Breast Milk for the Preterm and LBW: Challenges and Solutions

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Variations in breastfeeding rates for very preterm infants between regions and neonatal units in Europe: results from the MOSAIC cohort

Mercedes Bonet ADC2011

- Varied from 19% to 70%
- Correlated with national breastfeeding rates
- Women were more likely to breastfeed if they were older or primiparous
- More premature, smaller and multiple babies or those with BPD dysplasia were breastfed less.
- Variations across regions and neonatal units remained statistically significant after adjusting for maternal, infant and unit characteristics.
Do we need breast milk for the preterm?

- Protection against infection
- Protection against NEC
- Appropriate lipid profile
- Better cognitive development
- Better visual development
- Involves the mother in the care of her baby

- Premature babies need the benefits of breast milk even more than term
Formula feeds

- No trophic factors: epidermal growth factor, nerve growth factor, insulin-like growth factor etc, etc
- Long chained polyunsaturated fatty acids (PUFA’s) are likely not added in proper amounts
- Bioavailability of many elements poor
The Challenges

- Breast milk output is low
- Breast milk may not be nutritionally adequate
Why breast milk output is low?

- Delayed initiation
- Poor and ineffective sucking/ expression
- Irregular sucking/expression
- Maternal anxiety/stress
- Hostile NICU environment (incubators, ventilators, alarms)
- Unfriendly staff - lack of guidance/counseling
- Use of formulas in NICU
- Lack of rest / inadequate diet for mother
Attitudes in NICU

- Question of life and death--Saving life most important—breast milk feeding can wait
- Breast milk feeding also saves lives!—so it is complementary, synergistic
- Saving baby’s life by technology and helping mother to feed have same goals
## Requirements for a preterm

*ESPGHN2010*

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>110-135</td>
</tr>
<tr>
<td>Protein &lt; 1 kg</td>
<td>4.0-4.5</td>
</tr>
<tr>
<td>Protein 1-1.8 kg</td>
<td>3.5-4.0</td>
</tr>
<tr>
<td>Fat</td>
<td>4.8-6.6</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>11.6-13.2</td>
</tr>
<tr>
<td>Sodium</td>
<td>69-115</td>
</tr>
<tr>
<td>Potassium</td>
<td>66-132</td>
</tr>
<tr>
<td>Calcium</td>
<td>120-140</td>
</tr>
<tr>
<td>Phosphate</td>
<td>60-90</td>
</tr>
</tbody>
</table>
Apparent deficiencies of breastmilk

- Not enough protein to support the growth of the premature baby
- Insufficient calcium, phosphorus and vitamin D
- Insufficient calories for intrauterine growth rate
- Intolerance of some babies to lactose; **BUT**
- Prematurity ranges from 26 weeker 800 grams to 33 weeks, 1500 grams
- Both cannot be treated similarly
## Composition of very preterm breast milk


<table>
<thead>
<tr>
<th></th>
<th>&lt; 28 weeks</th>
<th>28-31 weeks</th>
<th>32-33 weeks</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>2.3</td>
<td>2.1</td>
<td>1.9</td>
<td>1.6</td>
</tr>
<tr>
<td>CHO</td>
<td>7.6</td>
<td>7.5</td>
<td>7.5</td>
<td>6.2</td>
</tr>
<tr>
<td>Fat</td>
<td>4.4</td>
<td>4.4</td>
<td>4.8</td>
<td>4.1</td>
</tr>
<tr>
<td>Energy</td>
<td>78</td>
<td>78</td>
<td>77</td>
<td>68</td>
</tr>
<tr>
<td>Sodium</td>
<td>10.6</td>
<td>10.6</td>
<td>10.4</td>
<td>11.2</td>
</tr>
<tr>
<td>Potassium</td>
<td>14.0</td>
<td>13.1</td>
<td>12.1</td>
<td>11.5</td>
</tr>
<tr>
<td>Calcium</td>
<td>6.2</td>
<td>6.5</td>
<td>7.4</td>
<td>5.4</td>
</tr>
<tr>
<td>Phosphate</td>
<td>2.2</td>
<td>2.1</td>
<td>2.0</td>
<td>1.9</td>
</tr>
</tbody>
</table>
Composition of very preterm breast milk  

- Protein content varied from 2.7-3.0 g/dL for 24-25 weekers to 1.8-2.3 g/d for 32-33 weekers
- Protein content keeps decreasing by 0.12 g/dL/week
- CHO and fat content increased with lactation weeks
- Very variable composition from mother to mother
Solutions for Low Milk output

- Early initiation of suckling/ expression
- Regular suckling/expression from day 1
- 24 hour access for mother
- Expression by Pumps (Manual with Mechanical)
- Breast milk expression room
- Friendly environment, friendly nurses, counselors and doctors
- Lactation support staff 24x7
- Development of sucking---oral stimulation programs, NNS, KMC

- Early Skin to skin contact –KMC
- 1200-2199 gram newborns.

<table>
<thead>
<tr>
<th></th>
<th>SSC (n=20)</th>
<th>Incubator (n=14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NICU Transfer</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Abnormal parameters</td>
<td>3</td>
<td><strong>12</strong></td>
</tr>
<tr>
<td>Hypothermia</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
Kangaroo Mother Care

- Better mother-infant bonding
- Greater likelihood of full breastfeeding in hospital and at discharge
- Current Practices---used for short durations, started late
Solutions for Low Milk output

- Facility for storing milk
- Avoid bottles; use spoon feeding / cup feeding/finger feeding
- Galactagogues ? ?
- Milk Banking
Handling the expressed milk

- Best to use freshly expressed milk
- Refrigerated better than frozen
- Even if you some bio growth factors lost, there are none in formula!
- Glass and hard plastic preferred containers
Solutions for nutritional inadequacy

- Increase administered volume
  - 180-200 ml/kg/d  250-300 ml/kg/d
- Ensure hind milk is given
- Fortification
- Accept lower growth!
Intrauterine growth rate

- Besides being academically satisfying, is there any evidence that a baby is better off growing at intrauterine growth rates?
- The physiologic situation is completely different for a baby outside the uterus.
- There are advantages of exclusive breastmilk feeding that go beyond growth rate.
Is more initial weight gain better?

Singhal A, Lucas 2004

- LDL : HDL cholesterol ratio was significantly lower in adolescents who had been randomised to bank breastmilk compared with those who received preterm formula
- CRP concentration was also significantly lower in adolescents randomised to banked breastmilk compared with preterm formula
- Lower BP
Is more initial weight gain better?

Bishop 1996

- Compared banked donor milk vs preterm formula as a supplement to mother’s breast milk in 54 children aged five years
- “Increasing human milk intake was strongly positively associated with later bone mineral content”
The apparent breastfeeding paradox in very preterm infants: relationship between breast feeding, early weight gain and neurodevelopment based on results from two cohorts, EPIPAGE and LIFT

Roze BMJ Open2012

- Gestational age 29.9 weeks, birth weight 1380 gms
- Breast feeding was associated with decreased risk of suboptimal neurodevelopmental outcome at 2 and 5 years of age.
- Increased risk of loosing 1 weight Z score during hospitalization
The apparent breastfeeding paradox in very preterm infants: relationship between breast feeding, early weight gain and neurodevelopment based on results from two cohorts, EPIPAGE and LIFT Roze BMJ Open 2012

- From 2 years of age, weight, HC and height were higher in those breast fed at discharge
- Increased chance of having a head circumference Z score higher than 0.5 at 5 years
Standard vs Individualized Fortification

- Standard fortification assumes same composition for all mothers on all days and at all times
- Individual assessment of milk composition – how?
  - Creamatocrit
  - Protein??
- Even if you can assess, availability of suitable component fortifiers
Colostrum use in preterm

- Should be provided as soon as possible
- Even few drops may be beneficial, by “priming” the baby’s gut and giving protective antibodies
- Can be tolerated even by the smallest and sick baby
- Sends a very strong message
Conclusions

- Challenges exist --but so do solutions
- Concept of intrauterine growth needs a re-look
- Require change in mindset and simple innovative solutions
- Use individualized fortification and as a drug—on prescription

Thank You so much…