ANTENATAL IDA IN MALAYSIA

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Disclosure

NIL
MDG 5 has two targets:

- Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio.
- Achieve, by 2015, universal access to reproductive health.

Maternal Mortality Ratio (MMR) of 11 per 100,000 live births by 2015.
Trend of MMR in Malaysia

Target: maternal mortality ratio (MMR) of 11 per 100,000 live births by 2015.

## MMR – By State and Ethnicity

### Table 5.1: Maternal deaths, live births and maternal mortality ratios by state, 1998, 2000 and 2007

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Malaysia</td>
<td>153</td>
<td>524,978</td>
<td>29.1</td>
<td>168</td>
<td>549,543</td>
<td>30.6</td>
<td>137</td>
<td>472,048</td>
<td>29.0</td>
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<tr>
<td>Johor</td>
<td>19</td>
<td>57,091</td>
<td>33.3</td>
<td>12</td>
<td>67,907</td>
<td>17.7</td>
<td>29</td>
<td>56,865</td>
<td>51.0</td>
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<tr>
<td>Kedah</td>
<td>15</td>
<td>39,814</td>
<td>37.7</td>
<td>10</td>
<td>41,263</td>
<td>24.2</td>
<td>11</td>
<td>33,630</td>
<td>32.7</td>
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<tr>
<td>Kelantan</td>
<td>13</td>
<td>45,123</td>
<td>28.8</td>
<td>9</td>
<td>40,641</td>
<td>22.1</td>
<td>9</td>
<td>33,646</td>
<td>26.7</td>
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<tr>
<td>Melaka</td>
<td>7</td>
<td>15,951</td>
<td>43.9</td>
<td>2</td>
<td>15,672</td>
<td>12.8</td>
<td>2</td>
<td>13,260</td>
<td>15.1</td>
</tr>
<tr>
<td>Negeri Sembilan</td>
<td>2</td>
<td>19,142</td>
<td>10.4</td>
<td>1</td>
<td>19,394</td>
<td>5.2</td>
<td>5</td>
<td>16,866</td>
<td>29.6</td>
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<tr>
<td>Pahang</td>
<td>13</td>
<td>29,156</td>
<td>44.6</td>
<td>7</td>
<td>29,724</td>
<td>22.4</td>
<td>7</td>
<td>24,725</td>
<td>28.3</td>
</tr>
<tr>
<td>Perak</td>
<td>8</td>
<td>47,956</td>
<td>16.7</td>
<td>12</td>
<td>48,786</td>
<td>24.6</td>
<td>9</td>
<td>35,990</td>
<td>25.0</td>
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<tr>
<td>Perlis</td>
<td>1</td>
<td>4,692</td>
<td>21.3</td>
<td>0</td>
<td>4,656</td>
<td>0</td>
<td>2</td>
<td>3,927</td>
<td>50.9</td>
</tr>
<tr>
<td>Pulau Pinang</td>
<td>8</td>
<td>26,039</td>
<td>30.7</td>
<td>1</td>
<td>26,826</td>
<td>3.7</td>
<td>5</td>
<td>22,196</td>
<td>22.5</td>
</tr>
<tr>
<td>Sabah*</td>
<td>21</td>
<td>54,738</td>
<td>38.4</td>
<td>68</td>
<td>56,352</td>
<td>120.7</td>
<td>20</td>
<td>47,535</td>
<td>42.1</td>
</tr>
<tr>
<td>Sarawak</td>
<td>8</td>
<td>46,083</td>
<td>17.4</td>
<td>7</td>
<td>50,689</td>
<td>13.8</td>
<td>11</td>
<td>41,840</td>
<td>26.3</td>
</tr>
<tr>
<td>Selangor*</td>
<td>20</td>
<td>81,354</td>
<td>24.6</td>
<td>28</td>
<td>90,514</td>
<td>30.9</td>
<td>20</td>
<td>94,324</td>
<td>21.2</td>
</tr>
<tr>
<td>Terengganu</td>
<td>4</td>
<td>24,995</td>
<td>16.0</td>
<td>5</td>
<td>25,502</td>
<td>19.6</td>
<td>4</td>
<td>22,213</td>
<td>18.0</td>
</tr>
<tr>
<td>Kuala Lumpur</td>
<td>14</td>
<td>32,844</td>
<td>42.6</td>
<td>6</td>
<td>31,617</td>
<td>19.0</td>
<td>3</td>
<td>25,031</td>
<td>12.0</td>
</tr>
</tbody>
</table>

Notes:  
- a. Includes Labuan.  
- b. Includes Putrajaya.  
- Maternal deaths and live births are numbers. MMR is per 100,000 live births.  
- Source: Malaysia, Department of Statistics, Vital Statistics, various years.

### Figure 5.2: Maternal mortality ratio by ethnic group, 1997–2007 (deaths per 100,000 live births)

Note: “Others” includes non-citizens.  
Source: Malaysia, Department of Statistics, Vital Statistics, various years.
**MMR – By Age Group and Parity**

**Figure 5.3**

Maternal mortality ratio by age group, 2007 (deaths per 100,000 live births)

- 20–24: 20
- 25–29: 30
- 30–34: 60
- 35–39: 80
- 40–44: 80

**Table 5.2**

Number of maternal deaths in 2007 by age and parity

<table>
<thead>
<tr>
<th>Age</th>
<th>Parity 1</th>
<th>Parity 2–5</th>
<th>Parity &gt;6</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 19</td>
<td>2</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>20–24</td>
<td>14</td>
<td>2</td>
<td>—</td>
</tr>
<tr>
<td>25–29</td>
<td>14</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>30–34</td>
<td>7</td>
<td>26</td>
<td>5</td>
</tr>
<tr>
<td>35–39</td>
<td>2</td>
<td>22</td>
<td>9</td>
</tr>
<tr>
<td>40–44</td>
<td>—</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>&gt; 45</td>
<td>—</td>
<td>—</td>
<td>2</td>
</tr>
</tbody>
</table>

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Source: Malaysia, Department of Statistics, *Vital Statistics*, various years.

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Source: Malaysia, Ministry of Health, Health Informatics Centre.
Causes of Maternal Death, 1997 and 2007

32.3% potentially stand a better chance if they DON’T have Anemia

<table>
<thead>
<tr>
<th>Cause</th>
<th>1997</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postpartum haemorrhage</td>
<td>31</td>
<td>23</td>
</tr>
<tr>
<td>Hypertensive disorders in pregnancy</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>Obstetric embolism</td>
<td>18</td>
<td>25</td>
</tr>
<tr>
<td>Associated medical conditions</td>
<td>36</td>
<td>24</td>
</tr>
<tr>
<td>Obstetric trauma</td>
<td>5.7</td>
<td>6</td>
</tr>
<tr>
<td>Antepartum haemorrhage</td>
<td>1.9</td>
<td>2</td>
</tr>
<tr>
<td>Puerperal sepsis</td>
<td>1.9</td>
<td>3</td>
</tr>
<tr>
<td>Abortion</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Ectopic pregnancy</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Unspecified complications of pregnancy and puerperium</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Associated with anaesthesia</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Others</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>158</td>
<td>136</td>
</tr>
</tbody>
</table>
Anemia

- Hemoglobin (Hb) or hematocrit (Hct) value less than the fifth percentile of the distribution of Hgb or Hct in a healthy reference population based on the stage of pregnancy\(^1\).

<table>
<thead>
<tr>
<th></th>
<th>1(^{st}) Trimester</th>
<th>2(^{nd}) Trimester</th>
<th>3(^{rd}) Trimester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin (g/dL)</td>
<td>&lt; 11</td>
<td>&lt; 10.5</td>
<td>&lt;11</td>
</tr>
<tr>
<td>Hematocrit (%)</td>
<td>&lt; 33</td>
<td>&lt; 32</td>
<td>&lt; 33</td>
</tr>
</tbody>
</table>
The most frequent nutritional disorder

How many suffer from iron deficiency anemia?

2 billion people

1/3rd of the world’s population

Milman N, Anemia still a major health problem in many parts of the world, Ann Hematol(2011) 90:369–377
Prevalence of anemia

<table>
<thead>
<tr>
<th></th>
<th>World</th>
<th></th>
<th>Malaysia</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-school children</td>
<td>47%</td>
<td></td>
<td>32%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>42%</td>
<td></td>
<td>38%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-pregnant women during child bearing age</td>
<td>30%</td>
<td></td>
<td>30%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WHO Global Database on Anemia, 2008
Prepartum iron deficiency anemia (IDA)

- Among fertile, non-pregnant women, ~40% have ferritin of ≤30 μg/L

- Prepartum IDA predisposes to postpartum IDA

<table>
<thead>
<tr>
<th>Test</th>
<th>Level</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum Ferritin (ug/L)</td>
<td>&lt; 30</td>
<td>Low iron status</td>
</tr>
<tr>
<td></td>
<td>&lt; 15</td>
<td>Iron deficiency</td>
</tr>
</tbody>
</table>

Prevalence of Anemia – Limitation of Epidemiological Studies in Malaysia

- Different cut off levels of haemoglobin was used
- Rural population vs urban population
- Most study was isolated small-sample
- Most study was hospital based vs population based
- Various method blood sampling (venous vs capillary)
Prevalence of anemia in late pregnancy – different cut off point, population? Sample saiz?

Prevalence of anemia – Rural vs Urban


1997² Haemoglobin cut off point 11 g/dL

- 1997: 47.5%
- 2007: 35%

Rural
Rural + Urban

## Prevalence of anemia by severity

<table>
<thead>
<tr>
<th>N</th>
<th>Prevalence of severity of anemia % (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>(N=352)</td>
</tr>
<tr>
<td>Moderate</td>
<td>(N=19)</td>
</tr>
<tr>
<td>Severe</td>
<td>(N=0)</td>
</tr>
<tr>
<td>Overall prevalence</td>
<td>1072</td>
</tr>
</tbody>
</table>

Remark: Mild anemia is defined as having a haemoglobin level of 9-<11 g/dL; Moderate anemia is defined as having a haemoglobin level of 7-<9 g/dL; Severe anemia is defined as having a haemoglobin level of <7 g/dL; Note: Since the lowest haemoglobin level is 7.6 g/dL, therefore, there were no severe anemic subjects.
Distribution of Hemoglobin Levels

Figure 1. Distribution of haemoglobin levels

Figure 1. Distribution of haemoglobin levels

Iron requirement in pregnancy

[Graph showing iron requirements during pregnancy, menstruation, and lactation.]

Milman N Ann Hematol 2006; 85(9):559-565
Figure 2. Distribution of haemoglobin levels in relation to gestation age (Weeks).

*p-value* < 0.001 (This value is obtained from nonparametric trend test developed by Cuzick, which is an extension of the Wilcoxon rank-sum test.)
Can a non-anemic pregnant women have low iron?

Distribution of blood haemoglobin concentrations in non pregnant women with replete iron stores (serum ferritin <30 μg/L) and absent iron stores (serum ferritin<12 μg/L)

Iron Deficiency Anemia

<table>
<thead>
<tr>
<th>Test</th>
<th>Normal Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasma iron level</td>
<td>40-175 micrograms/L</td>
</tr>
<tr>
<td>Plasma total iron-binding capacity</td>
<td>216-400 micrograms/L</td>
</tr>
<tr>
<td>Transferrin saturation</td>
<td>16-60%</td>
</tr>
<tr>
<td>Serum ferritin² level</td>
<td>More than 10 micrograms/L</td>
</tr>
</tbody>
</table>

1. ACOG Practice Bulletin-Anemia in Pregnancy VOL. 112, NO. 1, JULY 2008
Laboratory Test Characteristic of IDA¹

- Microcytic and hypochromic RBC
- Low plasma iron levels
- High TIBC
- Low serum ferritin levels
  - Highest sensitivity and specificity for diagnosing IDA

¹ ACOG Practice Bulletin-Anemia in Pregnancy VOL. 112, NO. 1, JULY 2008
Risk factors for IDA in pregnancy

- Diet poor in iron-reach food (vegetarian?)
- Diet poor in iron absorption enhancers
- Diet rich in foods that diminish iron absorption
- Pica (eating non food substances such as clay etc..)
- Gastrointestinal disease affecting absorption
- Short interpregnancy interval
- Antepartum hemorrhage?
Complication of iron deficiency anemia

- Increased risk of\(^1,2\):
  - Low birth weight
  - Preterm delivery
  - Perinatal mortality
- Associated with\(^3,4\):
  - Postpartum depression
  - Poor results in mental and psychomotor performance testing in offspring

IDA During pregnancy

- Increased fatigue intra & post partum and during lactation
- Increased risk of infection
- Poor tolerance to heavy blood loss during delivery
- Cardiovascular stress

Post-partum Anemia

“More than 80 percent of maternal deaths are caused by haemorrhage,...... Most of these deaths are preventable when there is access to adequate reproductive health service”

Post partum anemia

- Severe postpartum anemia is a complication of 5% of deliveries\textsuperscript{1}

- Following delivery, women lose some amount of iron through breastfeeding and lactation

- IDA has been associated with impaired cognitive function and behavioral disturbances in postpartum women

- Mother’s iron status should be evaluated prior to discharge to monitor postpartum anemia

Post partum anemia

- Iron deficiency persists beyond the 4-6 weeks postpartum period
  - 12% of women are iron deficient up to 12 months after delivery
  - 8% of women are iron deficient 13-24 months after delivery
- Iron supplementation should continue after delivery if iron status remains low or while the mother is breastfeeding

Sign & Symptoms of IDA

ANEMIA: Signs & Symptoms

- Pale Skin
- Dizziness
- Weakness, Fatigue, Shortness of Breath
- Cold Hands & Feet
- Headaches
Goals of treatment:
1. To restore normal levels of red blood cells and hemoglobin levels to normal.
2. To replenish iron stores.

How to treat anemia?
- Increase food intake that are rich in iron
- Take iron supplement
- Parenteral route-im/iv infusion
- Blood transfusion
How to increase iron bioavailability?

- **Dietary enhancers** - Bioavailability of iron is increased with these foods
  1. Ascorbic acid present in citrus fruits
  2. Fruit juices
  3. Green leafy vegetables, cabbage, cauliflower

- **Dietary inhibitors**
  1. Phytates present in cereal bran, cereal grains
  2. Legumes, nut and seeds
  3. Calcium, particularly in milk and milk products
  4. Tannins present in tea, coffee, and cocoa
Food that are rich in iron

*Women with iron deficiency in pregnancy should not attempt to correct it through means of diet alone.

Only 10% to 15% of dietary iron is being absorbed.

Iron Supplementation:

- Simple and effective to treat & prevent IDA.

- Ferrous iron salts (ferrous fumarate, ferrous sulfate and ferrous gluconate) are the preferred oral preparations of iron as it gives better bioavailability of elemental iron.

- Slow-release tablets are preferred as they are better tolerated and absorption is 29% greater than standard preparations.

- Iron supplements should be taken at bedtime or between meals to ensure optimum absorption (Milman N, 2000).
Oral iron treatment

- WHO recommendation 120 mg/day elemental iron
- RNI Malaysia 2005 recommendation 100mg/day elemental iron

- High-dose iron therapy
  - preferably administered as sustained release iron preparations
    - to optimize absorption and reduce GI side effects

RNI Malaysia 2005, National Coordinating Committee on Food and Nutrition (NCCFN), Ministry of Health Malaysia
Iron supplementation reduces IDA

Iron supplementation has significantly reduced prevalence of anemia during pregnancy as well as in post-partum period.

Treatment of IDA in pregnancy

In women with slight to moderate IDA (Hb 90–105 g/L)
Rx : oral ferrous iron of ~100 mg/day

Hb checked after 2 weeks
Increase > 10g/l

Continue oral iron

Oral iron prophylaxis

- Would be convenient for the woman if iron supplements could be taken as combined multivitamin–mineral preparations.

- Should be given as early as 10 weeks gestation or upon first visit to the clinic, when red blood cell mass begins increasing.

- For ID women, supplementation should begin at the time pregnancy is planned.
  - should continue after delivery if iron status remains low, or
  - while the mother is breastfeeding.

- Slow-release tablets are better tolerated and absorption is 29% greater compared with standard ferrous sulphate preparations.
Oral iron prophylaxis

- Iron prophylaxis should be tailored according to serum ferritin levels - 2007 Danish Advisory National Board of Nutrition

- In Southeast Asia, where the prevalence of ID is estimated to be >90%, dosages of 100 mg/day are needed for the majority of pregnant women

<table>
<thead>
<tr>
<th>Serum Ferritin Level</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 70 µg/L</td>
<td>No Iron supplementation needed</td>
</tr>
<tr>
<td>30 - 70 µg/L</td>
<td>40 mg Ferrous Iron daily taken between meals</td>
</tr>
<tr>
<td>&lt; 30 µg/L</td>
<td>100 mg Ferrous Iron daily taken between meals</td>
</tr>
</tbody>
</table>
Impact of intervention

- Restore personal health and raise **national productivity** levels by as much as 20%
- Reduction in **maternal deaths**: Anaemia contributes to 20% of all maternal deaths

**Maternal Iron & Folic Acid Supplementation Improve Lives !!**

In conclusion

- IDA is the most frequent form of anaemia in pregnant women

- Dietary measures are inadequate to reduce the frequency of prepartum IDA

- Pregnant women should be given 100mg/day iron regardless of ID status in 2nd and 3rd trimester, prophylactically

- Treatment of IDA should aim at replenishing body iron deficits

- Treating and preventing IDA can improve national productivity by 20% and reduce maternal mortality
Thank you

Maternal IRON & FOLIC ACID supplementation improve lives!