Southeast Asia: Nutrition in transition and its challenges for maternal and child nutrition

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Outline

• Global and regional situation (Lancet series on MCN 2013)
• Nutritional status of underfive children
• Nutritional status of women
• Micronutrient situation in children and women & emerging problems
• Infant and young child feeding
• Conclusion
Causes of mortality in children under 5 years old (2004)

- Neonatal 37%
- Acute respiratory infections 17%
- Diarrhoea 16%
- Malaria 7%
- Measles 4%
- Injuries 4%
- HIV/AIDS 2%
- Other 13%

Globally, undernutrition contributes to more than one third of child deaths


THE LANCET

Maternal and Child Nutrition

Executive Summary of The Lancet Maternal and Child Nutrition Series
Rural-urban disparity in stunting prevalence was less than disparity by wealth quintiles – Bangladesh, Brazil & Nigeria
### Child stunting/wasting w/ infection increased risks of death

<table>
<thead>
<tr>
<th>Height/Length-for-Age</th>
<th>All Deaths HR (95% CI)</th>
<th>Pneumonia Deaths HR (95% CI)</th>
<th>Diarrhoea Deaths HR (95% CI)</th>
<th>Measles Deaths HR (95% CI)</th>
<th>Other Infectious Deaths HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; -3</td>
<td>5.5 (4.6, 6.5)</td>
<td>6.4 (4.2, 9.8)</td>
<td>6.3 (4.6, 8.7)</td>
<td>6.0 (3.0, 12.0)</td>
<td>3.0 (1.6, 5.8)</td>
</tr>
<tr>
<td>-3 to &lt; -2</td>
<td>2.3 (1.9, 2.7)</td>
<td>2.2 (1.4, 3.4)</td>
<td>2.4 (1.7, 3.3)</td>
<td>2.8 (1.4, 5.6)</td>
<td>1.9 (1.0, 3.6)</td>
</tr>
<tr>
<td>-2 to &lt; -1</td>
<td>1.5 (1.2, 1.7)</td>
<td>1.6 (1.0, 2.4)</td>
<td>1.7 (1.2, 2.3)</td>
<td>1.3 (0.6, 2.6)</td>
<td>0.9 (0.5, 1.9)</td>
</tr>
<tr>
<td>&gt; -1</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight-for-Length Z-Score</th>
<th>All Deaths HR (95% CI)</th>
<th>Pneumonia Deaths HR (95% CI)</th>
<th>Diarrhoea Deaths HR (95% CI)</th>
<th>Measles Deaths HR (95% CI)</th>
<th>Other Infectious Deaths HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; -8</td>
<td>11.6 (9.8, 13.8)</td>
<td>9.7 (6.1, 15.4)</td>
<td>12.3 (9.2, 16.6)</td>
<td>9.6 (5.1, 18.0)</td>
<td>11.2 (5.9, 21.3)</td>
</tr>
<tr>
<td>-3 to &lt; -2</td>
<td>3.4 (2.9, 4.0)</td>
<td>4.7 (3.1, 7.1)</td>
<td>3.4 (2.5, 4.6)</td>
<td>2.6 (1.3, 5.1)</td>
<td>2.7 (1.4, 5.5)</td>
</tr>
<tr>
<td>-2 to &lt; -1</td>
<td>1.6 (1.4, 1.9)</td>
<td>1.9 (1.3, 2.8)</td>
<td>1.6 (1.2, 2.1)</td>
<td>1.0 (0.6, 1.9)</td>
<td>1.7 (1.0, 2.8)</td>
</tr>
<tr>
<td>≥ -1</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

### Prevalence of Small-for-gestational age (SGA)

- 20% preterms in LMIC = SGA
- RR for neonatal mortality among SGA is 1.83x of AGA; 3x of AGA for term SGA
- ~ 1 of 5 child stunting was SGA
Global prevalence & trends in child malnutrition

- **Largest stunting reduction is in Asia:**
  - 26% from 40% in 1990
  - Annual reduction rate of 2.1%
- **U5 stunting = 2.47x higher among lower quintile than richest quintile**
- **Slight gender differences in prevalence (boys > girls)**
- **Prevalence in rural areas = 1.5x of urban areas**
- **Globally,**
  - 16% = udeweight (36% reduction of 1990)
  - 8% = wasting (11% decline from 1990), but 70% U5 wasting are in Asia, severe wasting highest in S-central Asia
  - Overwt/obesity 7%, expected to rise to 9.9% in 2025, most live in LMICs; Asia=5%, but # very high (17 mill)
Development in SE Asia and

- Rapidly industrialized – 20-30 y
- Economic growth 7-10%
- Urbanization
  - rural to urban migration
  - mechanization of agriculture
  - better transport and communication in rural areas
  - expansion of industry to some rural areas
- Better access to basic services (some countries)
- More sedentary lifestyles
  - Less physical activity (energy expenditure)

- Time allocation patterns in the family, esp. women with young children
- Changing Infant and young child feeding
  - Mothers working outside (far from) home – EBF not possible
  - Shorter breastfeeding duration
  - Use of infant formula
  - Commercial complementary foods
- Changing ‘availability’ and ‘access’ to foods and other services (both urban & rural)
  - Better reach of market -- Diversity of food choices
  - Less own food production, more ‘purchased’ foods
    - Processed foods
    - Street foods
Stunting prevalence in children underfive UNICEF/EAPR

Source: UNICEF-WHO, Joint Global Malnutrition Analysis Data Set, 2011

• Inverse relationship between income and stunting may be through dietary diversity
• Increased food varieties and availability improved undernutrition (incl stunting), increased obesity later due to intakes of high energy, but low in micronutrients and changing lifestyle to sedentary

Bloem, et al, FNB 2013

Consequences of size at birth/infancy

• COHORTS project: 5 developing countries: Guatemala, Philippines, India, Brazil, South Africa
• Small size (esp. height) at birth and first 2 y were associated w/human capital: short adults, less schooling, low economic productivity; for women– LBW offspring
• Large size at 24 m – risk of high bl. Glucose, BP, lipid adjusted for adult BMI – suggesting rapid wt gain after infancy --- increase risk
• Heavier BW and faster linear growth (height) from 0-2 y – large gain in human capital; little on risk of CVD
• After 2 y of age, esp 4 y, rapid wt gain – adverse effects on adult cardiovascular risk
Early growth and cognitive performance

- Longitudinal studies showed stunting before 2-3 y old --- poor cognitive and educational performance

- Study in Khonkaen (NE Thailand) (Pongcharoen, et al, 2011)
  - IQ at 9 y of age – significantly associated w/ weight & length gains from birth to 4 months; HC at 4 months

As many as half of all adolescent girls in some countries are stunted, increasing risk of complications in pregnancy and delivery and of poor fetal growth
Comparison of pregnancy outcomes between teenage vs adult pregnancy

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Teenage pregnancy</th>
<th>Adult pregnancy</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Pregnancy anemia</td>
<td>24/214</td>
<td>11.2</td>
<td>112/1189</td>
</tr>
<tr>
<td>Weight gain &lt; 10 kg</td>
<td>101/319</td>
<td>31.7</td>
<td>551/1963</td>
</tr>
<tr>
<td>Birthweight &lt; 2500 g</td>
<td>68/450</td>
<td>15.1</td>
<td>257/2922</td>
</tr>
</tbody>
</table>

(Longitudinal study in 4 geographical areas, Thailand)
Gestational diabetes mellitus (GDM)

1. Prevalence of GDM (hospital-base data)
   - 5% Maharaj hospital, Chiangmai
   - 22.8% Siriraj hospital, Bangkok, 2005-6
   - 5.7% Phramongkutklao Hospital, Bangkok, 2003-5

2. GDM prevalence by trimester of pregnancy
   - Taksin hospital, Bangkok: Overall = 13.2%
     • 1st = 14.2% ; 2nd = 13.0% , 3rd ~ 12%

3. High risk pregnancy
   - 20.2%, Bhumibol Adulyadej Hospital, 2004

4. Pregnant women with one abnormal value of oral glucose tolerance test (OGTT), prevalence of GDM = 21.9% vs 1.8% among those having normal OGTT (Siriraj hospital, 2003-4)

5. GDM risk of DM in later adulthood

Much higher among females aged 30+y, is it related to wt retention postpartum?

Prevalence of Overweight/obesity (BMI ≥25 kg/m²), 15+ y old,

Is gestational DM risk factor?

Prevalence of Diabetes (FBG ≥ 126 mg/dl), 15+ y old,
**Prevalence of Anemia in Children and Women**

<table>
<thead>
<tr>
<th>Region</th>
<th>Total Population</th>
<th>Anemia</th>
<th>Iron Deficiency Anemia</th>
<th>Other Causes of Anemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Americas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E Mediterranean</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE Asia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W Pacific</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*WHO regions*

Prevalence of anemia/Iron deficiency - pregnant women, MOPH, 1993-4

<table>
<thead>
<tr>
<th>Status</th>
<th>Bkk</th>
<th>S</th>
<th>NE</th>
<th>N</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>58</td>
<td>24</td>
<td>38</td>
<td>48</td>
<td>25</td>
</tr>
<tr>
<td>Iron depletion</td>
<td>14</td>
<td>16</td>
<td>19</td>
<td>16</td>
<td>22</td>
</tr>
<tr>
<td>Iron deficiency</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Iron deficiency anemia</td>
<td>10</td>
<td>37</td>
<td>20</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td>Anemia, unidentified cases</td>
<td>11</td>
<td>17</td>
<td>21</td>
<td>14</td>
<td>14</td>
</tr>
</tbody>
</table>

During pregnancy, iron deficiency was confirmed in only about half of anemia.

Determinants of hemoglobin concentration in a sample of NE Thai school-aged children

<table>
<thead>
<tr>
<th></th>
<th>F-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>15.38</td>
<td>0.000</td>
</tr>
<tr>
<td>Hb type (AA or AE)</td>
<td>9.17</td>
<td>0.003</td>
</tr>
<tr>
<td>Serum retinol (µmol/L)</td>
<td>8.69</td>
<td>0.003</td>
</tr>
<tr>
<td>Serum ferritin (µg/L)</td>
<td>2.84</td>
<td>0.093</td>
</tr>
</tbody>
</table>

Children with Hb type EE and CRP>10 mg/L excluded

Thurlow, Winichagoon, et al, AJCN, 2005

P. Winichagoon, INMU
MEAN HEMOGLOBIN LEVELS OF EACH AGE GROUP
DHS surveys 1990-2000 (0-24 months of age)

- 32,756 in India, Kazakhstan, Uzbekistan, Kyrgyzstan, Guatemala, Peru, Egypt, Haiti, Armenia, Madagascar
- Hgb g/dL

<table>
<thead>
<tr>
<th>Age</th>
<th>Hb, g/L</th>
<th>ZPP μmol/mol heme</th>
<th>Ferritin μg/L</th>
<th>TIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-6 mo</td>
<td>105</td>
<td>&gt;75</td>
<td>&lt; 20 (4 mo); &lt;9 (6 mo)</td>
<td>&gt; 11</td>
</tr>
<tr>
<td>9 mo</td>
<td>100</td>
<td>&gt;90</td>
<td>&lt;5</td>
<td></td>
</tr>
</tbody>
</table>

Domellof et al, JN, 2002

Iron Requirement

First 6 mo

Exclusive breastfeeding

Iron (mg)

Breastfeeding + compl feeding

After 6 mo

Iron (mg)

P Winichagoon, INMU
Proportion and # school-aged children and general population with insufficient iodine intakes by UIC by WHO region, 2011

<table>
<thead>
<tr>
<th>WHO region</th>
<th># countries insufficient iodine</th>
<th>Insufficient iodine intakes (UIC &lt;100 μg/l)</th>
<th>School-aged children</th>
<th>General population</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Proportion, %</td>
<td>Total #, millions</td>
<td>Proportion, %</td>
<td>Total #, millions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td>10</td>
<td>39.3</td>
<td>57.9</td>
<td>40</td>
<td>321.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Americas</td>
<td>2</td>
<td>13.7</td>
<td>14.6</td>
<td>13.7</td>
<td>125.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>4</td>
<td>38.6</td>
<td>30.7</td>
<td>37.4</td>
<td>199.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>11</td>
<td>43.9</td>
<td>30.5</td>
<td>44.2</td>
<td>393.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>0</td>
<td>31.8</td>
<td>76</td>
<td>31.6</td>
<td>541.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Pacific</td>
<td>5</td>
<td>18.6</td>
<td>31.2</td>
<td>17.3</td>
<td>300.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global</td>
<td>32</td>
<td>29.8</td>
<td>240.9</td>
<td>28.5</td>
<td>1881.2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Urinary iodine concentration among children <15 y in Thailand

<table>
<thead>
<tr>
<th>Age, y</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>median</td>
<td>n</td>
</tr>
<tr>
<td>1</td>
<td>238</td>
<td>194</td>
<td>207</td>
</tr>
<tr>
<td>2-5</td>
<td>1110</td>
<td>187</td>
<td>1090</td>
</tr>
<tr>
<td>6-9</td>
<td>1059</td>
<td>147</td>
<td>1066</td>
</tr>
<tr>
<td>10-14</td>
<td>1455</td>
<td>128</td>
<td>1482</td>
</tr>
</tbody>
</table>

Health Examination Survey 4 (2008-9)
Issues related to IDD

1. Median UIC in casual urine in ‘population’ indicates risk of IDD in pop
2. Use of UIC cutoffs to define prevalence – overestimating prevalence -- more analysis forthcoming
3. Emerging issues:
   - discrepancies UIC in pregnant women vs school-aged children vs WRA in the same population
   - re-emerging IDD when IDD program slow down or stops
   - monitoring of population iodine status remains crucial & vulnerable groups (pregnant women, infants) be included
   - Several food vehicles – risk iodine excess?
4. food industry to use iodized salt in processing – tech feasibility
5. potential effects of initiatives to lower population sodium consumption on iodine intake for adequate I-status

Overweight/obesity & micronutrients

• micronutrient deficiencies among overwt/obesity is often linked to intakes of poor quality diets (high energy, low micronutrients)
• Evidence that micronutrient metabolism may be affected:
  – Iron metabolism is inversely correlated with higher BMI in WRA; overwt children had poorer response to iron supplement (Zimmermann,m et al, 2011)
  – Iodine-deficient pregnant women who were overwt prepregnancy had 3.6x increased risk of hypothryoxinemia (Gowachirapant, et al, 2013)
### Worldwide VAD prevalence and # young children and pregnant women affected by geographical region

<table>
<thead>
<tr>
<th>WHO region</th>
<th>Night blindness</th>
<th>S retinol &lt;0.7 µmol/L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preschool</td>
<td>Pregnant</td>
</tr>
<tr>
<td></td>
<td>children</td>
<td>women</td>
</tr>
<tr>
<td></td>
<td>Prev % # mill</td>
<td>Prev % # mill</td>
</tr>
<tr>
<td>Africa</td>
<td>2 2.55 9.8 3.02</td>
<td>44.4 56.4 13.5 4.18</td>
</tr>
<tr>
<td>Americas</td>
<td>0.6 0.36 4.4 0.5</td>
<td>15.6 8.68 2 0.23</td>
</tr>
<tr>
<td>Europe</td>
<td>0.8 0.24 3.5 0.22</td>
<td>19.7 5.81 11.6 0.72</td>
</tr>
<tr>
<td>Eastern</td>
<td>1.2 0.77 7.2 1.09</td>
<td>20.4 13.2 16.1 2.42</td>
</tr>
<tr>
<td>Mediterranean</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southeast</td>
<td>0.5 1.01 9.9 3.84</td>
<td>49.9 91.5 17.3 6.69</td>
</tr>
<tr>
<td>Asia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western</td>
<td>0.2 0.26 4.8 1.09</td>
<td>12.9 14.3 21.5 4.9</td>
</tr>
<tr>
<td>Pacific</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global</td>
<td>0.9 5.17 7.8 9.75</td>
<td>33.3 190 15.3 19.1</td>
</tr>
</tbody>
</table>


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### VAD and VAS

- **VAS for underfives every 6 m**
  - Coverage
  - Sustainability
- **Phasing-in Food-based strategy**
  - What – dietary diversity, food fortification?
  - How to scale-up
  - Effectiveness in large scale implementation
- **VA for lactating women – Breast milk VA**
Emerging or unrecognized micronutrient MN

- **Vitamin D deficiency**
  - Cutoffs remain debatable – prevalence?
  - VDD is a problem in tropical countries
- **Neural tube defects due to folate deficiency**
  - Data on NTD not accurate
  - Possibility to use biomarkers e.g., serum folate for pop assessment – folate ‘insufficiency’ to implicate needs for intervention
- **Zinc – insufficient intakes and low S. zinc**
  - No large scale data to confirm PH problem
  - Zn supplement in treatment of diarrhea being scaled up

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**IYCF in Myanmar**

<table>
<thead>
<tr>
<th>Early initiation of breastfeeding (%)</th>
<th>76</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusive breastfeeding &lt;6 months (%)</td>
<td>24</td>
</tr>
<tr>
<td>Introduction of solid, semi-solid or soft foods 6-8 months (%)</td>
<td>81</td>
</tr>
<tr>
<td>Breastfeeding at age 2 (%)</td>
<td>65</td>
</tr>
</tbody>
</table>
**Issues on IYCF**

- Declining BF, esp EBF upto 6 mo is not achievable in several countries in development transition:
  - Working mothers – not EBF or BF for short duration
  - H/Nutrition during pregnancy & lactation (inadequate milk)
  - Beliefs – giving water or prelacteal feeds
- Inappropriate complementary feeding (CF)
  - Timing – too early or too late
  - Quality/quantity of CF – nutrient density
Summary

1. Nutrition in transition is observed in most countries in SEA
2. Stunting and wasting still highly prevalent in several countries; Rapid increased in overweight and obesity in children and women, where undernutrition may or may not be highly prevalent – Double Burden of Malnutrition
3. Micronutrient deficiencies of PH importance (VAD, IDA, IDD) may still be high, but overt deficiencies are disappearing, while new problems are emerging
4. Income – important determinants, operated via dietary diversity
5. Unbalance diets (high energy low micronutrients) coupling with more sedentary lifestyles
6. Infant and young child feeding continues to be a challenge:
   – Low or short duration of exclusive breastfeeding
     • Declining trends and shorter duration of breastfeeding
   – Inappropriate complementary feeding
   – Maternal nutrition during pregnancy & lactation
7. Maternal overnutrition – prepregnancy, pregnancy and postpartum; Adolescent mothers
8. Early life nutrition (1000 d) – aiming at optimal fetal & child nutrition and development
   – Who should be target groups: Adolescent girls or pre-pregnancy
   – What is/are feasible implementation strategy

Thank you for your attention