**Glycaemic Progression Study Among Population in Penang, Malaysia**

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**Introduction**

Type 2 Diabetes Mellitus (T2DM) is an interesting disease paradigm, as most patients with this condition pass through a ‘Pre-Diabetes’ phase, where the biochemical threshold for diagnosis has not been reached. Clinical trials have shown that the risk of progression to T2DM can be reduced in ‘Pre-Diabetes’ phase. The prevalence of diabetes from 2006-2011 in Malaysia has increased by 31% in the space of 5 years (Reference 1). Most studies focus on the treatment of diabetes patients. Being one of the highest populated states, there has not been a study on glycaemic progression in Penang. We are currently conducting a study on the Epigenetic Biomarkers of Impaired Glucose Regulation and Progression to Type 2 Diabetes. We have observed interesting progression patterns amongst Healthy, Pre-Diabetes and Treatment-NAve Diabetes groups. We have found that it is easier to regress to the healthy stage in the ‘Pre-Diabetes’ stage compared to subjects with diabetes. We speculate the trend may be observed at national level if not global and it indicates the study on ‘Pre-Diabetes’ is absolutely essential to circumvent this pandemic-like disease in Malaysia.

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**Objective**

To study on the progression of T2DM among 4 different groups (Healthy, Pre-Diabetes, Treatment-Naive Diabetes and Diabetes with Treatment) recruited in an Epigenetic Study of T2DM.

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**Method**

- Ethics approval was acquired from the Medical Research Ethics Committee (MREC) (NMRR-15-980-26563)
- This study is led by Dr Ang Hock Aun.

**Screenings:**
34 public screenings were conducted at various shopping malls, events and hospitals and at 7 Klinik Keshatan (Health Clinics) in Penang from February 2016 to July 2017. A total of 5379 people were screened by either going through the patient’s history record or Medisafe Fit (Terumo, Tokyo, Japan) and 774 people were offered a blood test (full blood profile, fasting blood glucose, oral glucose tolerance test, glycated haemoglobin, liver and kidney function test) and finally 382 subjects consented to the study.

**Table 1: Criteria Used To Determine Study Groups**

<table>
<thead>
<tr>
<th>Study Groups [WHO Criteria]</th>
<th>Fasting Blood Glucose (mmol/L)</th>
<th>Oral Glucose Tolerance Test (mmol/L)</th>
<th>Glycated Haemoglobin (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy</td>
<td>6.1 AND</td>
<td>7.8 AND</td>
<td>6</td>
</tr>
<tr>
<td>Pre-Diabetes</td>
<td>6.1-6.9 OR</td>
<td>7.8-11.0 OR</td>
<td>6.0-6.4</td>
</tr>
<tr>
<td>Treatment-Naive Diabetes and Diabetes With Treatment</td>
<td>&gt;7.0 OR &gt;11.0 OR</td>
<td>&gt;6.5</td>
<td></td>
</tr>
</tbody>
</table>

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**Results and Discussions**

Glycaemic progression of 270 subjects were followed-up at 6 months (T6).

**Healthy**

- 92 (91%) 6 months later
- 9 (9%) 6 months later

**Pre-Diabetes**

- 28 (44%) 6 months later
- 30 (48%) 6 months later
- 5 (8%) 6 months later

**Treatment-Naive Diabetes**

- 1 (4%) 6 months later
- 6 (24%) 6 months later
- 18 (72%) 6 months later

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**Diabetes With Treatment**

**Satisfactory**

- 9 (11%) 6 months later
- 71 (89%) 6 months later

*Only 9 (11%) out of the 80 subjects have satisfactory glycaemic control.

**Figure 2: Progression of Subjects at T6 Months Based on Glycaemia Control**

- Less than half (44%) of the ‘Pre-Diabetes’ subjects regressed to healthy while nearly half (48%) remained ‘Pre-Diabetes’ and 8% progressed to diabetes.
- 72% of the treatment-naive diabetes remained the same, while 24% regressed to ‘Pre-Diabetes’ and only 4% regressed to healthy.
- From the above results, we can see that the ability to regress to the healthy stage is 10 times better in the ‘Pre-Diabetes’ stage compared to subjects with Diabetes (44% vs 4%).
- Patients with diabetes under treatment could be lacking awareness in terms of healthy eating and lifestyle.

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**Figure 3: T6 Subjects Demography According to Age Range**

- The ‘Pre-Diabetes’ group is a prominent group across all age-ranges.
- This indicates that many people may have the potential to avoid progressing to diabetes and regress to the healthy stage.
- Thus, encouraging Malaysians to keep track and control their blood sugar level as well as educating and raising awareness about diabetes is very beneficial.

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**Conclusion**

This study reviews that it is more efficient to target the disease in the ‘Pre-Diabetes’ stage. Developing epigenetic biomarkers to aid in monitoring the progression of this pandemic-like disease is critical to the health of the people and enlighten the financial burden of the government.

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**Reference**

1) National Diabetes Registry Report, 2009-2012, Volume 1