Maternal nutrition – impact on preterm and low birth weight

PTB/LBW Global Technical Working Group on Implementation Challenges and Solutions

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MALNUTRITION OF THE MOTHER DIRECTLY INFLUENCES HER CHILD

*malnutrition defined as too thin, too short, or too few micronutrients*
MATERNAL NUTRITION

Short-term consequences of maternal malnutrition

<table>
<thead>
<tr>
<th>Maternal nutritional problem</th>
<th>Associated health consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short maternal status (stunting)</td>
<td>Maternal and neonatal death, SGA</td>
</tr>
<tr>
<td>Underweight</td>
<td>SGA</td>
</tr>
<tr>
<td>Obesity</td>
<td>gestational diabetes, pre-eclampsia, haemorrhage, neonatal and infant death</td>
</tr>
<tr>
<td>Anemia and iron deficiency</td>
<td>LBW, perinatal mortality, maternal and neonatal death</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>LBW, infant mortality</td>
</tr>
<tr>
<td>Zinc</td>
<td>pre-term delivery, delivery complications</td>
</tr>
<tr>
<td>Iodine</td>
<td>lowered IQ, mental retardation, sub-optimal cognitive development and growth</td>
</tr>
<tr>
<td>Folate</td>
<td>neural tube defects</td>
</tr>
<tr>
<td>Calcium &amp; Vitamin D</td>
<td>hypertension during pregnancy, pre-eclampsia, preterm birth and SGA</td>
</tr>
</tbody>
</table>

Long-term consequences of maternal malnutrition

Both short & long term consequences for mother and child

Fig. 2. Metabolic syndrome: chronic disease in adult life. (○): The small circle to the left = definition of short-term health; (□), the end points that define increased risk. High BMI and metabolic syndrome interact in defining risk for chronic disease in adult life.

Sources: Bhatta et al. Lancet 2013
Black et al. Lancet 2013
PREGNANCY COMES AT A HIGH NUTRITION COST

Total additional energy cost of
- pregnancy = 77,000 kcal *
- 6 months exclusive breastfeeding = 90,000-120,000 kcal

<table>
<thead>
<tr>
<th></th>
<th>Europe</th>
<th>Africa / Asia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Menarche</td>
<td>11 years</td>
<td>12 years</td>
</tr>
<tr>
<td># children</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td># months pregnant</td>
<td>2*9 = 18</td>
<td>4*9 = 36</td>
</tr>
<tr>
<td>Months lactation</td>
<td>2*4 = 8</td>
<td>4*18 = 72</td>
</tr>
<tr>
<td>Age Menopause</td>
<td>51 years</td>
<td>48 years</td>
</tr>
<tr>
<td># months rep life</td>
<td>43*12 = 516</td>
<td>36*12 = 432</td>
</tr>
<tr>
<td>% Rep. activity</td>
<td>(8+18) / 516 = 5%</td>
<td>(36+72) / 432 = 25%</td>
</tr>
<tr>
<td>Total energy cost</td>
<td>275,200 kcal</td>
<td>1,398,800 kcal</td>
</tr>
</tbody>
</table>

UNDERLYING NUTRITION-RELATED CAUSES OF MATERNAL DEATHS

**Iron-deficient anemia** is a risk factor for death due to hemorrhage.

Chronic Energy Deficiency contributes to prolonged labor.

Stunting contributes to obstructed labor.

Micronutrient deficiencies reduce immune response.

Calcium & vit D deficiency contribute to hypertension, pre-eclampsia and eclampsia.

Direct Causes:
- Haemorrhage: 35%
- Hypertension: 18%
- Sepsis: 8%
- Unsafe abortion: 9%
- Embolism: 1%

Indirect Causes:
- Other direct: 11%
- Indirect: 18%

www.gainhealth.org
DETERMINANTS OF LOW BIRTH WEIGHT

**Born preterm (<37 weeks)**
- Spontaneous preterm birth - multifactorial process, 50% unidentified
  - Age at pregnancy, pregnancy spacing, multiple pregnancy
  - Infections*
  - Underlying maternal (chronic) medical condition
  - **Some nutritional factors**
    - Lifestyle/work related – smoking*, stress
    - Maternal psychological health
    - Genetics
  - SES*

**VS**

**Born Small for Gestational Age (SGA) (<10th percentile)**
- Proxy for IUGR
  - Low energy intake/low gestational weight gain
  - Low BMI pre-pregnancy
  - Short stature (stunting)
  - Malaria
  - Smoking
  - Pregnancy-induced hypertension
  - Primiparity
  - Congenital anomalies
  - Genetics

Pre-term

– Pre-pregnancy weight status:
  • Underweight (↑ risk by 32%)
  • Overweight/obesity
  – Indirectly: hypertension, pre-eclampsia (↑ risk by ~2x)

Source: Bhutta, et al. (2011a)
NUTRITIONAL DETERMINANTS OF LBW

Pre-term
- Pre-pregnancy weight status:
  - Underweight (↑ risk by 32%)
  - Overweight/obesity
    - Indirectly: hypertension, pre-eclampsia (↑ risk by ~2x)
- Micronutrient deficiencies?
  - Zinc suppl →↓14% pre term
  - Calcium suppl – only if at risk of preeclampsia
  - Multiple micron suppl – risk of pre-eclampsia (27%)
  - Vit D – pre-term (↑ risk by 58%) and pre-eclampsia (~2x)
- Fatty acids? (conflicting results)
- Nutrition related disorders: Diabetes, Gestational hypertensive disorders
NUTRITIONAL DETERMINANTS OF LBW

Small for Gestational Age (SGA)
- Pre-pregnancy weight status:
  - Underweight (↑ risk by 64%)
  - Overweight/obesity
- Short stature (stunting)
- Micronutrient deficiencies
  - MN suppl → ↓ 8% IUGR/16% lbw
  - Iron def (Iron suppl → ↓ 20% lbw (+ folic acid suppl → ↓30% lbw))
  - Vit A? (ass with lbw)
  - Vit D def (↑ risk by 52%)
- Nutrition related diseases
  - Hypertension (Vit D, Calcium)
  - Anemia (M/S) - ↑ risk of SGA

**NUTRITIONAL DETERMINANTS OF LBW**

- **Pre-term**
  - Pre-pregnancy weight status:
    - Underweight
    - Overweight/obesity
      - Indirectly: hypertension, pre-eclampsia
  - Micronutrient deficiencies?
    - Zinc suppl
    - Calcium suppl
    - Vit D – pre-term and pre-eclampsia
  - Fatty acids?
  - Nutrition related disorders

- **Small for Gestational Age (SGA)**
  - Pre-pregnancy weight status:
    - Underweight
    - Overweight/obesity
  - Short stature (stunting)
  - Micronutrient deficiencies
    - Iron def
    - Vit A?
    - Vit D def
  - Nutrition related diseases
    - Hypertension (Vit D, Calcium)
    - Anemia (Mod/Sev)

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"Where LBW is highly prevalent, most is due to IUGR rather than preterm"

Black et al, 2013
HEALTHY WOMEN, MOTHERS & BABIES

IMMEDIATE
- Reproductive health & family planning
- Healthy diet, physical activity, micronutrient supplementation
- Screening & management of chronic diseases/infectious diseases (immunization)

INTERMEDIATE
Essential health services
Care for adolescent girls & women
Adequate nutrition

UNDERLYING
Healthy environment & women’s empowerment:
- Financial independence & education
- Preventing violence against women & girls

Must begin in Adolescence if to reduce the rates of prematurity and low birthweight

Adapted from WHO, 2012
Integral part of antenatal care services:

- Weight monitoring
- Nutrition counselling?
- Iron (Folate) supplements
- Other:
  - Supplements (Zn, Ca etc)?
  - Protein/calorie supplements?

Any vs recommended 90+ (may be as low as <5%)
## EVIDENCE-BASED NUTRITION INTERVENTIONS DURING PREGNANCY

### Limited impact on PTBs, some on LBW

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Pre-Term Births</th>
<th>Low Birth Weight</th>
<th>Other MNCH outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balanced Protein Energy Supplementation</td>
<td>Strong Against</td>
<td>Strong</td>
<td>Strong: Infant Mortality</td>
</tr>
<tr>
<td>Multiple Micronutrient Supplementation</td>
<td>Strong Against</td>
<td>Strong</td>
<td>Weak Against: Neonatal Mortality</td>
</tr>
<tr>
<td>Iron Folate Supplementation</td>
<td>Weak Against</td>
<td>Weak Against</td>
<td>Strong: Anemia</td>
</tr>
<tr>
<td>Zinc Supplementation</td>
<td>Weak</td>
<td>Strong Against</td>
<td>Weak</td>
</tr>
<tr>
<td>Magnesium Sulfate Supplementation</td>
<td>Weak Against</td>
<td>Weak Against</td>
<td>Weak: Supplementation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Strong: Treatment of eclampsia &amp; prevention of cerebral palsy</td>
</tr>
<tr>
<td>Calcium Supplementation</td>
<td>Weak</td>
<td>Weak</td>
<td>Strong: Preclampsia</td>
</tr>
<tr>
<td>Supplementation with Fatty Acids</td>
<td>Strong Against</td>
<td>Strong Against</td>
<td>-</td>
</tr>
</tbody>
</table>

Prevent pregnancy in adolescence
Promote birth spacing:
  – Continued breastfeeding for 2 years
Optimize pre-pregnancy weight
  – Underweight: BCC, food security
  – Overweight: availability and access to nutritious foods versus high energy dense foods; BCC
Promote healthy nutrition:
  – Supplementation
  – Food fortification
INTEGRATED SERVICE DELIVERY

**CLINICAL**
- Reproductive health & family planning
- Childbirth care
  - E.g. Hygiene, warmth, breastfeeding, resuscitation
- Emergency newborn care
- Emergency childcare

**OUTREACH / OUTPATIENT**
- Reproductive healthcare, family planning, nutrition counselling
- Antenatal care visits, calcium supplementation
- Postnatal care
  - E.g. Promotion of healthy behaviours e.g. hygiene, breastfeeding,
  - growth monitoring
- Child healthcare
  - E.g. Immunizations, nutrition (Vitamin A supplementation),
  - growth monitoring

**FAMILY / COMMUNITY**
- Adolescent nutrition
- Gender violence
- Education & empowerment
- Prevention of STIs & HIV
- Counselling & preparation for newborn care
  - Where skilled care not available, prep for clean birth and immediate newborn care (hygiene, warmth, breastfeeding)
- Healthy home care:
  - E.g. Preventative care, newborn care (hygiene, warmth), nutrition (breastfeeding, complementary feeding), family planning/birth spacing

Source: Adapted from (Kerber et al., 2007; Lawn et al., 2012). Note: interventions for preterm birth are bold. Acronyms used: ANC = Antenatal care; CPAP = Continuous positive airway pressure; HIV = Human Immunodeficiency Virus; IMCI = Integrated Management of Childhood Illnesses; IPTp = Intermittent presumptive treatment during pregnancy for malaria; pPHROM = Prelabour premature rupture of membranes; STI = Sexually Transmitted Illness
INNOVATIONS IN DELIVERY

• Start pre-conception → adolescent girls
• Intervene beyond the health system
  • Workplace
  • Community e.g. Girl centers
  • Schools
  • Sports
  • Social media
• Social change – not only individual behavior change
**Nutrition Concurrent Sessions**

Join us to find out the difference good nutrition can make in the lives of women and girls all over the world and why we must make it a priority.

**Room B3-4**

**Nutrition: A gateway to achieving the SDGs**

**Tuesday, May 17**
**10:30 - 12PM**
Share and learn how integrating nutrition in development can help us reach the SDGs.

**Room B3-2**

**Adolescent Girls’ Nutrition: The 2nd window of opportunity**

**Wednesday, May 18**
**1:30 - 2:30PM**
Learn why nutrition must be part of the agenda to economically and socially empower adolescent girls.

**Room B3-4**

**From Grassroots to Global: Women as nutrition champions**

**Wednesday, May 18**
**3 - 4PM**
Discover how women everywhere – from the household to the boardroom – can be nutrition champions and advance the cause locally and globally.

**Insights on adolescent girls nutrition behaviours**

**Thursday, May 19th 13:05 (speakers corner)**
Thank you