
Dr LOW YEN LING
Director, Research & Development
Abbott Nutrition R&D Asia-Pacific Center
Outline

• Importance of maternal nutrition for good headstart to life

• International evidence
  - Role of maternal nutritional supplementation

• Local evidence
  - First ever maternal milk supplementation study in Vietnam
Outline

• Importance of maternal nutrition for good headstart to life

• International evidence
  ➢ Role of maternal nutritional supplementation

• Local evidence
  ➢ First ever maternal milk supplementation study in Vietnam
Risk Factors for Childhood Stunting in 137 Developing Countries: A Comparative Risk Assessment Analysis at Global, Regional, and Country Levels

Goodarz Danaei¹,² *, Kathryn G. Andrews¹, Christopher R. Sudfeld¹, Günther Fink¹, Dana Charles McCoy³, Evan Peet¹,⁴, Ayesha Sania¹, Mary C. Smith Fawzi⁵, Majid Ezzati⁶,⁷, Wafaie W. Fawzi¹,²,⁸
Term, small for gestational age (TSGA) is the leading risk factor for stunting worldwide.
Maternal nutrition - Key to healthy birth outcomes and successful breastfeeding
Optimal nutrition during pregnancy to support normal and healthy fetal development

- **Energy:** +50 kcal  +250 kcal  +450 kcal
- **Protein:** +1 g  +10 g  +30 g
- **Minerals (iron, zinc, calcium & iodine):** +20% to 50% compared with non-pregnant, non-breastfeeding women
- **Vitamin (B vitamin, vitamin A, C & D):** +10% to 50% compared with non-pregnant, non-breastfeeding women

Build energy and nutrient store for later breastfeeding
Optimal nutrition during breastfeeding contributes the success of breastfeeding

Requirements during breastfeeding are higher than during pregnancy for most nutrients

<table>
<thead>
<tr>
<th></th>
<th>First 6 months</th>
<th>Second 6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy:</strong></td>
<td>+500 kcal (10% higher than in pregnancy)</td>
<td></td>
</tr>
<tr>
<td><strong>Protein:</strong></td>
<td>+19 g</td>
<td>+13 g</td>
</tr>
<tr>
<td><strong>Minerals (zinc, calcium, iodine):</strong></td>
<td>+ 8 to 15% compared with pregnant women</td>
<td></td>
</tr>
<tr>
<td><strong>Vitamin (B vitamin, vitamin A, C &amp; E):</strong></td>
<td>+ 5 to 50% compared with pregnant women</td>
<td></td>
</tr>
</tbody>
</table>
Healthy Birth Outcomes

• Birth weight
• Birth length
• Birth head circumference
Birth outcomes (even within normal range) associated with later IQ in Singapore babies

**TABLE 2**  Relationship of BL, BW, HC, and GA With Childhood IQ

<table>
<thead>
<tr>
<th></th>
<th>All Children, $\beta$ Coefficient (95% CI)</th>
<th>Excluding BW &gt; 4 kg, BW &lt; 2.5 kg, GA &lt; 37 wk, HC &gt; 36 cm, HC &lt; 32 cm, $\beta$ Coefficient (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IQ Score, Model 1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>IQ Score, Model 2&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>IQ Score, Model 1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>IQ Score, Model 2&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>BL, per 1-cm increase</td>
<td>0.37 (0.14 to 0.61)</td>
<td>0.49 (0.19 to 0.78)</td>
</tr>
<tr>
<td>$p$</td>
<td>0.002</td>
<td>0.001</td>
</tr>
<tr>
<td>BW, per 1-kg increase</td>
<td>1.37 (0.24 to 2.49)</td>
<td>2.19 (0.60 to 3.77)</td>
</tr>
<tr>
<td>$p$</td>
<td>0.017</td>
<td>0.007</td>
</tr>
<tr>
<td>HC, per 1-cm increase</td>
<td>0.42 (0.08 to 0.75)</td>
<td>0.62 (0.21 to 1.04)</td>
</tr>
<tr>
<td>$p$</td>
<td>0.015</td>
<td>0.003</td>
</tr>
<tr>
<td>GA, per 1-wk increase&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.05 (−0.32 to 0.41)</td>
<td>0.04 (−0.34 to 0.43)</td>
</tr>
<tr>
<td>$p$</td>
<td>0.805</td>
<td>0.821</td>
</tr>
</tbody>
</table>

<sup>a</sup> GA was not adjusted for in these models.

<sup>b</sup> Linear regression model of IQ scores, adjusted for age, gender, ethnicity, school, and mother’s education.

<sup>c</sup> Linear regression model of IQ scores, adjusted for age, gender, ethnicity, school, mother’s education, BMI, mother’s age at birth, mother’s and father’s smoking, family size, birth order, and GA.

Broekman et al, 2009
Head circumference associated with different aspects of later IQ

<table>
<thead>
<tr>
<th>Head Growth Variable</th>
<th>Regression Coefficient (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not Adjusted for Parental Factors</td>
</tr>
<tr>
<td><strong>Full-scale IQ</strong></td>
<td></td>
</tr>
<tr>
<td>Head circumference at birth SDS</td>
<td>2.14 (1.02–3.26)(^a)</td>
</tr>
<tr>
<td>Conditional head growth</td>
<td></td>
</tr>
<tr>
<td>Between birth and 1 y</td>
<td>2.60 (1.27–3.94)(^a)</td>
</tr>
<tr>
<td>Between 1 and 4 y</td>
<td>1.59 (—0.70 to 3.37)</td>
</tr>
<tr>
<td><strong>Verbal IQ</strong></td>
<td></td>
</tr>
<tr>
<td>Head circumference at birth SDS</td>
<td>1.33 (0.23–2.41)(^a)</td>
</tr>
<tr>
<td>Conditional head growth</td>
<td></td>
</tr>
<tr>
<td>Between birth and 1 y</td>
<td>2.57 (1.27–3.86)(^a)</td>
</tr>
<tr>
<td>Between 1 and 4 y</td>
<td>1.06 (—0.69 to 2.80)</td>
</tr>
<tr>
<td><strong>Performance IQ</strong></td>
<td></td>
</tr>
<tr>
<td>Head circumference at birth SDS</td>
<td>2.42 (1.26–3.57)(^a)</td>
</tr>
<tr>
<td>Conditional head growth</td>
<td></td>
</tr>
<tr>
<td>Between birth and 1 y</td>
<td>1.79 (0.41–3.16)(^a)</td>
</tr>
<tr>
<td>Between 1 and 4 y</td>
<td>1.83 (—0.01 to 3.68)</td>
</tr>
</tbody>
</table>

Parental factors were parental education, social class, parenting score, duration of breastfeeding, maternal age, history of postnatal depression, and number of older siblings.

\(^a\) P < .05.

Gale et al, 2006
Outline

• Importance of maternal nutrition for good headstart to life

• International evidence
  ➢ Role of maternal nutritional supplementation

• Local evidence
  ➢ First ever maternal milk supplementation study in Vietnam
Supplementation with Multiple Micronutrients Intervention Trial (SUMMIT) in Indonesia

Supplementation duration from enrolment to 3 months postpartum

**Neonatal outcomes**
- 14% ↓ in Low Birth Weight
- 11% ↓ in fetal loss & neonatal deaths
- 18% ↓ in 3m infant mortality

**Cognition outcomes: 3-5 years**
- ↑ motor ability
- ↑ visual attention/ spatial ability in children of undernourished mothers

**Cognition outcomes: 9-12 years**
- ↑ procedural memory (equivalent to half year schooling)
- ↑ in 18 out of 21 tests

SUMMIT study group, Lancet 2008
Prado et al, Pediatrics 2012
Prado et al, Lancet Global Health 2017
Supplementation of multiple micronutrients is more effective than iron and folic acid alone and has long term benefits on child cognitive development.
Protein energy multivitamins supplementation during the last trimester improves birth weight in Asian mothers at nutritional risk who lived in UK

Nutritionally at-risk pregnant women, 28 wks gestation N=39

- **ProEnVi Multivitamins, glucose syrup + protein (425 kcal)** N=15
- **EnVi Multivitamins + glucose syrup (425kcal)** N=12
- **Vi Multivitamins** N=12

Supplementation duration from 28-38 weeks gestation

No differences in other growth parameters

**Crude birth weight (g)**
- p≈ 0.05 (ProEnVi vs. Vi)

- **Mean z-score (local growth reference)**
  - P<0.02 (ProEnVi vs. Vi)

*Viegas et al, Clin Res Edu 1982*
Impact of fortified food supplement vs. multiple micronutrient supplementation on birth outcomes in African women

Fortified food supplement
(Multiple micronutrients plus spread providing 373 kcal)
N=655

Multiple micronutrients
N=641

Pregnant women
(40% trimester 1,
55% trimester 2, 5% trimester 3)
N=1296

Huybregts et al, AJCN 2009
Supplementation of protein, energy and multiple micronutrients is more effective in improving birth outcomes compared with multiple micronutrient supplementation alone.
Higher energy food supplementation increases breast milk production in nutritionally at-risk breastfeeding mothers.

**Nutritionally at-risk breastfeeding women 5wks postpartum**

- **Higher energy fortified food supplement** (510 kcal, 10% protein, 45% carbohydrate, 45% fat)  
  - N=27

- **Low energy fortified supplement with lower micronutrients** (119 kcal, 12% protein, 72% carbohydrate, 16% fat)  
  - N=26

**Gonzalez-Cossio et al, J Nutr 1998**

**Graphs:**
- **Mean infant milk intake (g)**  
  - Week 10: Intervention > Control (p=0.04)
  - Week 20: Intervention > Control
  - Week 25: Intervention > Control
- **Exclusive breastfeeding rate**  
  - Intervention > Control (p<0.05)
Maternal nutritional supplementation during breastfeeding helps improve breastfeeding performance
Outline

• Importance of maternal nutrition for good headstart to life

• International evidence
  ➢ Role of maternal nutritional supplementation

• Local evidence
  ➢ First ever maternal milk supplementation study in Vietnam
How can a daily continued maternal milk supplementation from pregnancy to breastfeeding in conjunction with lactation support help mothers and babies – New evidence in Vietnamese mothers

The key findings of this study are also mentioned in the Maternal Nutrition Guideline
To evaluate the effects of a lactation support program consisting of:

- Maternal milk supplementation twice daily
- Pre- and postnatal breastfeeding education and consultation

on birth outcomes and breastfeeding performance in Vietnamese mothers
Vietnamese pregnant women (N=228)
- 26-29 weeks gestation
- 20-35 y
- pre-pregnant BMI <25

Control N=114

Intervention N=114

2 servings of maternal milk/day + Lactation support*

Folic acid & iron supplement + breastfeeding advice if available

- Primary outcome: Exclusive breastfeeding rate
- Other outcomes:
  - Infant’s breast milk intake
  - Infant’s anthropometry
  - Mother’s dietary intake and anthropometry

* Lactation support consists of one prenatal BF class, 1 consultant visit within 48 h of delivery, one telephone follow-up at 1 week postpartum and one follow-up at 1 month postpartum
Study Sites

1. Hà Nam
2. Ninh Bình
3. Hải Phòng
4. Thái Nguyên
## Baseline characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Intervention N=113</th>
<th>Control N=113</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), mean (SD)</td>
<td>23.9 (2.7)</td>
<td>24.1 (3.0)</td>
<td>0.8142*</td>
</tr>
<tr>
<td>Education level, n (%)</td>
<td></td>
<td></td>
<td>0.7081**</td>
</tr>
<tr>
<td>Primary</td>
<td>1(0.9)</td>
<td>2(1.8)</td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>27(23.9)</td>
<td>32(28.3)</td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>43(38.1)</td>
<td>36(31.9)</td>
<td></td>
</tr>
<tr>
<td>Colleague/University</td>
<td>42(37.2)</td>
<td>43(38.1)</td>
<td></td>
</tr>
<tr>
<td>Pre-pregnant BMI (kg/m²), mean (SD)</td>
<td>19.2 (0.2)</td>
<td>19.2 (0.2)</td>
<td>0.8203***</td>
</tr>
<tr>
<td>Mid upper arm circumference, mean (SD)</td>
<td>24.1 (1.9)</td>
<td>24.2 (2.4)</td>
<td>0.7471***</td>
</tr>
<tr>
<td>Delivery mode, n (%)</td>
<td></td>
<td></td>
<td>0.4872**</td>
</tr>
<tr>
<td>Normal delivery</td>
<td>76 (68.5)</td>
<td>80 (72.7)</td>
<td></td>
</tr>
<tr>
<td>C-section</td>
<td>35 (31.5)</td>
<td>30 (27.3)</td>
<td></td>
</tr>
</tbody>
</table>

*p-values is calculated from * Wilcoxon test, ** Chi-square test and ***t-test*
Intervention reduces risk of small for gestational age birth outcomes

P-value is from Chi-square test
Not too small, not too big - Improved percentage of infants in healthy z-score range
Intervention had significantly higher exclusive breastfeeding rate over 12 weeks postpartum.

P-value from GEE analysis, controlling for mother’s MUAC, delivery mode, infant gender, study site and visit.

Improve full breastfeeding rate by 42%
10% more breast milk production in half of mothers with lower nutritional status

P-value is from GEE analysis, controlling for MUAC, wealth index score, study site and visit
**Intervention babies also had better postnatal growth**

![Bar graph showing mean z-scores for weight for age, length for age, and head circumference for age at 12 weeks old for intervention and control groups.](graph.png)

- **Weight for age**: Control group showed a higher mean z-score (p=0.0528 **)
- **Length for age**: Control group showed a higher mean z-score (p=0.0720 **)
- **Head Circumference for age**: Control group showed a higher mean z-score (p=0.0279 **)

* P-value is from ANCOVA analysis controlling for mother’s age, mother’s mid arm circumference and infant gender
** P-value is from GEE analysis considering repeated measures of growth indicators at birth, weeks 4, 8 and 12 controlling for mother's mid arm circumference and/or infant gender and/or wealth index score, and/or site and visit
Intervention had significantly higher percentage of mothers with nutritional adequacy of wide range of nutrients.

Vietnam RNIs, NIN 2016

P-value is from Chi-square test, \(^{a} p<0.0001\), \(^{b} p<0.001\)
Intervention mothers had significantly higher energy and macronutrient intake

P-value is from repeated measure ANOVA for log transformed energy and protein intake
How does the supplement affect weight gain during pregnancy and weight loss after delivery?
Both groups had similar weight measurements at all time points during pregnancy and post-delivery.

P-value is from repeated measure ANCOVA, controlling for baseline energy intake and study site’s effect.
## Summary of key study findings

Maternal milk supplementation as part of a lactation support program is clinically proven to help:

- ✔ Improve birth outcomes and postnatal growth
- ✔ Improve and sustain exclusive breastfeeding
- ✔ Support weight management of mothers during pregnancy and post-delivery
Key considerations when recommending maternal nutrition supplementation

- Provide key micronutrients to build up mother’s nutritional stores to support breast milk production and fetal growth & development.
- To meet mother’s increased nutritional demands during pregnancy and for breast milk production.
- Balanced protein, carbohydrate & energy.
- Low fat to prevent excessive weight gain of mother.
- Contains long chain polyunsaturated fatty acids such as DHA to support fetal development.
Conclusions

• Maternal nutrition plays an extremely important role to improve health and development of future generations

• First ever maternal milk supplementation study in Vietnam demonstrated that such supplement is clinically proven to improve birth outcomes and breastfeeding success in Vietnamese moms and babies.
IT'S EASIER TO BUILD STRONG CHILDREN THAN REPAIR BROKEN MEN.

FREDERICK DOUGLASS