Keeping Babies of HIV+ Mothers in Rural Zimbabwe Healthy

Exclusive breastfeeding and then what?

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for the ZVITAMBO study group
September 28, 2009

540,000 children acquire HIV each year
Mostly from their mothers

Total risk: 25 - 40%

Contribution of each period to total transmission

Risk of HIV
(Richardson, et al, 2002)

• 1 liter breastmilk ~ 1 act unprotected sex

• Breastfeeding is about as risky as having unprotected sex with an infected partner 5 times a week.

Breastfeeding-associated HIV infection

• 40% of all mother-to-child transmission of HIV

• 216,000 new pediatric HIV cases per year

• Nearly one million children are living today with an HIV infection they acquired during breastfeeding

Kwa-Zulu Natal, South Africa:
Survival of infants, by feeding method

HIV-free survival of infants, by feeding method
Prevalence of EBF at 3 mo increased from 6.7% to 25.0%, p=0.005

Exposure to EBF counseling increases EBF practice among HIV + mothers in Zimbabwe


Breastfeeding + ART to baby vs. formula-feeding RCT evidence from Botswana

“...These results demonstrate the risk of formula feeding to infants in sub-Saharan Africa, and the need for studies of alternate strategies.” (p 794)

What if no formula is provided?

In-depth study of 11 mothers in rural Zimbabwe who were counseled and chose abrupt weaning at 6 months

- Mothers were highly motivated to step BF:
  - “That’s it; we want the baby’s life.”
- But diets were grossly inadequate:
  - Median infant E intake was 54% of requirement
  - Median intakes were < 67% of RDA for 9 of 12 micronutrients
- Replacement milk was a problem:
  - “I just said the baby will survive even without milk.”


Energy (Kcal) consumed from breast milk vs. complementary foods by healthy breastfed children

Complementary feeding of young children in developing countries. WHO/NUT/98.1, p 51.

What have we learned?

- In the first 6 months:
  - HIV transmission rates with EBF are same as FF
  - HIV-free survival rates with EBF are much higher (better) than FF
- In the first 6 months and beyond:
  - When formula was provided under “best case” research conditions, the lives saved from HIV transmission were fully offset by the lives lost from diarrhea and malnutrition
  - But, the risk of transmission from breast milk is real
  - After 6 months, breast milk typically contributes 40-70 % of Energy: a big gap to fill
  - Rural Zimbabwean HIV+ mothers who were counseled and chose to wean their HIV+ baby at 6 months were unable to provide adequate diets.

Updated HIV and Infant Feeding recommendations, based on 2000 and 2006 technical consultations

1. The most appropriate infant feeding option for an HIV-infected mother depends on her individual circumstances, including her health status and the local situation, and should take consideration of the healthcare services available and the counselling and support she is likely to receive.

2. Exclusive breastfeeding is recommended for HIV-infected mothers for the first six months of life unless replacement feeding is acceptable, feasible, affordable, sustainable and safe for them and their infants before that time.

3. When replacement feeding is acceptable, feasible, affordable, sustainable and safe, avoidance of all breastfeeding by HIV-infected mothers is recommended.

4. At six months, if replacement feeding is still not acceptable, feasible, affordable, sustainable and safe, continuation of breastfeeding with additional complementary foods is recommended, while the mother and baby continue to be regularly assessed. All breastfeeding should stop when a nutritionally adequate and safe diet without breast milk can be provided.
More detail on what is meant by AFASS

- acceptable (socially welcome)
- feasible (facilities and help are available to prepare formula)
- affordable (formula can be purchased for six months)
- sustainable (feeding can be sustained for six months)
- safe (formula is prepared with safe water and in hygienic conditions).


How to keep babies of HIV + mothers healthy: EBF, and then what?

Building blocks:
1. Safe milk or milk replacement
   1. Formula (caution + cost)
   2. Animal milk (caution + unreliable supply)
2. Good complementary feeding practices
3. Supplement to fill the gaps?
4. Sanitation & Hygiene—disrupt fecal-oral transmission

Flash-heating breastmilk
Israel-Ballard & Chantry et al., Berkeley

- Flash-heat can inactivate HIV in naturally infected breast milk from HIV-positive women. (JAIDS 2007)
- Storage of flash-heated breastmilk is safe at room temperature for up to 8 h. (J Trop Ped 2006)
- Most vitamin concentrations are retained after heating. (JAIDS 2008)
- Most breast milk immunoglobulin activity survives FH (JAIDS 2009)

Goal: to create and implement an integrated nutrition, sanitation and hygiene intervention for HIV-exposed children delivered by village health workers in rural Zimbabwe, and to evaluate the effectiveness of the program processes and infant health outcomes.

EBF Tozodii

Exclusive Breastfeeding for first 6 months
Complementary Feeding Practices
Provision of Nutributter Energy + MN supp
EHT breast milk Berkeley protocol
Hygiene (Handwashing after fecal contact)

Zimbabwe

Building the intervention

COMPLEMENTARY FEEDING + NUTRIBUTTER

Keriann Paul
And the ZVITAMBO team

The improved practice most readily adopted was to mash locally available foods.

Evidence of transformative learning

<table>
<thead>
<tr>
<th>Previous assumptions</th>
<th>Lack of awareness</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;I was not feeding fruits such as mango because the baby can't chew.&quot;</td>
<td>&quot;How did you know that these foods such as termites can be fed to babies?&quot;</td>
</tr>
<tr>
<td>Validation of new knowledge</td>
<td>Critical reflection on old assumptions</td>
</tr>
<tr>
<td>&quot;When I grated cabbage...they did not come out like that.&quot;</td>
<td>&quot;I saw that I had been depriving my baby of them.&quot;</td>
</tr>
</tbody>
</table>

Transfer of knowledge

"I have already taught one mother on how to prepare these foods particularly moros (amaranth) and mataputis (pumpkin) seed.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Amount per 20 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy, kcal</td>
<td>1.08</td>
</tr>
<tr>
<td>Protein, g</td>
<td>2.56</td>
</tr>
<tr>
<td>Fat, g</td>
<td>7.08</td>
</tr>
<tr>
<td>Calcium, mg</td>
<td>100</td>
</tr>
<tr>
<td>Phosphorus, mg</td>
<td>82.13</td>
</tr>
<tr>
<td>Potassium, mg</td>
<td>152</td>
</tr>
<tr>
<td>Magnesium, mg</td>
<td>16</td>
</tr>
<tr>
<td>Zinc, mg</td>
<td>4</td>
</tr>
<tr>
<td>Copper, mg</td>
<td>0.2</td>
</tr>
<tr>
<td>Iron, mg</td>
<td>9</td>
</tr>
<tr>
<td>Iodine, μg</td>
<td>90</td>
</tr>
<tr>
<td>Selenium, μg</td>
<td>10</td>
</tr>
<tr>
<td>Vitamin A, mg RE</td>
<td>0.08</td>
</tr>
<tr>
<td>Vitamin C, mg</td>
<td>30</td>
</tr>
<tr>
<td>Vitamin B1, mg</td>
<td>0.3</td>
</tr>
<tr>
<td>Vitamin B2, mg</td>
<td>0.4</td>
</tr>
<tr>
<td>Vitamin B6, mg</td>
<td>0.3</td>
</tr>
<tr>
<td>Vitamin B12, μg</td>
<td>0.5</td>
</tr>
<tr>
<td>Folic acid, μg</td>
<td>80</td>
</tr>
</tbody>
</table>

Major themes for Nutributter acceptability

1. Tastes good
2. Not like normal peanut butter
3. Child eats more overall

"I like the taste and that my baby likes it so much. This makes him eat more."

Figure 2. Percentage of ways NB was mixed into infant diets based on the 24 hour dietary recalls.

Figure 3. Changes in nutrient intakes from complementary foods for the TIPS without Nutributter (Non-NB) and with (NB) based on the 24 hour dietary recalls adjusted for initial nutrient intake and change in food intake. Infants consumed on average 2.8 ±0.3 teaspoons NB/day. Means are least square means ± SEM. Means with * are significantly greater than Non-NB, p<0.001.
Complementary feeding messages

1. An infant can eat any food that an adult eats.
2. Grind food so that an infant can swallow and digest it.
3. Food which is locally available is important for your infant.
4. Add 4 teaspoons of Nutributter to your baby’s foods during the course of one day.

Building the intervention, continued

**COMPLEMENTARY FEEDING + EXPRESSED HEAT-TREATED (EHT) BREAST MILK**

Mduduzi Mbuya,
Deputy Director, ZVITAMBO

and the ZVITAMBO team

What do we need to know now?

- Is EHT breastmilk a feasible feeding option in a resource poor rural Zimbabwean setting?
- What needs to be in place to minimize constraints?
  - in the household?
  - in the health delivery system?

EBF Social Marketing Campaign

- Key messages:
  - Immediate (within 1 h of birth)
  - Exclusive: only breastmilk
  - EHT breastmilk good for any mother who needs to be away from her infant.
- Roadshow components:
  - Launch hosted by the Minister of Health
  - Health worker training and EBF aprons
  - T-shirts, posters, brochures
  - EHT movie, shown 65 times throughout the district

EBF Social Marketing Campaign Evaluation

- Random sample of men and women throughout district:
  - 70% said without prompting: EBF means breastmilk only
  - 81% had heard of expressing, 70% of flash heating
  - 75% thought EHT would be acceptable in their home.
  - Benefits of EHT:
    - 56% provide a feeding while the mother was away
    - 41% prolong the shelf life of the expressed milk
    - 24% prevent HIV transmission
Methods: Recruitment

- 20 mothers recruited:
  - HIV-positive mothers with 6-month PCR-negative babies,
  - Do not meet AFASS criteria,
  - Within the catchment area of St Theresa’s Mission hospital

Methods: EHT support and home visits

- Inputs
  - Pot, glass jars
  - Bucket (with lid), dish towel, monthly supply of soap
  - Nutributter

- 20 home visits over a 2-month period:
  - Lactation counseling
  - EHT & enhanced complementary feeding counseling
Methods: EHT support and home visits

- Data collection
  - Daily logs completed by mothers (infant feeds)
  - Observations of EHT procedures & complementary feeds
  - Counseling (documentation)
  - Participants’ feedback
  - Infants’ health & dietary intake

Results: Adherence to protocol

<table>
<thead>
<tr>
<th>Process indicators</th>
<th>All Visits</th>
<th>Mean</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak temperature (°C)</td>
<td></td>
<td>80.4</td>
<td>70.3 – 93.1</td>
</tr>
<tr>
<td>% Adherence to protocol (overall)</td>
<td></td>
<td>96.0</td>
<td>50 – 100</td>
</tr>
<tr>
<td>Time taken to express</td>
<td></td>
<td>14.6</td>
<td>2 – 137</td>
</tr>
<tr>
<td>Time taken to heat treat</td>
<td></td>
<td>17.6</td>
<td>4 – 137</td>
</tr>
<tr>
<td>Time taken to feed baby</td>
<td></td>
<td>5.6</td>
<td>1 – 50</td>
</tr>
</tbody>
</table>

Adherence points assessed:
1. washing hands with soap and water before expressing
2. clearing utensils with soap
3. sterilizing jar and feeding cup by boiling
4. expressing into heating jar
5. expressing from both breasts
6. correct amount of water in the pot [2 finger widths above breast milk]
7. removal of pot from flame as soon as water boiled
8. immediate removal of jar from pot.

Results: Volumes of EHT milk

- EHT = 442.8 (230)
- HT = 440.2 (231)
- Fed = 430.8 (230)

Reference intake: 592 g/day (from WHO/NUT/98.1)

Results: Volumes of EHT milk [2]

Mean (SD) 430.8 (230)

EHT transition time and duration

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Time from EHT initiation to no direct breastfeeding, days % (n)</th>
<th>EHT frequency/day [(SD), range]</th>
<th>EHT duration (months) [(SD), range]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time from EHT initiation to no direct breastfeeding, days</td>
<td>0 – 2: 35 (7) 3 - 7: 25 (5) 8 - 14: 30 (8) &gt; 14: 10 (2)</td>
<td>4.0 (1.82), 1 - 13</td>
<td>4.5 (2.73), 1.1 - 11.1</td>
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<td>[ (SD), range]</td>
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Results: Energy intakes by source

<table>
<thead>
<tr>
<th>Week</th>
<th>EHT Milk</th>
<th>Foods</th>
<th>Nutributte</th>
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<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2</td>
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Energy intakes by source

- EHT Milk
- Foods
- Nutributte

Energy intakes by source

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</tbody>
</table>
Energy intakes by source

![Energy intakes by source graph]

Growth

![Growth graph]

Short fat babies?

![Short fat babies graph]

Qualitative Results:
Maternal motivation/motivators

- Keeping babies HIV negative
  "... I just want to learn and do things which save my baby’s life and health this time. The loss of my first baby at 10 months gave me a challenge with this baby"

Qualitative Results:
Mother’s time

- No negative impact on daily routines reported
  "... EHT is just like preparing any other meal for the baby. It’s even getting shorter with experience."
  "... Yesterday was my co-operative gardening day. I also had to go for a political meeting at the shopping centre but I managed to do my EHT procedures and other daily activities"
  "... I also keep some EHT milk in reserve to feed the baby on demand and carry on with my other daily duties.

Qualitative Results:
Stigma

- Stigmatization was not a major concern for the clients:
  "... When I told my neighbors that I had joined a program on expressing and heat treating, which some of them had seen and heard about during the EBF road shows in our area, they said they had heard that EBF can be practiced by any mother with a child, whether HIV negative or positive."

- EHT was separated from HIV status:
  "... I have long back disclosed my doing EHT procedures to most relative and neighbors but not about my HIV status. It’s only my mother who knows about it."
Qualitative Results: Stigma

- Not that finger-pointing didn’t exist
  “... I always tell you that I have passed that state of worrying what
  people say about my status”
  “... There is always some element of being stigmatized but if you
  positively respond you may not have problems”

Possibility of selection bias in our small sample

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Qualitative Results: Why mothers stopped EHT

- All 20 mothers cited inadequate milk production, often linked
  to food insecurity and stress:
  “... I could not get enough food for myself. I had one meal of sadza
  per day, which could at least be enough for me to produce
  enough breast milk. I was expressing 20mLs per day, which was
  not enough for the baby.”
- The mother with the shortest duration (5 weeks) cited
  inadequate production and her own ill health (but refused
  CD4 testing and screening for HAART).

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Conclusions: Final study design/implementation notes...

- EHT was “feasible” in this context of high support
- Normalizing EHT through social marketing was helpful in
  avoiding stigma
- Scaling up EHT support—how many visits are needed?
  - Plan for material inputs and instruction beginning in 3rd month of EBF
  - What is needed at 6 mo, during transition period?
  - More support on decreasing anxiety, perceived milk insufficiency
- How hard to push for rapid transition to exclusive EHT?
  - Slower transition may enhance EHT volumes but will also increase risk of
    transmission
- Defining successful EHT for the evaluation:
  - Rapid transition, EHT output, 8-point adherence score, duration of
    sustainment.