

Breastfeeding Complications, Preventable Neonatal Morbidity, Brain Injury and Disability

September 22, 2017
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THE FED IS BEST FOUNDATION

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We have convened this meeting to discuss very important issues regarding infant feeding that affects millions of families in the developed and developing world. The importance of this meeting cannot be overstated. How we teach mothers to feed their children affects whether or not their newborn is hospitalized for feeding complications, whether their babies experience days to weeks of hunger and thirst or whether they are safely and fully fed, whether they experience brain- and life-threatening complications and subsequent disability and even death or whether they are able to lead a healthy and independent life. Safe infant feeding is perhaps THE most critical way we preserve health and human potential. At this time, feeding complications from exclusive breastfeeding are the leading causes of newborn hospitalization and disability in the world. It is our Foundation's mission to eliminate accidental infant starvation and the brain injury and disability it causes. We do this by investigating the science of infant feeding, breastfeeding complications and perinatal brain injury and by re-educating mothers and health professionals on the definition of "ideal" infant feeding.

Financial Disclosures:

No financial disclosures.

We are a non-profit organization. We do not accept donations from breastfeeding, formula-, infant-feeding related companies.

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We have no financial disclosures. The Foundation has not and will not accept any donations from any infant feeding companies both breast- and formula-feeding companies in order to provide unbiased advocacy and education on safe infant feeding.

Agenda

- Discuss feeding complications in breastfed newborns and its root causes
- Incidence of complications and hospitalization from insufficient feeding of exclusively breastfed newborns
- Newborn brain injury and disability from breastfeeding complications
- Global epidemic of neonatal jaundice, dehydration and perinatal brain injury from insufficient exclusive breastfeeding
- Preventing feeding complications, newborn brain injury and disability

Increasing Rates of Breastfeeding Initiation

Given the widely known benefits of breastfeeding, initiation of exclusive breastfeeding (EBF) is increasing in all hospitals across the globe

Step 6 of the WHO's Ten Steps implemented by the Baby-Friendly Hospital Initiative:

"Give infants no food or drink other than breast-milk, unless medically indicated."

However, with increasing exclusive breastfeeding rates → increasing rates of neonatal morbidity and hospitalizations for the complications related to underfeeding EBF newborns

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Given the widely known benefits of breastfeeding, rates of EBF initiation is increasing in all hospitals across the country. The 10 Steps of the WHO BFHI is the protocol used to promote EBF of newborn. Step 6 of the guidelines recommends giving infants no food or drink other than breast milk unless medically indicated. Because of this guideline, we are seeing increasing rates of neonatal morbidity and hospitalizations for complications related to underfeeding EBF newborns.

How do these complications occur?

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We have thousands of stories posted on the fed is best facebook page and website by mothers all around the world. But the common theme in all the stories are summarized by the following mother.

Stories from Mothers: Feeding Complications

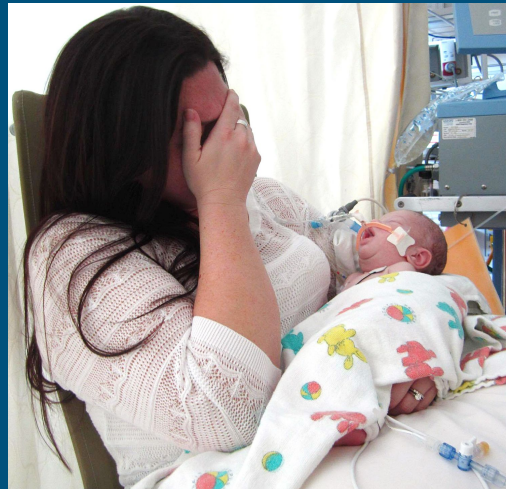
"I was made to feel that breastfeeding was the ONLY way to feed my child. My child suffered from lethargy, jaundice and hypoglycemia while still in the hospital..."

Kathryn Coiro, Wilmington, NC

Landon Johnson Death from Hypernatremia

Widely publicized starvation death of Landon Johnson who was constantly crying and breastfeeding for 2 days while in a Baby-Friendly hospital.

Discharged at 9.7% weight loss. Suffered cardiac arrest from hypernatremic dehydration 12 hours after discharge.



The most widely publicized case of accidental newborn starvation was the case of Landon Johnson who showed obvious signs of hunger and distress for 2 days while in the hospital and went into cardiac arrest 12 hours after discharge due to hypernatremic dehydration from insufficient exclusive breastfeeding.

Complications from Underfeeding Breastfed Newborns

Dehydration

Excessive Weight Loss

Hypoglycemia

Hyperbilirubinemia

Hypernatremia

Starvation

Brain Injury

Injury to Vital
Organs

Death



The complications associated with accidental starvation of exclusively breastfed newborns are well-known and include dehydration, excessive weight loss, hypoglycemia, hyperbilirubinemia and hypernatremia, all of which make up the syndrome of starvation. Starvation result in injury to the brain and vital organ, and if uncorrected, leads to loss of vitals signs and death.

How are exclusively breastfed newborns underfed?

Why do EBF newborns lose weight?

How is an EBF newborn underfed?

- Some newborns are born too sleepy to latch
- Difficulty latching and transferring milk
 - Anatomic reasons
 - Poor coordination and suck
- Majority of insufficient feeding is caused by not enough breast milk



Some newborns are born too sleepy to latch. Some have difficulty latching and transferring milk due to anatomical reasons, poor coordination and suck. But the majority of insufficient feeding is caused by not enough breast milk.

Caloric Needs of Newborns to Ensure Cell Survival

Day of life	Average daily colostrum production ¹	Calories provided by colostrum	Daily 3 kg newborn caloric req't
Day 1	56 mL/day	30 Cal	300 Cal
Day 2	185 mL/day	100 Cal	300 Cal
Day 3	383 mL/day	207 Cal	300 Cal
Day 4	580 mL/day	313 Cal	300 Cal

Daily neonatal caloric requirement 100-120 Cal/kg/day¹²
Colostrum has 54 Cal/100 mL; Mature milk has 66-77 Cal/100 mL²³

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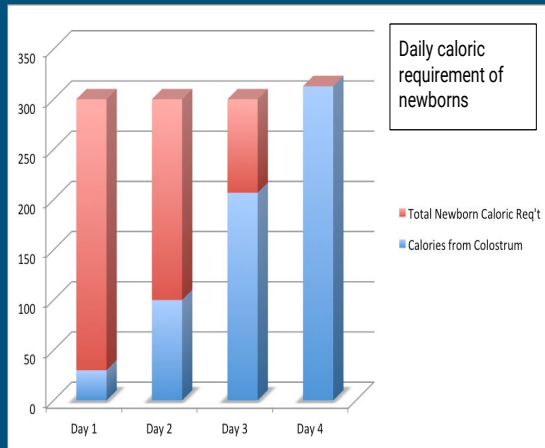
The daily caloric requirement of a newborn to feed all their living cells is a minimum of 100-120 Calories/kg/day,

For an average 3 kg baby, the daily caloric requirement is 300 Calories at birth.

This is the published average daily colostrum production of healthy, vaginally delivering mothers on the first 4 days of life and this is the number of calories that colostrum provides.

The number calories provided by the average mother provides roughly a tenth, a third and then 2/3rds of a newborn's caloric requirement for the first 3 days of life, finally exceeding the full requirement on day 4.

When colostrum/milk meets the newborn caloric need

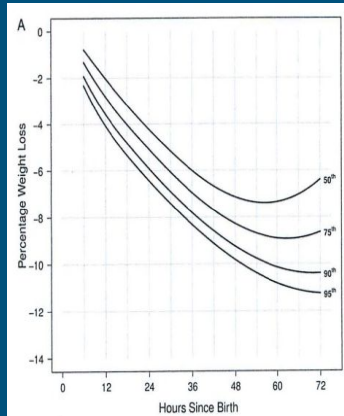


Only on the fourth day does an "average" mother produce sufficient milk to meet the full caloric need of a 3 kg newborn.

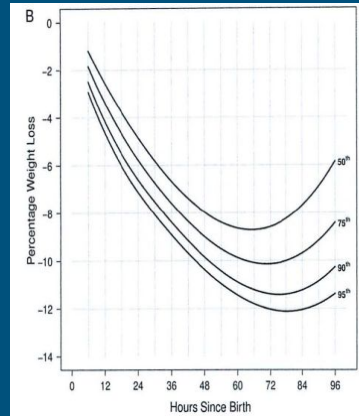
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This is a graphical representation of the number of calories an average mother can provide a 3 kg newborn, the blue representing the number of calories colostrum provides and the red representing the number of calories a newborn requires additionally to be fully fed. Only on the fourth day does an average mother's milk provide the full caloric requirement. Until that time, a newborn is fasting and relying on internal reserves to feed its vital organs.

How does the newborn respond to this?



Weight loss of vaginally-delivered EBF babies



Weight loss of cesarean-delivered EBF babies⁴

How does the newborn respond to fasting? The newborn loses weight. Weight loss of exclusively breastfed newborns has been widely taught as “fluid loss” when it is in fact caused by receiving a fraction of their daily caloric and fluid requirement. An exclusively breastfed newborn relies on the onset of his mother’s copious milk production in order to be rescued from this fasting state.

How many babies have to fast longer?

22% (1 in 5) of all healthy mothers delivering at term had delayed lactogenesis II (>72 hrs of life)⁵

- Study of 280 mothers, well-supported with close lactation support
- Babies with mothers who had DLII were 7-fold more likely to lose excessive weight of > 10%
- Leading risk factor - *First time mom w/ >3.6 kg babies (34% w/ DLII),

Another study showed 42% of first-time mothers have delayed lactogenesis II⁶

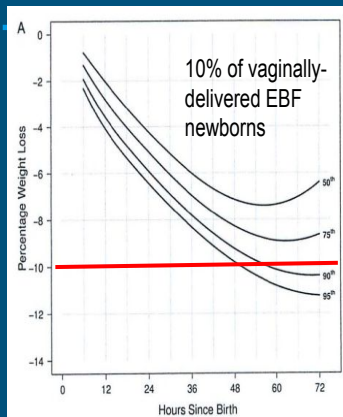
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How many babies have to fast longer?

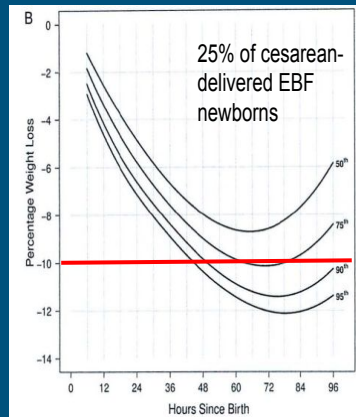
In a study of 280 healthy mothers delivering term babies who were well-supported with lactation services, 22% or more than 1 in 5 mothers had delayed onset of copious milk production and their babies were 7-fold more likely to lose excessive weight

The leading risk factor for delayed lactogenesis II is being a first time mom, which was confirmed by another study showing that 42% of first-time mothers had delayed lactogenesis II.

How many EBF newborns develop excessive weight loss?



Weight loss of vaginally-delivered EBF babies



Weight loss of cesarean-delivered EBF babies⁴

Dehydrated newborns are at high risk for hypoglycemia, hyperbilirubinemia, hypernatremia

How many EBF babies develop excessive weight loss?

Because of the high rates of delayed lactogenesis II and the low caloric and fluid yield of the average mother's colostrum, it is common to lose excessive weight and develop the related complications of hypoglycemia, hyperbilirubinemia, and dehydration. The largest study of EBF newborns showed that 10% of vaginally delivered and 25% of cesarean-delivered EBF newborns lost excessive weight of >10%

Causes of Readmissions, N = 5308 (17.9/1000 WBN Discharges) (Utah)	
Cause	N (%)
Feeding problems*	2170 (40.9)
Jaundice*	1873 (35.3)
Respiratory distress	1753 (33)
Rule out sepsis	1193 (22.5)
Infection	1124 (21.2)

Early Readmission of Newborns in a Large Utah Healthcare System. Pediatrics May 2013, Volume 131(5)

*The leading causes of newborn readmissions in the U.S. are complications from insufficient feeding due to early exclusive breastfeeding.⁷

***Therefore, the leading causes of newborn hospitalizations are complications associated with insufficient feeding from early exclusive breastfeeding. This is data showing the most frequent causes of readmission for one large US Healthcare system were for feeding problems and jaundice.

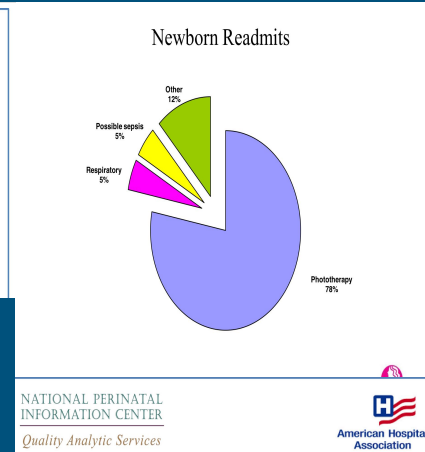
Leading Causes of Neonatal Readmission^{8,11}

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Top 8 Principal Dx Codes for Inborn Readmissions (2005- 2009)

DX Code	Percent of total 2005	Percent of total 2009	Percent change 2005-2009
774.xx Jaundice	40.1%	47.7%	17.2%
778.4 Other disturbances of temp. regulation	3.8%	5.3%	39.5%
780.6x Fever	3.3%	.7%	-78.8%
530.81 Esophageal Reflux	3.0%	.7%	-76.7%

86% of jaundice admissions result from non-hemolytic or starvation-related jaundice.¹¹



The American Hospital Association's data on U.S. neonatal readmissions showed that the PRINCIPAL diagnosis for 48% of all neonatal readmission in 2009 was jaundice. Among all the readmission, 78% of newborns received phototherapy. The literature estimates that 86% of jaundice admissions result from non-hemolytic or starvation-related jaundice.

Epidemiology of Neonatal Jaundice

Since the 1991 BFHI, hospitalizations for **starvation jaundice in breastfed newborns** have risen steadily⁹

Neonatal jaundice in EBF newborns is the **leading cause of newborn hospitalizations worldwide**.¹⁰

1.1 million a year will develop severe hyperbilirubinemia; majority caused by dehydration/underfeeding¹¹

114,000 a year die from severe jaundice¹²

Remaining survive delayed or disabled



Jaundiced babies receiving phototherapy in Vietnam. Provided by Firefly Phototherapy

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Since the publication of the exclusive breastfeeding guidelines, hospitalizations for neonatal jaundice and dehydration have risen steadily.

Neonatal jaundice is the leading cause of newborn hospitalizations in the world, the majority in underfed breastfed newborns. It is also one of the leading causes of perinatal brain injury and developmental disability in the world.

1.1 million newborns will develop severe jaundice every year, the majority in resource-poor countries with insufficient health care resources to monitor breastfeeding complications combined with increasing avoidance of supplementation previously used to prevent starvation-related complications in the first days of life.

114,000 newborns a year will die from that severe jaundice. The remaining survive their jaundice with varying degrees of developmental delay and disability.

Cerebral Palsy from Jaundice in Ghana

Hannah Awadzi is a professional journalist in Ghana who was determined to exclusively breastfeed her first born daughter, Avery. She developed jaundice by day 3. Avery was found to be severely dehydrated, hypoglycemic and had hyperbilirubinemia of 30 mg/dL by day 11.

"I was told to continue breastfeeding, meanwhile the milk was not flowing, she couldn't latch on for hours. She was never satisfied, she couldn't sleep. Milk started to flow later but it was not enough. No mention was made of supplementation to reduce jaundice."



Hannah Awadzi and daughter, Avery

Cerebral Palsy from Jaundice in Ghana

“Jaundice is very common in Ghana and a majority of children with cerebral palsy in Ghana suffered jaundice. ”

“What I am suffering now can not be measured compared to feeding the baby with formula. I wouldn't wish cerebral palsy on my worst enemy especially in our part of the world with very scarce resources to help such children. Many parents end up wishing their children dead or even killing them.”

– Hannah Awadzi



What does hyperbilirubinemia do to the brain?

Hyperbilirubinemia - > 15 mg/dL (phototherapy threshold)

- Associated with higher risk for neurological and developmental disabilities (ADHD, cerebral palsy, seizures, language delay, bilirubin-induced neurological disorder, kernicterus)¹³⁻¹⁸
- Long-term 30-year follow-up study of newborns with bilirubin > 20 mg/dL showed that 45% had long-term neurobehavioral problems (higher rates of ADHD, difficulty with reading, writing, math, inability to complete high school/college, alcoholism)¹⁹

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What does hyperbilirubinemia do to the brain?

The epidemiological data shows that hyperbilirubinemia > 15 mg/dL increases the risk of multiple developmental disabilities including ADHD, cerebral palsy, seizures, language delays to name a few.

In a 30-year follow-up study of newborns who developed bilirubins of > 20 showed that 45% developed long-term neuro-developmental problems.

How many babies develop hyperbilirubinemia?

- 10-18% of U.S. EBF newborns experience “starvation jaundice” from insufficient feeding (Academy of Breastfeeding Medicine)²⁰
- One large U.S. BFHI hospital system has reported 12-20% of their babies developed bilirubin levels of > 15 mg/dL²¹
 - Phototherapy admission rate of 10.1% = 10,583 in 3 years (9-10 babies a day)
- Scientific literature shows that by the time they require phototherapy, markers of brain injury are already present in the blood²²

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It has been estimated by the Academy of Breastfeeding Medicine that 10-18% of U.S. EBF newborns experience “starvation jaundice” from insufficient feeding

One large Baby-Friendly hospital system reported that 12-20% of babies born developed hyperbilirubinemia and that 10.1% of those newborns were admitted for phototherapy. That’s over 10 thousand babies in 3 years.

The scientific literature has shown that by the time they meet criteria for phototherapy, markers of brain injury are already present in the blood.

How many babies develop
hypoglycemia from exclusive
breastfeeding?

Hypoglycemia in healthy, term EBF babies

Study of 100 healthy, singleton, full term EBF newborns and incidence of hypoglycemia < 40 mg/dL within the first 48 hours²³

Strictly followed the BFHI protocol with good sucking reflex and latch

10% of all newborns developed hypoglycemia

23% of the first-born newborns developed hypoglycemia

All hypoglycemia events at 1 and 6 hours

J Clin Diagn Res. 2015 Sep;9(9):SC07-10.

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The only study of healthy, term EBF newborns experiencing strict application of the Baby-Friendly protocol, all of whom with excellent latch, looked at the incidence of hypoglycemia within the first 48 hours. This study showed that 10% of all the newborns and 23% of all first-born newborns developed hypoglycemia of less than 40 mg/dL, all occurring by 6 hours of life.

What does hypoglycemia do to the brain?

1395 newborns universally-screened for hypoglycemia by 3 hrs of life²⁴

Effects of transient hypoglycemia on **ability to pass 4th-grade standardized proficiency tests in literacy and math**

Hypoglycemia < 45 resulted in **38% reduction in passing literacy test**

Hypoglycemia < 35 and < 40, there were **50% reductions in their ability to pass the test in literacy and math**

Even with aggressive correction of hypoglycemia (IV dextrose/feeding)

Kaiser, et al. JAMA Pediatr. Oct 2015; 169(10): 913-921

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What does hypoglycemia do to the brain?

In a study published in JAMA Pediatrics, almost 1400 asymptomatic newborns were universally-screened for hypoglycemia by 3 hours of life # to look at the effects of hypoglycemia on the ability to pass the 4th grade proficiency test in literacy and math.

They found that for newborns who developed glucose levels < 45, there was a 38% reduction in their ability to pass the literacy test

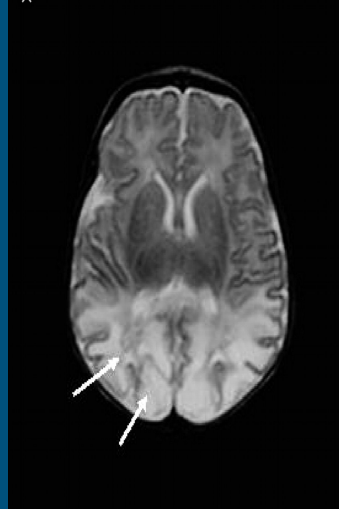
And for those who had glucoses less than 35 and 40, they were around 50% less likely to pass the tests in literacy and math

These declines in cognitive potential persisted despite aggressive correction of hypoglycemia with IV dextrose and supplemental feeding.

What this study says is that the physiologic nadir of glucose shortly after birth resulting in hypoglycemia is common but not benign and that any hypoglycemia below the critical threshold of around 50 mg/dL can occur in any newborn and can cause long-term cognitive declines.

Effects of Prolonged Hypoglycemia

Latest article on lethargic hypoglycemic breastfed newborns showed devastating levels of brain injury on MRI resulting in long-term disability²⁵



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Newborn lethargy occurs when the brain is no longer supplied with enough calories to keep the brain awake.

The most recent article on lethargic newborns who developed hypoglycemia from insufficient breast milk intake suggests that by the time they are found lethargic, they may already have devastating levels of brain injury visible on MRI

Hypoglycemia from Poor Breastfeeding

11 healthy, term, appropriate-sized breastfed newborns, found lethargic and hypoglycemia from insufficient feeding²⁵

Occurred between days 2 - 5

9 out of 11 lost < 10% of their birth weight

Found lethargic, poorly feeding, seizing, hypothermic, not breathing

5 out of 6 MRIs had brain injury present affecting a third to almost the entire brain

This article published in Hospital Pediatrics described 11 previously-healthy term exclusively breastfed babies who were found lethargic from hypoglycemia # between the 2nd and 5th days of life

9 out of 11 lost less than 10% of their birth weight

They were found lethargic, poorly feeding, seizing, hypothermic and not breathing

5 out of the 6 brain MRIs obtained found injury affecting a third to almost the entire brain

Hypoglycemia from Poor Breastfeeding

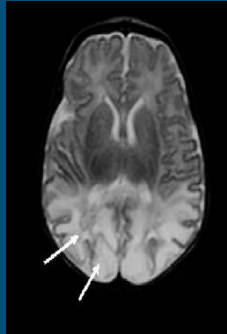
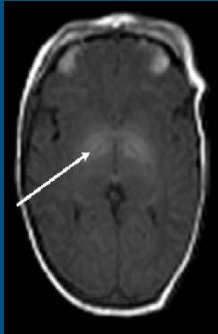
- Babies went on to have variable long-term neurological disabilities
 - Epilepsy
 - Diffuse body weakness (hypotonia)
 - Visual impairment
 - Severe feeding difficulties requiring speech therapy

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The babies went on to have long-term neurological disabilities including epilepsy, diffuse body weakness, visual impairment and feeding difficulties requiring speech therapy.

Hypoglycemia ≤ 47 mg/dl

Study of 35 newborns with symptomatic hypoglycemia - 33 babies had brain injury on MRI²⁶



Lesion Site	No. With Isolated Hypoglycemia (%)
WM abnormalities	33 (94)
Mild	5 (14)
Moderate	13 (37)
Severe	15 (43)
Nature of severe WM lesions	
Focal hemorrhage	2 (13)
Unilateral focal MCA infarction	3 (20)
Widespread infarction	10 (67)
Global	2 (13)
Symmetrical posterior parasagittal	6 (39)
Asymmetrical posterior parasagittal	2 (13)
Location of all WM lesions	
Global	13 (39)
Posterior more than anterior	4 (12)
Anterior more than posterior	2 (6)
Posterior only	6 (18)
Anterior only	0 (0)
Unilateral	2 (6)
Periventricular	12 (36)
Posterior	4 (12)
Basal ganglia or thalamic lesion	14 (40)
Normal (score 0)	21 (60)
Mild (score 0)	10 (29)
Moderate/severe (score 1)	4 (11)
PLIC	
Abnormal/absent myelination	4 (11)
Normal myelination	31 (89)
Cerebellum	2 (6)
Abnormal SI	1 (3)
Hemorrhage	1 (3)
Cortex	18 (51)
Highlightings*	12 (34)
Loss of markings*	9 (26)
Brainstem	2 (6)
Abnormal SI	1 (3)
Hemorrhage	1 (3)
Extracerebral hemorrhage	5 (14)
Intraventricular hemorrhage	3 (9)
Subarachnoid hemorrhage	0 (0)

* Not mutually exclusive.

The effects of hypoglycemia are well known. In a larger study of newborns with isolated symptomatic hypoglycemia of less than 47, 33 of 35 babies had brain injury on MRI affecting every part of the brain.

Neurological Outcomes of Hypoglycemia

Variable patterns of neurodevelopmental disabilities

- Cerebral palsy
- Mild to moderate motor deficits
- Mild to moderate cognitive deficits
- Speech and language deficits
- Visual deficits
- Febrile seizures and epilepsy

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They developed different patterns of disability, which included frank cerebral palsy as well as deficits in several areas of brain development.

How many EBF newborns
develop hypernatremia?

How many EBF newborns develop hypernatremia?

When does hypernatremia (>145 mEq/L) occur? 7% weight loss

95% of hypernatremia develop by 7% weight loss²⁷

Half of all EBF newborn babies lose $> 7\%$ of their birth weight⁴

Currently, hypernatremia is considered rare because it is not screened for in EBF newborns

Effects of hypernatremia (> 150 mEq/L) on brain development

Study of 116 cases of breastfeeding-related neonatal hypernatremia²⁸

More than 50% of babies exhibited abnormal development by 12 months

AAP Breastfeeding Guidelines 2012 recommend no greater than 7% weight loss in newborns²⁹

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At this time, the scientific literature has shown that 95% of hypernatremia occurs by 7% weight loss and at this time over HALF of all EBF newborns lose $> 7\%$ of their birth weight.

Currently, hypernatremia is considered to be rare because it is not screened for in EBF newborns.

The effects of hypernatremia on brain development are severe. A study of 116 cases of breastfeeding-related hypernatremia showed that more than 50% of babies exhibited abnormal development by 12 months of age. This is perhaps the rationale for the 2012 update of American Academy of Pediatrics Breastfeeding Guidelines recommending no greater than 7% weight loss in newborns.

How are all these
complications prevented?

By ensuring optimal breastfeeding technique then *supplementing with adequate milk* if breast milk is not enough *before* they develop starvation-related complications

Majority of hospitalizations are preventable

- The majority of hyperbilirubinemia, hypoglycemia, dehydration are preventable with adequate feeding
- Honest infant feeding education on both breastfeeding technique, **signs of hunger, insufficient feeding and need for supplementation**
- Hospital infant feeding policies that **prioritize infant safety** and prevention of feeding complications over exclusivity of breastfeeding
- We can protect an underfed child with supplementation **while still maintaining the stimulus required to produce breast milk**

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- The majority of hyperbilirubinemia, hypoglycemia, dehydration are preventable with adequate feeding
- This is only possible with HONEST infant feeding education on both breastfeeding technique as well as the signs of infant hunger and insufficient feeding when supplementation is needed. This includes teaching all mothers that supplementation can prevent brain injury when breast milk is not enough.
- We need hospital infant feeding policies that prioritize infant safety and prevention of feeding complications over the goal exclusive breastfeeding
- Furthermore, we can protect an underfed breastfed child with supplementation while still maintaining the stimulus required to produce breast milk

How Do We Change Infant Feeding Standards to Prevent Feeding Complications and Perinatal Brain Injury?

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Preventing injury to the brain and vital organs by closely monitoring feeding are literally the most important things we can do in health care to protect babies. The consequences of crossing the starvation threshold are IRREVERSIBLE. Supplementation before crossing that threshold is one of the most cost-effective ways to protect infant health.

Update the Message: Feed the Baby Safely

Update the message regarding breastfeeding to reflect what the scientific data says about the realities of breastfeeding with the goal of preserving the integrity of the brain and vital organs.

Breast milk supply is variable and at times insufficient, especially in the first days of life. Supplementation can prevent unintended starvation and disability.

Allowing a child to go hungry to achieve high exclusive breastfeeding rates is unsafe and has irreversible consequences.

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We need to update the message being taught to mothers all over the world to reflect what the scientific data says about the realities of breastfeeding - the math and physics of breast milk supply and the caloric and fluid requirements of newborns -- with the explicit goal of preserving the integrity of the brain and vital organs.

The biological norm is for breast milk supply to be variable and at times insufficient, especially in the first days of life. The reality that mothers are not being taught is that supplementation can prevent unintended starvation and disability and that our primal instincts have protected children from those dangers for millennia.

Allowing a child to go hungry to achieve high exclusive breastfeeding rates is unsafe and has irreversible consequences and this is a standard of care that is being promoted all over the world. Most of all, newborn fasting to achieve exclusive breastfeeding represents hunger, thirst and suffering that every mother has the human right to prevent.

Safe Supplementation vs. Underfeeding

Breast milk substitutes in the form of wet nurse milk, sugar water and animal milk have been used throughout history to prevent starvation when breast milk is not enough.

Insufficient breast milk is in fact *common* between birth to 6 months and only one episode of acute starvation can disable a child for life.

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Breast milk substitutes in the form of wet nurse milk, sugar water and animal milk have been used throughout history to prevent starvation when breast milk is not enough.

The reality is that insufficient breast milk is a common problem between birth to 6 months in the vast majority of mothers and only one episode of acute starvation can disable a child for life.

Safe Supplementation vs. Underfeeding

Educate on *safe* breastfeeding

- Teach mothers the signs of insufficient feeding
- Teach mothers when supplementation is needed while preserving breast milk supply
- Teach safe preparation of breast milk substitutes
- Prioritize access to clean water

Teaching mothers to avoid supplementation does not guarantee sufficient breast milk production and may increase risk of preventable infant morbidity, brain injury and lifelong disability

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We need to openly weigh the risks of supplementation vs. the risks of underfeeding when we educate mothers on breastfeeding. The risks of underfeeding far outweigh the risks of supplementation with safe breast milk substitutes.

We need to educate mothers about *safe* breastfeeding, which includes teaching them the signs of infant hunger and distress, when supplementation is needed and how to preserve breast milk supply while supplementing. They need education on safe preparation of breast milk substitutes for when it is necessary. And finally, if we are going to promote safe feeding for all children, we need to prioritize access to clean water.

Teaching mothers to avoid supplementation does not guarantee sufficient breast milk production and can increase the risk of preventable infant morbidity, brain injury and lifelong disability.

Prioritize Optimal Nutrition of Newborns

“Estimated that the prevalence of women who overtly fail to produce enough milk may be as high as 10–15%.”³⁰

“Prevalence of lactation “insufficiency” may be much higher, as 40–50% of women in the US and 60–90% of women internationally cite “not producing enough milk” as the primary reason for weaning prior to 6 months.”

– Shannon Kelleher, Ph.D., Human Milk Investigator

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It has been estimated by human milk investigator Dr. Shannon Kelleher that the prevalence of women who overtly fail to produce enough milk may be as high as 10-15% and that the prevalence of lactation “insufficiency” may be much higher, as 40-50% of women in the US and 60-90% of women internationally cite “not producing enough milk” as the primary reasons for weaning prior to 6 months.

This is not a misperception among mothers. At this time, there is no quantitative data supporting that the vast majority of mothers have sufficient breast milk to exclusively breastfeed to 6 months of age. Low world exclusive breastfeeding rates reflect natural variations in breast milk production in the population, not a failure of education.

Prioritize Optimal Nutrition of Newborns

Pressure to achieve exclusive breastfeeding is contributing to an epidemic of neonatal feeding complications, preventable hospitalizations, unrecognized brain injury, lower academic achievement and long-term disability.

Publicly acknowledging the common problem of insufficient breast milk and the importance of supplementation to protect the brain can prevent millions of complications and newborn injuries.

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The pressure to achieve exclusive breastfeeding is contributing to an epidemic of neonatal feeding complications, preventable hospitalizations, unrecognized brain injury, lower academic achievement and long-term disability.

Publicly acknowledging the common problem of insufficient breast milk and the importance of supplementation to protect the brain can prevent millions of complications, hospitalizations and newborn injuries.

We are asking the WHO to assist us in making infant feeding safe for all infants by ensuring that all babies have access to enough milk to preserve the integrity of their brain and vital organs. Being fully fed is a basic human right that is not currently met by the standard of care. It is our hope that the experts present can come together to critically evaluate the current standard of care to prevent and eliminate these unacceptable outcomes.

Appendix

Do Ketones Protect the Neonatal Brain?

Study of 44 fasting newborns - rates of hypoglycemia < 40 mg/dL, ketone (BOB, AcA) production³¹

Found low levels of ketones in fasted neonates, much lower than that found in fasting older infants

Found no increase in ketone production in hypoglycemic newborns

Term AGA	4/24	17%
Pre-Term AGA	2/9	22%
Term SGA	5/6	83%
Pre-Term SGA	3/5	60%

	Neonates	Older Infants
BOB (mM/L)	<0.4	2.4
AcA (mM/L)	<0.06	0.28

Neonates Dependent on Plasma Glucose

"These data indicate that the rate of ketone synthesis is limited during the immediate newborn period."

"The low levels of ketones found in the present study, therefore, suggest that, compared to older infants, ketones contribute little to brain metabolism during fasting in neonates."

"In turn, this implies that newborn infants may be almost completely dependent on adequate plasma glucose concentrations to support CNS metabolism."

How can this be if we survived through EBF?

No historical evidence that we primarily fed babies through *exclusive* breastfeeding from a single mother from birth prior to the WHO BFHI.

Before the WHO BFHI, newborns were near-universally *supplemented* in the first days of life with **prelacteal feeding** (milk of wet nurses, animal milk or sugar water)

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How can this be if our species was propagated by the practice of exclusive breastfeeding?

If you look at the published data on native practices of breastfeeding countries all over the world, there is no historical evidence that we have ever exclusively breastfed from birth from a single mother.

Before the WHO guidelines, newborns were near-universally supplemented in the first days of life with prelacteal feeding, most commonly with the milk of wet nurses, animal milk or sugar water.

High Breastfeeding Rates Despite Supplementation

Country (Survey date)	Prelacteal Feeding	Median BF Duration	BF @ 1 year / 2 year
Vietnam (1997)	<u>Nearly 100%</u> ³²	16.7 months	80.2% / 23.3%
India (1992-1993)	<u>87.9%</u> , ³³ , <u>99%</u> ³⁴	24.4 months	87.5% / 67.5%
Gambia (2000, earliest)	<u>98%</u> ³⁵	No data	96.8% / 53.9%
Nigeria (1990)	<u>Nearly 100%</u> ³⁶	19.5 months	86.4% / 42.9%
S. Africa (1998)	<u>57% mix-fed; 47.1% PLF</u> ³⁷	16 months	66.6% / 30.4%
Bangladesh (1993-94)	<u>90%</u> ³⁸	>36 months	95.5% / 86.5%
Pakistan (1990-91)	<u>Nearly 100%</u> ³⁹	19.9 months	78.2% / 51.7%

From the WHO Global Data Bank on Infant and Young Child Feeding ⁴⁰

This is a sampling of countries showing the prevalence of prelacteal feeding, showing 88-100% of newborns received some form of supplementation in the first days of life. Yet despite the high incidence of prelacteal feeding, the vast majority of babies were breastfed to 1-2 years of age without ever experiencing the fasting conditions imposed by early exclusive breastfeeding.

Why was prelacteal feeding common?

- Most common answer from breastfeeding mothers is “not enough milk”
- 2002 Study of 1100 healthcare workers in Kaduna, Nigeria⁴¹
 - 68.2% of doctors, 70.2% of nurses gave prelacteal feeds
 - Nurses gave prelacteal feeds for “perceived” milk insufficiency
 - Doctors gave prelacteal feeds to prevent dehydration, hypoglycemia and neonatal jaundice

*Eur J Clin Nutr. 2002 Aug;56(8):729-34.

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Why was prelacteal feeding common? The most common answer given by breastfeeding mothers is that their **milk is not enough**. Simply put, mothers used prelacteal feeds because they used their maternal instincts and common sense and did not want their babies to starve while waiting for their milk to come in.

In fact, a study of Nigerian nurses and doctors found nurses gave these feeds for milk insufficiency, while doctors gave them to prevent dehydration, hypoglycemia and neonatal jaundice. Now, these complications are the most common causes of newborn hospitalization in the world.

Supplementation Does Not Discourage Breastfeeding

Randomized 40 EBF healthy, term infants 24-48 hours \geq 5% weight loss⁴²

At 1 week, 47% supplemented newborns were EBF vs. 10% in unsupplemented group ($p = 0.01$)

At 3 months, 79% supplemented newborns were EBF vs. 42% of unsupplemented newborns ($p=0.02$)

Supplementation NEARLY DOUBLED EBF at 3 months

[Pediatrics](#), 2013 Jun;131(6):1059-65.

Randomized 104 healthy, term infants 24-48 hours \geq 5% weight loss⁴³

No differences in rates of exclusive and any breastfeeding (p-values for EBF, ABF)

Discharge ($p = 0.2$, $p>0.99$)

3 months ($p=0.12$, 0.10)

6 months ($p=0.45$, 0.34)

[PLoS One](#), 2016 Feb 26;11(2):e0150053.

Supplementation does not discourage breastfeeding. When mother-baby dyads are randomized to receive early supplementation after breastfeeding at weight loss 5% or greater, supplementation either had no effect or nearly doubled the rates of exclusive breastfeeding in the following months.