viral suppression
New HIV diagnosis in pregnancy	– Increases risk of having detectable viral load at time of delivery
HIV status disclosure	– Evaluation of patient's social support system – Cultural issues-will patient incidentally disclose HIV status to extended family by not breastfeeding – Assistance with disclosure if safe and desired
Substance use	– If active substance use within 30–60 days of delivery, avoid BF – Refer to appropriate outpatient or inpatient resources
Mental health concerns	Untreated depression or other diagnosis increase risk for poor adherence and viral rebound Refer for appropriate mental health evaluation and treatment
Social determinants of health	– Food, housing, transportation insecurity – Intimate partner violence – Transactional sex work/history of trafficking – Work with Social Work and Case Manager and peer navigators to access appropriate support and referrals
Prior breastfeeding experience	– If patient is experienced, they may have more insight into process

Table 3: **Adherence assessment screening.**

Discussion point	Notes
Timing of delivery	1. Preterm birth may: – Make lactation initiation more difficult – Be associated with decreased infant gut maturity 2. In view of the risks of formula milk for preterm infants, mothers should receive the necessary support to assist them with breastmilk expression to feed their infants with breastmilk until infant is able to latch adequately. 3. Data on outcomes of preterm neonates receiving breastmilk from persons with HIV are limited.
Importance of adherence to ART and postnatal follow up	Estimated HIV transmission rate through breastfeeding in the setting of optimal ART is <1%. Limitations to applying U=U. Rates are likely to increase in setting of non-optimal maternal ART use or neonatal ARV prophylaxis
Avoidance of mixed feeding[a]	Exclusive breastfeeding is strongly recommended. There is insufficient data at this time to provide guidance in the setting of optimal viral suppression and episodes of neonatal hypoglycaemia, inadequate weight gain, etc.
Duration of feeding	Exclusive breastfeeding is recommended for the first 6 months and then the mother together with her support team should be assisted to re-assess whether breastfeeding should be continued.
Virology HIV testing for mother and infant	– Ongoing viral load checks will be necessary to monitor risk for HIV transmission during breastfeeding with additional clinic or lab visits – Maternal viral load check 1–2 months – DHHS Paediatric Guidelines suggest: virologic HIV testing at the standard time points (birth, 14–21 days, 1–2 months, and 4–6 months), and then every 3 months throughout breastfeeding, followed by monitoring at 4–6 weeks, 3 months, and 6 months after cessation of breastfeeding.
Neonatal ARV prophylaxis plan	– May be determined on an institutional basis until clear recommendations available on optimal regimen and duration. Expert opinion suggests use of 3 drug presumptive regimen with continuation until 4 weeks following cessation of breastfeeding.
Breast care plan	– Proactive counselling to avoid latch/feeding problems – Mastitis can increase risk for HIV transmission – Clinicians (paediatric provider should be notified if mastitis or cracked nipples occur in order to provide a safe feeding plan for the infant)
Weaning plan	– Early cessation of breastfeeding can happen for a variety of reasons. – Develop a weaning plan; rapid weaning is not recommended.
Rescue strategy in case of detectable maternal plasma HIV RNA	Due to insufficient data to suggest otherwise, cessation of breastfeeding would most likely be advised in this scenario

[a]In a study of mother-to-child transmission in Kwa-Zulu Natal (South Africa), infants who received mixed feeding during their first 6 months were at higher risk for HIV than those exclusively breastfed [hazard ratio (HR) 10.9].[30]

Table 4: **Discussion guide for HIV breastfeeding counselling.**

her milk supply or if there are other reasons precluding breastfeeding. Information on accessing banked human milk can be found through resources such as the Human Milk Banking Association of North America (www.hmbana.org).

"Mixed feeding" refers to non-exclusive provision of breastmilk, or breastmilk and any other liquid or food, within the first 6 months after delivery. Historically, "mixed feeding" of solid foods within the first 2 months of life (absent maternal ART) has been strongly discouraged in the setting of HIV infection out of concern for increasing gut mucosal inflammation and two-fold increased risk for HIV transmission during the postnatal period.[30,40] Due to a lack of recent research in this area, it is unknown whether in the setting of optimal maternal ART use and viral suppression this same risk is still present. We recommend against mixing breastmilk with any other foods/liquids prior to 6 months of age, though can only assume that risk for perinatal transmission may be decreased. The BHIVA guidelines[16] do not consider breastmilk/formula supplementation as mixed feeding but do recommend avoiding breast milk (and/or formula) mixing with solid food prior to 6 months of age. In contrast, the Australasian guidelines[41] recommend not returning to breastmilk once formula is provided.

Premature infants are at higher risk for poor suck reflex[42] and have more immature intestinal tracts with altered microbiome compositions.[43] Patients that ultimately deliver prematurely may have a more difficult time establishing lactation.[44,45] While difficulty with lactation may complicate the recommendation to avoid formula supplementation, it may be overcome with proper support and milk expression every 2–3 h.[46] Additionally, limited data exist on the outcomes of preterm infants who receive breastmilk from a person living with HIV.[8,47] Using a stable isotope technique to measure output volumes and maternal body composition, Mulol et al.[48] showed that breastmilk outputs of mothers with HIV were within published reference ranges and thus sufficient to provide breastmilk adequately. There is no data regarding lactation induction specifically in the

setting of HIV or with concomitant ART use. At our institution, patients are thus advised to discontinue breastfeeding once formula supplementation is deemed necessary; weaning considerations are reviewed below.

Duration of breastfeeding is also a risk factor for HIV transmission with shorter duration translating to lower risk. Becquet et al. (2009)[29] report on pooled data from 2 African cohorts where breastfeeding duration was 4 months with rare exclusive breastfeeding (West African cohort-DP) or longer (South African cohort-Vertical Transmission Study). They report a postnatal transmission risk at 18 months of 3.9% (2.3–6.5) among infants breastfed for less than 6 months, and 8.7% (6.8–11.0) among children breastfed for >6 months with a crude hazard ratio (HR) 2.1 (1.2–3.7), P = 0.02 and adjusted HR 1.8 (0.9–3.4), P = 0.06, with children exposed to solid foods within the first 2 months of life having 2.9 times the risk for infection (1.1–8.0). In a meta-analysis investigating postnatal HIV transmission in breastfed infants of women with HIV on ART, Bispo et al. report from 11 studies in LMIC settings an overall pooled transmission rate at 6 months for breastfed infants was 3.54% (95% CI: 1.15–5.93%) and at 12 months 4.23% (95% CI: 2.97–5.49%).[9] Of note, maternal ART did not continue beyond 6 months postpartum and none of the studies provided data on mixed feeding and transmission risk.

Post-natal follow-up

Post-exposure neonatal prophylaxis is recommended in addition to continued administration of maternal ART. While the optimal neonatal regimen and duration has not been established. In breastfeeding infants, daily NVP[12,49,50] has been shown to be safe and effective for extended use in the absence of maternal ART. In the HIV Prevention Trials Network (HPTN) 046 trial evaluating different durations of infant NVP prophylaxis while breastfeeding among mothers on ART, there were no differences in postnatal HIV transmission rates between infants on NVP versus placebo, suggesting a lack of benefit of neonatal PEP in the setting of maternal ART and viral suppression.[50] Based on expert opinion, our institution uses presumptive HIV therapy during breastfeeding exposure, typically with a three-drug neonatal ART regimen consisting of zidovudine, lamivudine and nevirapine for 6 weeks with nevirapine alone until 4 weeks after breastfeeding completion. We aim for breastfeeding individuals to have regular viral load testing to assure aviremia however due to the reality of nonadherence during the postpartum period, we have opted to recommend additional preventive measures. This varies from the BHIVA guidelines which do not extend neonatal PEP beyond 2 weeks (assuming maternal ART is continued).[16] An alternative regimen of zidovudine/lamivudine/raltegravir can also be considered[3] though local Paediatric Infectious Disease teams should be consulted for input. Regarding safety and tolerability, maternal ART in breastmilk does not appear to adversely affect the growth of infants and children.[51–53] Extended versus shorter courses of ART drug prophylaxis for HIV-exposed infants also do not appear to increase the risk for adverse growth or non-HIV infections.[8,49] Nucleoside (NRTI) and non-nucleoside reverse transcriptase inhibitors (NNRTI) have lower levels in breastmilk than plasma levels but exclusively breastfed infants may receive up to 10% of the weight-adjusted infant dose.[54] While tenofovir disoproxil fumarate (TDF) has very little transfer into breastmilk,[51] emtricitabine and lamivudine can have more accumulation.[53] Breastmilk pharmacokinetic data has not been generated yet for tenofovir alafenamide (TAF), a newer form of tenofovir found in several single drug combinations used for people with HIV. Protease inhibitors (PI) reach very low breastmilk concentrations that result in minimal detectable drug in infant blood. The DolPHIN-1 study found that infant exposure to dolutegravir in breastmilk was about 3% of those levels found in maternal plasma. Serious adverse infant events are uncommon though data on long-term consequences are lacking.[52] Another concern for variable drug level exposure through breastmilk is drug resistance from HIV viral mutations in infants who acquire HIV despite prophylaxis. Fogel et al. (2013) analysed nevirapine (NVP) resistance in infants who acquired HIV through breastfeeding despite post-exposure prophylaxis exposure with NVP alone in the HPTN 046 trial and found NVP resistance was detected in 92% of infants who acquired HIV by 6 weeks, and in 75% of infants who were diagnosed with HIV by 6 months.[55] Nelson et al. assessed NVP resistance in infants who acquired HIV in the three arms of the BAN study (daily infant NVP prophylaxis, triple maternal ART or no intervention for 28 weeks of breastfeeding).[56] Infants acquiring HIV while on daily NVP were significantly more likely to develop resistance: 56% in infant-NVP arm versus 6% in maternal ART arm versus 11% in control arm, P = 0.004.) Thus, the concern for passage of resistant virus should remain a valid concern until additional data shows otherwise.

The World Health Organization (WHO) recommends that mothers living with HIV in countries that "have opted to promote and support breastfeeding together with ART, who are on ART and adherent to therapy should" exclusively breastfeed for the first 6 months, followed by the addition of complementary feeding until 12 months of age.[57] Breastfeeding with complementary feeding may continue until 24 months of age or beyond.[57]

Patients who choose to breastfeed may benefit from identifying peer support in a breastfeeding mentor or a community-based support network, e.g., The Well Project,[58] that are increasingly accessible through HIV organizations in high resource countries. Having

adequate support may decrease maternal emotional distress, reducing disruption of milk flow and let-down.[59,60]

Monitoring

HIV-exposed neonates receiving breastmilk should be closely followed by a provider with appropriate expertise. The DHHS Perinatal and Paediatric Guidelines propose infant monitoring to include virologic HIV testing at the standard time points (birth, 14–21 days, 1–2 months, and 4–6 months), and then every 3 months throughout breastfeeding, followed by monitoring at 4–6 weeks, 3 months, and 6 months after cessation of breastfeeding.[3] This varies from the BHIVA guidelines[16] that recommend monthly neonatal viral loads while breastfeeding and for 2 months following cessation.

There is no firm guidance for maternal viral load monitoring; McKinney et al. currently test 2–6 weeks postpartum and subsequently every 2 months.[14] Our practice checks maternal viral load monthly, which appears consistent with BHIVA and Australasian guidelines.[16,41] With the assistance of lactation consultants, parents with HIV who breastfeed should be informed about and assessed for latch concerns, evidence of mastitis, or supply issues that may otherwise impact the decision for continued breastfeeding. Mastitis and infant thrush should be promptly evaluated and treated[61,62] as both conditions may increase HIV transmission risk. A plan for weaning should also be discussed as rapid weaning over the course of several days is not recommended because of potentially increased rate of HIV shedding into breastmilk and an increased risk for HIV transmission (data from LMIC setting before ART widely accessible).[3,63] Data on weaning specifics among virally suppressed individuals on ART are lacking at this time. Conversations about contraception use, if applicable, may also be salient in the context of their desire to breastfeed. A Cochrane Database Review (2015) of combined hormonal versus nonhormonal versus progestin-only contraception in lactation found no significant impact on breast feeding duration, composition or volume apart from combined oral contraceptives (COC).[64] Where hormonal contraception is planned, the recommendation is to follow manufacturer instructions to avoid their use until breastfeeding is well-established, or 6 weeks post-partum, to avoid any potential interference with optimal milk production.[65] Our antenatal care team (including obstetrics, nursing, social work and case manager) assists with linking parents to care with an Infectious Disease provider prior to delivery to anticipate a 'warm hand-off' following graduation from obstetrical services. Providers should continue "4th trimester care" to facilitate retention in care with Infectious Disease specialists as this period can be challenging for patients to maintain viral suppression.[66,67] Ultimately, which provider will follow the breastfeeding parent's viral load matters less than identifying this individual prior to the start of feeding and communicating with other team members. Providers are also encouraged to call The National Perinatal HIV Hotline (1-888-448-8765), which provides free clinical consultation on all aspects of perinatal HIV care, when additional guidance is desired.

Research priorities

Resource-rich settings should track outcomes of mother-infant pairs with registries in order to tabulate any transmissions and the conditions under which they occur. The UK has one such registry (Integrated Screening Outcomes Surveillance Service). Ultimately, resource rich settings should attempt to reach general consensus on specific guidance regarding breastfeeding, though this may be difficult as the context of maternal health/maternity in each setting differs. As we have outlined, there are a variety of approaches in practice currently.

Conclusion

Providers should be aware of the full benefits of breastfeeding for mothers and infants as opposed to the almost negligible risk of HIV transmission in mothers who are virally suppressed and adherent to their ARVs and receiving the necessary breastfeeding support and encouragement from family and peers. More research is needed documenting the maternal and infant outcomes of women with HIV women in resource-rich settings who are supported to breastfeed.

Contributors

Conceptualization: all authors contributed equally. Resources-WCG, AA. Writing original draft-AMP. Writing, editing and reviewing-all authors contributed equally.

Declaration of interests

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