Conquering the Iodine Deficiency in the Northeast

S. Phuk, Janya, Narumonda
Professor of Pediatrics
Faculty of Medicine
Khon Kaen University
Thailand

Iodine deficiency disorders (IDD)

- Hypothyroidism
- Cretinism

Iodine status

- Iodine supplementation

Thyroid hormone

- Thyroxin (T4)
- Triiodothyronin (T3)

Increased basal metabolic rate
Long bone growth
Neuronal maturation
Fat, protein, carbohydrate, vitamins metabolism
Growth and development

Iodine deficiency disorders (IDD)

Goiter
Spectrum of Iodine deficiency disorders (IDD)

- IDD - The most common cause of preventable mental retardation
- All ages
- Fetus
- Neonate
- Child and adolescent
- Adults

Spectrum of Iodine deficiency disorders (IDD)

- Brain damage
- Growth failure
- Goiter
- Mental retardation, Low IQ

Spectrum of Iodine deficiency disorders (IDD)

- Fetus
  - Spontaneous abortion
  - Still birth
  - Congenital anomalies
  - Perinatal mortality

Spectrum of Iodine deficiency disorders (IDD)

- Neonate
  - Endemic cretin, MR, mutism
  - Spastic diplegia, squint
  - Short stature
  - Infant mortality

Spectrum of Iodine deficiency disorders (IDD)

- Child and adolescent
  - Impaired mental function
  - Delayed physical development
  - Goiter
  - Iodine induced hyperthyroidism

ระดับไอคิวในเด็กนักเรียน 6-15 ปี
IQ < 100

• 17/38 จังหวัดอยู่ในภาคอีสาน
  ลำดับที่ จังหวัด  IQ เฉลี่ย  N (/comment)
  63 ขอนแก่น 95.93  964
  67 มหาสารคาม  95.28  999
  71 กาฬสินธุ์  93.78  970
  74 ร้อยเอ็ด 91.65  1,014

Assessment and Diagnosis

Assessment of iodine deficiency
1. Urinary iodine concentration
   sensitive indicator of recent iodine intake (days)
2. Goiter rate
   long-term iodine nutrition (months to years)
3. Serum TSH in newborn
4. Serum thyroglobulin
   intermediate response (weeks to month)

Recommended dosages of daily and annual iodine supplementation

<table>
<thead>
<tr>
<th>Population</th>
<th>Daily dose (ug/D)</th>
<th>Single annual dose (mg/y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnant</td>
<td>250</td>
<td>400</td>
</tr>
<tr>
<td>Lactating</td>
<td>250</td>
<td>400</td>
</tr>
<tr>
<td>Woman (15–49)</td>
<td>150</td>
<td>400</td>
</tr>
<tr>
<td>Children 0–5 y</td>
<td>90</td>
<td>200</td>
</tr>
<tr>
<td>Children 6–12 y</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Children ≥12 y</td>
<td>150</td>
<td>400</td>
</tr>
</tbody>
</table>

WHO recommendations

Iodine status

Median urinary iodine concentrations of school-age children

<table>
<thead>
<tr>
<th>Median urinary iodine (ug/L)</th>
<th>Iodine intake</th>
<th>Iodine status</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Insufficient</td>
<td>Severe iodine deficiency</td>
</tr>
<tr>
<td>20–49</td>
<td>Insufficient</td>
<td>Moderate iodine deficiency</td>
</tr>
<tr>
<td>50–99</td>
<td>Insufficient</td>
<td>Mild iodine deficiency</td>
</tr>
<tr>
<td>100–199</td>
<td>Adequate</td>
<td>Adequate iodine nutrition</td>
</tr>
<tr>
<td>200–299</td>
<td>Above requirement</td>
<td></td>
</tr>
<tr>
<td>≥ 300</td>
<td>Excessive</td>
<td>Risk of adverse health consequences (iodine induced hyperthyroidism)</td>
</tr>
</tbody>
</table>
**Iodine in children**

- โครงการสำรวจสุขภาพประชาชนไทย พ.ศ. 2551-2552
- ระดับไอโอดีนในปัสสาวะของเด็กในกลุ่มอายุ 1-14 ปี
- ภาคตะวันออกเฉียงเหนือมีร้อยละของผู้ที่ขาดสารไอโอดีนมากที่สุด (ระดับไอโอดีนในปัสสาวะน้อยกว่า 100 ไมโครกรัม/ลิตร)
- เพศชายร้อยละ 41.4 และเพศหญิงร้อยละ 44.6

**Iodine and IQ in schoolchildren**

- December 2012
- 377 schoolchildren in suburban area, Khon Kaen
- Median UI 229.0 ug/L
- 10.6% UI < 100 ug/L
- 28.7% UI > 300ug/L
- Mean IQ 97.4
- No correlation Iodine vs IQ

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**Iodine and IQ**

- IQ
  - Environmental factors: health, socioeconomic status, quality of education
- In utero ID\(^{-}\) - neuromotor development
- Postnatal ID\(^{-}\) - cognitive function
- Chronic ID\(^{-}\) - reduced 13.5 points IQ
  \(^{-}\)ID = iodine deficiency

**Iodine and mental development of children ≤ 5 years old**

- A systematic review and meta-analysis
- Maternal iodine supplementation
- RCT, non RCT
- 7.4 IQ points lost from iodine deficiency
- Limitations in study design and analysis
  - sample size
  - iodine dosage
  - early or late pregnancy
  - age at developmental testing, varying types (Bayley, McCarthy, Brunet-Lezine, Stanford-Binet, Griffiths)

Nutrients 2013, 5, 1384-1416; doi: 10.3390/nu5041384

**Iodine status in Thai pre-schoolchildren**

- No available data
- Day care
- Primary health care center
- Population UI levels

**Iodine status in newborn**

- TSH age 3-4 days - sensitive indicator
  - Iodine sufficient
  - ≤ 3% of TSH values > 5 mU/L
Iodine status in newborn

- Iodine status in mothers and neonates in Srinagarind hospital 2011
- 300 mother-infant pairs
- Median maternal UI 208.4 ug/L
- 42.3% UI < 150 ug/L
- 3.0% newborn had TSH > 5 mIU/L
- Median neonatal UI 151.0 ug/L (26.0% < 100)
- No correlation maternal UI-neonatal TSH
- Positive correlation maternal UI-neonatal UI
- Positive correlation neonatal UI-neonatal TSH
- Subclinical CH: high TSH, normal T4

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Iodine supplementation in schoolchildren

- Increased urinary iodine level
- Improve VS no improvement of cognitive and motor function
  - Short duration
  - Small sample size
  - No randomization

Iodized oil 190 mg/cap

Iodine supplementation

- 0-6 mo.
  - No maternal supplementation
  - 1 oral dose 100 mg iodized oil = 90 ug/day potassium iodide
- 7-24 mo.
  - 1 yearly dose 200 mg iodized oil at 7 mo. old
- Children, women with child bearing age
  - 1 yearly dose 400 mg iodized oil

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Toxic effects of excess iodine

- Small number
- Thyroid gland - able to adjust wide range of iodine intake
- Increased thyroid volume
- Chronic iodine def. - iodine induced hyperthyroidism
- Transient
- Precaution in heart diseases