A Potpourri of Adolescent Health Outcomes Related to Breastfeeding Duration and Exclusivity

Sheila Gahagan, M.D., M.P.H.
Department of Pediatrics
Academic General Pediatrics, Child Development and Community Health
University of Chile
Institute for Nutrition and Food Technology
Infancy IDA Preventive Trial

Preventive Trial

1991-94
- Infants on ≥ 250 ml/day cow milk or formula
  - Assign to High-iron formula (430)
  - Assign to Low-iron formula (408)

1994-96
- Infants on ≥ 250 ml/day cow milk or formula
  - Assign to High-iron formula (175)
  - Assign Cow milk, vits-iron (404)
- Infants on < 250 ml/day cow milk or formula
  - Assign Vits-iron (112)
  - Assign Vits-iron (130)

Supplemented (1123)

No Added Iron (534)
Descriptive Statistics

- Sample size - 1657
- Birthweight - 3.5 kg
- Gestational age - 39.4 weeks
- All but 8 infants were initially breastfed
- 64% breastfeeding at 1- year
- Age at first bottle - 3.6 months
- 6-month weight/age percentile – 43 %ile
- Low-middle income
- Number of people in family - 5.3
- Maternal age 26.7 years
- Maternal education – 9 years
- Father absent – 15%
BMI change related to infant feeding first 28 days

Adjusted for maternal characteristics & BMI, birth weight, gender.
Health Outcomes Related to Breastfeeding Measured in Adolescence

Metabolic syndrome risk
Satiety responsiveness and eating behavior
Bone mineral density
Adiponectin levels
1. Metabolic Syndrome Risk in Adolescence

- Metabolic Syndrome
  - Central obesity
  - High triglycerides
  - Low high density lipoproteins (HDL)
  - Hypertension
  - High fasting blood glucose

- Global prevalence estimates are unknown but prevalence of each of the components have increased over the last few decades along with increasing rates of obesity.

- Adolescent metabolic syndrome tends to persist into adulthood.

- Breastfeeding may reduce the risk of obesity
  - Hormones in human milk, including leptin and ghrelin, may influence food intake and food preferences later in life.
## 1. Metabolic Syndrome Risk in Adolescence

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>16.6</td>
<td>16.7</td>
</tr>
<tr>
<td>BMI %ile</td>
<td>64.0</td>
<td>74.9</td>
</tr>
<tr>
<td>High waist circumference (%)</td>
<td>16</td>
<td>49</td>
</tr>
<tr>
<td>Elevated triglycerides (%)</td>
<td>7.2</td>
<td>8.0</td>
</tr>
<tr>
<td>Low HDL (%)</td>
<td>28.2</td>
<td>24.0</td>
</tr>
<tr>
<td>Elevated BP (%)</td>
<td>8.3</td>
<td>4.4</td>
</tr>
<tr>
<td>Hyperglycemia (%)</td>
<td>11.6</td>
<td>9.1</td>
</tr>
<tr>
<td>MetS (%)</td>
<td><strong>11.6</strong></td>
<td><strong>9.1</strong></td>
</tr>
</tbody>
</table>
Increased Metabolic Syndrome Risk in Adolescence

• Male sex
• Higher weight gain over the first 3 months
• Shorter duration of exclusive breast feeding
  - Introduction of the first bottle before 90 days
  (dichotomous variable)

We found that exclusive breastfeeding for 90 days was associated with a lower incidence of MS at 16 years
(β = -0.16 (-0.29, -0.04))
Breastfeeding and Risk of Metabolic Syndrome - Systematic Review

- This review included 11 studies, 2 of which were rated as “good quality” including ours.
- They found that “there may be a protective relationship between breastfeeding and metabolic syndrome in children and adolescents”.

UC San Diego
SCHOOL of MEDICINE
Understanding the role of breastfeeding in the development of satiety responsiveness and eating behavior may be important in an era characterized by abundant calorie-dense foods and a plethora of environmental cues promoting consumption.

2. Satiety responsiveness and eating behavior
Continuous line and filled circles = “still hungry” (n=55).
Dashed line and crosses = “not responsive” (n=237)
Dashed line and empty diamonds = “responsive” (n=284)
Total n = 576
EAH Paradigm
Adolescents who had breastfed < 6 months

→ Reported being hungrier, less full, and less satisfied with the breakfast.
→ They were more likely to endorse wanting to eat more, compared to those who had breastfed for 6 months or more. **Odds ratio 2.2**
→ Consumed **155 more calories** (avg) than those who had breastfed longer.

Length of breastfeeding could influence appetite regulation related to the finely tuned feedback loop between infant demand and maternal milk production.

Another plausible mechanism could be epigenetic changes related to breastfeeding.
3. Adolescent Bone Mineral Density Related to Breastfeeding Length and Exclusivity

N = 662

(β = 0.29 p < 0.05),
4. Adolescent Adiponectin Levels

- Adiponectin – insulin sensitizing and cardio-protective protein
  - Secreted by adipose tissue
  - Improves metabolism of lipids and carbohydrates
  - Anti-inflammatory effects
  - Lower adiponectin levels associated with cardiometabolic alterations
Adolescent Adiponectin Levels

- Adolescent adiponectin levels were inversely associated with
  - Insulin resistance
- Those with higher adiponectin levels had decreased odds of insulin resistance and elevated HDL-c, after controlling for fat mass index and sex

Breastfeeding duration was related to adolescent adiponectin levels
- Infants breastfed, as the sole source of milk, for > 6 months → Higher adiponectin levels at 16 years (p = 0.004)
- Higher weight gain in first six months was associated with Lower adiponectin levels at 16 years (p < 0.002)
Adolescent Health Outcomes Related to Breastfeeding Duration & Exclusivity

- Metabolic syndrome risk
- Satiety responsiveness and eating behavior
- Bone mineral density
- Adiponectin levels