Prevalence of Thyroid Disease In Malaysia

Mohammad Arif Shahar
Diabetes and Endocrine Unit (DEU)
International Islamic University Malaysia (IIUM)
Why do we need to know about prevalence?

- Burden of the disease (epidemiological point of view)
- Screening (public health point of view)
- Making a diagnosis (clinical point of view)
Morbidity related to thyroid disorders

Hyperthyroidism
- Cardiomyopathy
- Osteoporosis

Hypothyroidism
- Cardiovascular disease
- Obesity
- Dyslipidemia
- Pregnancy outcome
- Cognitive function

Thyroid Cancer
- Morbidity and mortality
Outline

• Previous studies on thyroid disorders in Malaysia
• The MyENDO-Thyroid study
• Clinical implications
• Unanswered questions
Prevalence of thyroid disorders

• Thyroid dysfunction
  – Thyroid status rather than actual diagnosis
• Goitre and thyroid nodules
### Previous studies on thyroid disorders in Malaysia

<table>
<thead>
<tr>
<th>Author</th>
<th>N</th>
<th>Disease of interest</th>
<th>Hypothyroid</th>
<th>Hyperthyroid</th>
<th>Goitre</th>
<th>Thyroid nodule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chen et al (1988)</td>
<td>343 Penan population, Sarawak</td>
<td>Endemic goitre</td>
<td>-</td>
<td>-</td>
<td>60.6%</td>
<td>-</td>
</tr>
<tr>
<td>Tan et al (1989)</td>
<td>180 from a single centre</td>
<td>Graves disease</td>
<td>-</td>
<td>0.2-1.4%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mafauzy et al (1993)</td>
<td>2450 Kelantan population</td>
<td>Endemic goitre</td>
<td>-</td>
<td>-</td>
<td>36.8%</td>
<td>-</td>
</tr>
<tr>
<td>Foo et al (1994)</td>
<td>974 population in Sarawak</td>
<td>Endemic goitre</td>
<td>-</td>
<td>-</td>
<td>31.8%</td>
<td>-</td>
</tr>
<tr>
<td>Osman et al (1995)</td>
<td>1419 Orang Asli vs Malay</td>
<td>Endemic goitre</td>
<td>28.4% vs 5.3%</td>
<td>-</td>
<td>20-70%</td>
<td>-</td>
</tr>
<tr>
<td>Yazmin et al (2014)</td>
<td>98 patients with depression</td>
<td>Subclinical thyroid dysfx</td>
<td>4% (subclinical)</td>
<td>11% (subclinical)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ong et al (2014)</td>
<td>174 SLE patients</td>
<td>AITD</td>
<td>54.5%</td>
<td>45.5%</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Endocrine Disorders in Malaysia: Thyroid (MyENDO:Thyroid) Study

- Initiated by The Malaysian Endocrine Metabolic Society (MEMS)

- Objectives:
  - Determine the prevalence of:
    - Thyroid dysfunction
    - Goitre and thyroid nodules;
  - In the Malaysian adult population

- Completed end of 2016

Shahar et al (2017)
Inclusion and exclusion criteria

• Inclusion criteria:
  – Age ≥ 18 years
  – Malaysian citizen

• Exclusion criteria:
  – Pregnancy
Results

Figure 1: Subjects enrolled

Shahar et al (2017)
Analysis

(1) Total population
N=2190

(2) Population reporting thyroid disease, goitre or taking thyroid medication
N=136

(3) Disease free population
N=2054

Newly detected thyroid dysfunction, goitre, thyroid nodule, antiTPO ≥ 10IU/mL and/or antiTG ≥ 20IU/mL
N=1396

(4) Reference population
N=658

Shahar et al (2017)

Figure 2: Definitions of sub-population in this cohort
Results

• **Demography**

• Measurement of TSH, FT4, FT3, antiTPO and antiTG in the population
  – The effect of age

• Prevalence of thyroid dysfunction

• Prevalence of goitre and thyroid nodule
  – Goitre vs age
  – Goitre vs ethnicity
  – Goitre vs geographical location
# Demography

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Study Population (N=2,190)</th>
<th>Malaysian Population* (N=30,995,700)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age distribution</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>9.8</td>
<td>19.4</td>
</tr>
<tr>
<td>25-34</td>
<td>9.9</td>
<td>18.7</td>
</tr>
<tr>
<td>35-44</td>
<td>13.7</td>
<td>13.0</td>
</tr>
<tr>
<td>45-54</td>
<td>23.5</td>
<td>10.6</td>
</tr>
<tr>
<td>55-64</td>
<td>26.6</td>
<td>7.4</td>
</tr>
<tr>
<td>65-74</td>
<td>12.9</td>
<td>3.9</td>
</tr>
<tr>
<td>&gt;74</td>
<td>3.7</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Median age</strong></td>
<td>52.0</td>
<td>27.8</td>
</tr>
<tr>
<td><strong>Male:Female Ratio</strong></td>
<td>58.1:100</td>
<td>106.6:100</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malay</td>
<td>69.1</td>
<td>61.8</td>
</tr>
<tr>
<td>Chinese</td>
<td>23.7</td>
<td>21.4</td>
</tr>
<tr>
<td>Indian</td>
<td>6.3</td>
<td>6.4</td>
</tr>
<tr>
<td>Others</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Non-Malaysian</td>
<td>0.0</td>
<td>9.6</td>
</tr>
</tbody>
</table>


Table 1: Comparison between the study cohort and Malaysian population
Results

• Demography
• Measurement of TSH, FT4, FT3, antiTPO and antiTG in the population
  – The effect of age
• Prevalence of thyroid dysfunction
• Prevalence of goitre and thyroid nodule
  – Goitre vs age
  – Goitre vs ethnicity
  – Goitre vs geographical location
TSH, FT4, FT3, antiTPO, antiTG in the adult Malaysian population (Total Population)

<table>
<thead>
<tr>
<th></th>
<th>Median</th>
<th>25&lt;sup&gt;th&lt;/sup&gt; Centile</th>
<th>75&lt;sup&gt;th&lt;/sup&gt; Centile</th>
<th>97.4&lt;sup&gt;th&lt;/sup&gt; Centile</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSH</td>
<td>1.16</td>
<td>0.81</td>
<td>1.63</td>
<td>3.55</td>
</tr>
<tr>
<td>fT4</td>
<td>12.98</td>
<td>11.99</td>
<td>13.97</td>
<td></td>
</tr>
<tr>
<td>fT3</td>
<td>4.10</td>
<td>3.71</td>
<td>4.48</td>
<td></td>
</tr>
<tr>
<td>antiTPO</td>
<td>12.8</td>
<td>&lt;10.0</td>
<td>20.4</td>
<td></td>
</tr>
<tr>
<td>antiTG</td>
<td>&lt;20.0</td>
<td>&lt;20.0</td>
<td>250.7</td>
<td></td>
</tr>
</tbody>
</table>

Shahar et al (2017)
TSH, FT4 and FT3 in the adult Malaysian population (Reference Population)

<table>
<thead>
<tr>
<th></th>
<th>Median</th>
<th>25th Centile</th>
<th>75th Centile</th>
<th>97.5th Centile</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSH</td>
<td>1.14</td>
<td>0.83</td>
<td>1.55</td>
<td>3.55</td>
</tr>
<tr>
<td>FT4</td>
<td>12.95</td>
<td>11.95</td>
<td>13.94</td>
<td></td>
</tr>
<tr>
<td>FT3</td>
<td>4.12</td>
<td>3.71</td>
<td>4.50</td>
<td></td>
</tr>
</tbody>
</table>

Shahar et al (2017)
TSH

Shahar et al (2017)

Lower limit = 0.32 uIU/mL
Upper limit (97.5th centile) = 3.55
Results

• Demography
• Measurement of TSH, FT4, FT3, antiTPO and antiTG in the population
  – The effect of age
• Prevalence of thyroid dysfunction
• Prevalence of goitre and thyroid nodule
  – Goitre vs age
  – Goitre vs ethnicity
  – Goitre vs geographical location
Relationship between TSH, fT4, fT3 and age (Total population)

* p<0.05
** p<0.001

Shahar et al (2017)
Relationship between TSH, fT4, fT3 and age (Reference population)

*T p<0.05

Shahar et al (2017)
Relationship between antiTPO and age (Total population)

*\( p<0.05 \)

Shahar et al (2017)
Results

• Demography
• Measurement of TSH, FT4, FT3, antiTPO and antiTG in the population
  – The effect of age
• Prevalence of thyroid dysfunction
• Prevalence of goitre and thyroid nodule
  – Goitre vs age
  – Goitre vs ethnicity
  – Goitre vs geographical location
Prevalence of thyroid dysfunction in Malaysia

Shahar et al (2017)
Prevalence of thyroid dysfunction among those with known thyroid disorders

- Patients not on any medication:
  - Euthyroid: 70.9%
  - Hypothyroid: 2.5%
  - Subclinical Hypothyroid: 7.6%
  - Hyperthyroid: 16.5%

- Patients on anti-thyroid drugs:
  - Euthyroid: 48.0%
  - Hypothyroid: 8.0%
  - Subclinical Hypothyroid: 4.0%
  - Hyperthyroid: 20.0%
  - Subclinical Hyperthyroid: 20.0%

- Patients on L-thyroxine:
  - Euthyroid: 57.1%
  - Hypothyroid: 3.6%
  - Subclinical Hypothyroid: 28.6%
  - Hyperthyroid: 10.7%

Shahar et al (2017)
Comparison of prevalence (%) of thyroid dysfunction of with selected studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Hypothyroidism</th>
<th>Hyperthyroidism</th>
</tr>
</thead>
<tbody>
<tr>
<td>MyENDO</td>
<td>3.40%</td>
<td>2.10%</td>
</tr>
<tr>
<td>Canaris (2000)</td>
<td>9.40%</td>
<td>2.20%</td>
</tr>
<tr>
<td>Hallowell (2002)</td>
<td>4.60%</td>
<td>1.30%</td>
</tr>
<tr>
<td>Tunbridge (1977)</td>
<td>1.60%</td>
<td>1.10%</td>
</tr>
<tr>
<td>Vanderpump (1995)</td>
<td>5.30%</td>
<td>4.30%</td>
</tr>
<tr>
<td>Madariaga (2002)</td>
<td>4.90%</td>
<td>1.70%</td>
</tr>
<tr>
<td>Konno (1993)</td>
<td>1.40%</td>
<td>0.60%</td>
</tr>
<tr>
<td>Kasagi (2009)</td>
<td>6.50%</td>
<td>2.80%</td>
</tr>
<tr>
<td>Usha Menon (2009)</td>
<td>3.90%</td>
<td>1.30%</td>
</tr>
<tr>
<td>Gopaliah R (2016)</td>
<td>11.40%</td>
<td>4.40%</td>
</tr>
</tbody>
</table>

Shahar et al (2017)
The burden of newly diagnosed thyroid dysfunction

<table>
<thead>
<tr>
<th>Thyroid Status</th>
<th>Known disorders</th>
<th>Previously undiagnosed thyroid dysfunction</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothyroid</td>
<td>5 (45.0)</td>
<td>6 (55.0)</td>
<td>11 (100.0)</td>
</tr>
<tr>
<td>Subclinical hypothyroid</td>
<td>11 (32.0)</td>
<td>23 (68.0)</td>
<td>34 (100.0)</td>
</tr>
<tr>
<td>Hyperthyroid</td>
<td>11 (92.0)</td>
<td>1 (8.0)</td>
<td>12 (100.0)</td>
</tr>
<tr>
<td>Subclinical hyperthyroid</td>
<td>21 (34.0)</td>
<td>40 (66.0)</td>
<td>61 (100.0)</td>
</tr>
</tbody>
</table>
The burden of newly diagnosed thyroid dysfunction

- Subclinical hyperthyroid: 66%
- Hyperthyroid: 8%
- Subclinical hypothyroid: 68%
- Hypothyroid: 55%

Known thyroid disorders
Previously undiagnosed thyroid dysfunction

Shahar et al (2017)
Results

• Demography
• Measurement of TSH, FT4, FT3, antiTPO and antiTG in the population
  – The effect of age
• Prevalence of thyroid dysfunction
• Prevalence of goitre and thyroid nodule
  – Goitre vs age
  – Goitre vs ethnicity
  – Goitre vs geographical location
Prevalence (%) of goitre and thyroid nodule in Malaysian adult population

<table>
<thead>
<tr>
<th>Category</th>
<th>Disease free Population</th>
<th>Known thyroid disorders</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goitre grade 1</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Goitre grade 2</td>
<td>3</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>Thyroid nodule</td>
<td>3</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Total thyroidectomy</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Comparison of Prevalence of Goiter between Selected Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MyENDO</td>
<td>9.3</td>
</tr>
<tr>
<td>Tunbridge (1977)</td>
<td>15.5</td>
</tr>
<tr>
<td>Vanderpump Kasagi (2009)</td>
<td>15.4</td>
</tr>
<tr>
<td>Usha Menon (2009)</td>
<td>12</td>
</tr>
<tr>
<td>Zhang Z (2002)</td>
<td>11.6</td>
</tr>
<tr>
<td>Yu XH (2008)</td>
<td>7.6</td>
</tr>
</tbody>
</table>

Shahar et al (2017)
Comparison of Prevalence of Thyroid Nodule between Selected Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shahar et al (2017)</td>
<td>3.6</td>
</tr>
<tr>
<td>Tunbridge (1977)</td>
<td>3.2</td>
</tr>
<tr>
<td>Yu XH (2008)</td>
<td>11</td>
</tr>
<tr>
<td>Yang YX (2011)</td>
<td>10</td>
</tr>
</tbody>
</table>
The burden of newly diagnosed goitre and thyroid nodule

<table>
<thead>
<tr>
<th></th>
<th>Known thyroid disorders</th>
<th>Previously undiagnosed goitre/thyroid nodules</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goitre</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 1</td>
<td>21 (20.0)</td>
<td>89 (81.0)</td>
<td>110 (100.0)</td>
</tr>
<tr>
<td>Grade 2</td>
<td>36 (38.0)</td>
<td>59 (62.0)</td>
<td>95 (100.0)</td>
</tr>
<tr>
<td>Total thyroidectomy</td>
<td>2 (100.0)</td>
<td>0 (0.0)</td>
<td>2 (100.0)</td>
</tr>
<tr>
<td>Thyroid nodule</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palpable</td>
<td>25 (32.0)</td>
<td>53 (68.0)</td>
<td>78 (100.0)</td>
</tr>
</tbody>
</table>

Shahar et al (2017)
The Burden Of Newly Diagnosed Goitre And Thyroid Nodule

Shahar et al (2017)
Results

• Demography

• Measurement of TSH, FT4, FT3, antiTPO and antiTG in the population
  – The effect of age

• Prevalence of thyroid dysfunction

• Prevalence of goitre and thyroid nodule
  – Goitre vs age
  – Goitre vs ethnicity
  – Goitre vs geographical location
Prevalence of Goitre According to Age

- **Age < 45**
  - No goitre: 88
  - Goitre: 12

- **Age ≥ 45**
  - No goitre: 92
  - Goitre: 8

*P = 0.008

Shahar et al (2017)
Results

• Demography
• Measurement of TSH, FT4, FT3, antiTPO and antiTG in the population
  – The effect of age
• Prevalence of thyroid dysfunction
• Prevalence of goitre and thyroid nodule
  – Goitre vs age
  – Goitre vs ethnicity
  – Goitre vs geographical location
Prevalence of goitre and thyroid nodule by ethnicity (Total population)

* P < 0.001

5/8/2017

Shahar et al (2017)
Prevalence of goitre and thyroid nodule according to ethnicity (Disease Free Population)

- Malay: 4.1% Goitre Grade 1, 2.5% Goitre Grade 2, 2.3% Thyroid nodule
- Chinese: 4.9% Goitre Grade 1, 1.6% Goitre Grade 2, 3.3% Thyroid nodule
- Indian: 4% Goitre Grade 1, 12% Goitre Grade 2, 1.6% Thyroid nodule
- Others: 10.5% Thyroid nodule

* P < 0.001
Prevalence of goitre and thyroid nodule by ethnicity (Population with known thyroid disease)

Shahar et al (2017)
Results

• Demography
• Measurement of TSH, FT4, FT3, antiTPO and antiTG in the population
  – The effect of age
• Prevalence of thyroid dysfunction
• Prevalence of goitre and thyroid nodule
  – Goitre vs age
  – Goitre vs ethnicity
  – Goitre vs geographical location
Prevalence of Goitre

Positive antiTPO
- > 15%
- 10-15%
- <10%

Positive antiTG
- > 15%
- 10-15%
- <10%

Shahar et al (2017)
<table>
<thead>
<tr>
<th>Region</th>
<th>West (5)</th>
<th>East (9)</th>
<th>North (4)</th>
<th>Central</th>
<th>South (8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Tanjung</td>
<td>Karang</td>
<td>Kuantan</td>
<td>Subang Jaya</td>
<td>Johor Bahru</td>
</tr>
<tr>
<td></td>
<td>and Kuala Selangor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Designation</td>
<td>Rural</td>
<td>Urban</td>
<td>Rural</td>
<td>Urban</td>
<td>Urban</td>
</tr>
<tr>
<td>Location</td>
<td>Coastal</td>
<td>Coastal</td>
<td>In-land</td>
<td>In-land</td>
<td>Coastal</td>
</tr>
<tr>
<td>Median urinary iodine (ug/L) (by State)*</td>
<td>126.0</td>
<td>76.5</td>
<td>77.8</td>
<td>131.0</td>
<td>118.0</td>
</tr>
<tr>
<td>Median urinary iodine (ug/L) (by rural/urban)**</td>
<td>94 (59,145)</td>
<td>121 (74,180)</td>
<td>94 (59,145)</td>
<td>121 (74,180)</td>
<td>121 (74,180)</td>
</tr>
</tbody>
</table>

* WM Wan Nazaimoon et al, 2010
** Rusidah Selamat et al, 2010

5/8/2017
Shahar et al (2017)
Who are those with goitre?

Total population

Shahar et al (2017)

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Table of Median urinary iodine (ug/L) and Grade of Goitre per Region and Ethnicity:

<table>
<thead>
<tr>
<th>Region</th>
<th>Median urinary iodine (ug/L)</th>
<th>Grade 1</th>
<th>Grade 2</th>
<th>Total thyroidectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>West (5)</td>
<td>126.0</td>
<td>76.5</td>
<td>77.8</td>
<td>131.0</td>
</tr>
<tr>
<td>East (9)</td>
<td>94 (59,145)</td>
<td>121 (74,180)</td>
<td>94 (59,145)</td>
<td>121 (74,180)</td>
</tr>
<tr>
<td>North (4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South (8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Clinical implications

• Exercise caution when interpreting thyroid function and antibodies (esp. TSH and antiTPO) in the elderly population – treat or not treat?

• Majority of patients with hypothyroidism and subclinical thyroid dysfunction was unaware of their condition – active case detection

• Goiter found in rural-inland areas are associated with previous reported low urinary iodine level, while those found in urban-coastal areas are associated with high titre of thyroid antibodies – areas of different etiologies
Unanswered questions

• Presence of pockets of iodine deficiency may be related to increase prevalence of goitre? – especially in rural in-land areas (Need actual measurement of iodine)

• Is there thyroid cancer among those with goitre and thyroid nodule (more in those aged < 45 years)? (Requires ultrasound examination and cytological/tissue diagnosis)

• The effectiveness of treatment given for patients with thyroid disorders (requires analysis at individual centre)
Take home messages

• Our prevalence of thyroid dysfunction are compatible most studies world wide (2.1% for hypothyroidism and 3.4% hyperthyroidism)

• Prevalence of goitre is 9.3% and thyroid nodule is 3.6%

• There may be pockets of iodine deficiency which contributes to goitre in rural areas

• Goitre in the coastal areas are likely autoimmune

• Large proportion of the population may be unaware that they have some sort of thyroid problems especially hypothyroidism and subclinical thyroid dysfunction
Acknowledgement

AP Dr Ahmad Marzuki Omar
Dr Azura Dina Muhayiddin
Dr Chong Kuck Meng
Dr Hanita Othman
Prof Dr Kwa Siew Kim
Dr G R Letchuman A/K Ramanathan
Dr Loh Huai Heng
Dr Luqman Ibrahim
Supporting staff

Prof Dr Nor Azmi Kamaruddin
AP Dr Norasyikin Ab Wahab
Dr Norhaliza Mohd Ali
Prof Dr Norlela Shukor
Dr Ooi CP
Dr Subashini Selvarajoo
Dr Wan Juani Wan Seman
Dr Yusniza Yusoff
Dr Zanariah Hussien

Endocrinology Laboratory, Universiti Kebangsaan Malaysia Medical Centre (UKMMC)
Department of Internal Medicine, UKMMC
Department of Internal Medicine, International Islamic University Malaysia (IIUM)
Medical Graduates, International Islamic University Malaysia, Class of 2015 and 2016.
Year 2/2015 Medical Students, Quest International University, Perak
Thank you for your kind attention