MANAGEMENT OF DIABETES IN PREGNANCY

QUICK REFERENCE FOR HEALTHCARE PROVIDERS
KEY MESSAGES

1. Diabetes in pregnancy is associated with risks to the woman and to the developing fetus.
2. Screening for gestational diabetes mellitus (GDM) based on risk factors using 75 gram oral glucose tolerance test (OGTT) should be done at booking.
3. Overt diabetes in pregnancy should be managed as pre-existing diabetes.
4. Pre-conception care of women with pre-existing diabetes which involve a multidisciplinary team should be fully implemented in all healthcare facilities.
5. Supplement of 5 mg folic acid per day should be given to women with diabetes who plan to become pregnant at least three months prior to conception and continue until 12 weeks of gestation.
6. Pregnant women at risk of GDM and those with diabetes should be given individualised medical nutrition therapy (MNT) which includes carbohydrate-controlled meal plan and monitoring of gestational weight gain.
7. Options of treatment for diabetes in pregnancy include MNT, metformin and insulin therapy.
8. Women with pre-existing diabetes should have ultrasound scans for dating, structural anatomy and growth.
9. Timing and mode of delivery in pre-existing diabetes and GDM should be individualised, taking into consideration the estimated fetal weight and obstetric factors.
10. In women with history of GDM, OGTT should be performed at six weeks after delivery to detect diabetes and prediabetes. If negative, annual screening should be performed.

This Quick Reference provides key messages and a summary of the main recommendations in the Clinical Practice Guidelines (CPG) Management of Diabetes in Pregnancy.

Details of the evidence supporting these recommendations can be found in the above CPG, available on the following websites:

- Ministry of Health Malaysia: www.moh.gov.my
- Academy of Medicine Malaysia: www.acadmed.org.my
- Malaysian Endocrine & Metabolic Society: www.mems.my
- Perinatal Society of Malaysia: www.perinatal-malaysia.org
- Family Medicine Specialists Association of Malaysia: www.fms-malaysia.org.my

CLINICAL PRACTICE GUIDELINES SECRETARIAT
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ALGORITHM A: SCREENING AND DIAGNOSIS OF DIABETES IN PREGNANCY

SCREENING*
• Women at risk to develop GDM**: at booking/as early as possible
• Women age ≥25 with no other risk factors: at 24-28 weeks of gestation

75 g Oral Glucose Tolerance Test (OGTT)

OGTT results
Fasting plasma glucose (FPG): ≥5.1 mmol/L
OR
2-hours postprandial (2-HPP) ≥7.8 mmol/L

YES

Gestational Diabetes Mellitus (GDM)

NO

Repeat OGTT at 24-28 week of gestation

YES

FPG ≥5.1 mmol/L OR 2-HPP ≥7.8 mmol/L

NO

Exclude GDM

*Overt DM is suspected in the presence of at least one of the following:
  o FPG ≥7.0 mmol/L
  o Random plasma glucose (RPG) ≥11.1 mmol/L
* However, the diagnosis of overt DM should be confirmed with a second test (FPG/RPG/OGTT).

** Presence of any risk factors:
  • Body mass index >27 kg/m²
  • Previous history of GDM
  • First degree relative with diabetes mellitus
  • History of macrosomia (birth weight >4 kg)
  • Bad obstetric history
  • Glycosuria ≥2+ on two occasions
  • Current obstetric problems (essential hypertension, pregnancy-induced hypertension, polyhydramnios and current use of corticosteroids)

HbA1c alone is not a useful alternative to OGTT as a diagnostic test for GDM.
QUICK REFERENCE FOR HEALTHCARE PROVIDERS MANAGEMENT OF DIABETES IN PREGNANCY

RISK FACTORS OF GDM

- Body mass index >27 kg/m²
- Previous history of GDM
- First degree relative with DM
- History of macrosomia (birth weight >4 kg)
- Bad obstetric history
- Glycosuria ≥2+ on two occasions
- Current obstetric problems (essential hypertension, pregnancy-induced hypertension, polyhydramnios and current use of corticosteroids)

PRECONCEPTION CARE

- Preconception care, provided by a multidisciplinary team, consists of:
  - discussion on timeline for pregnancy planning
  - lifestyle advice (diet, physical activities, smoking cessation and optimal body weight)
  - folic acid supplementation
  - appropriate contraception
  - full medication review (discontinue potentially teratogenic medications)
  - retinal and renal screening
  - relevant blood investigations
- Women with pre-existing diabetes should be informed of the glycaemic control targets and empowered to achieve control before conception. They are also counselled on the risk and expected management approaches during pregnancy.

SELF-MONITORING OF BLOOD GLUCOSE

- Self-monitoring of blood glucose (SMBG) should be done in diabetes in pregnancy. The blood glucose targets should be as the following:
  - fasting or preprandial: ≤5.3 mmol/L
  - 1-hour postprandial: ≤7.8 mmol/L
  - 2-hour postprandial: ≤6.7 mmol/L
- The frequency of SMBG should be individualised based on mode of treatment and glycaemic control.

TIMING FOR SELF-MONITORING OF BLOOD GLUCOSE

<table>
<thead>
<tr>
<th>Timing of SMBG &amp; Mode of treatment</th>
<th>Breakfast</th>
<th>Lunch</th>
<th>Dinner</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
</tr>
<tr>
<td>Diet only</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>OAD or single dose insulin</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Multiple dose insulin</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

MANAGEMENT IN PRE-EXISTING DIABETES

- Low dose aspirin supplementation (75-150 mg daily) should be given to women with pre-existing diabetes from 12 weeks of gestation until term.
- In women with pre-existing diabetes,
  - retinal assessment should be performed at booking and repeated at least once throughout the pregnancy
  - renal assessment should be performed at booking; those with pre-existing renal disease should be managed in a combined clinic
METFORMIN THERAPY

- In GDM, metformin should be offered when blood glucose targets are not met by modification in diet and exercise within 1–2 weeks.
- Metformin should be continued in women who are already on the treatment before pregnancy.

INSULIN THERAPY

- Insulin should be initiated when:
  - blood glucose targets are not met after MNT and metformin therapy
  - metformin is contraindicated or unacceptably
  - FPG ≥7.0 mmol/L at diagnosis (with or without metformin)
  - FPG of 6.0-6.9 mmol/L with complications such as macrosomia or polyhydramnios (start insulin immediately, with or without metformin).
- Human insulins are the preferred choice in pregnant patients who need insulin therapy.
- Both rapid and long acting (basal) insulin analogues are as efficacious as human insulin in pregnant women with pre-existing diabetes and GDM.
- Insulin analogues are associated with fewer incidences of hypoglycaemia.

FETAL SURVEILLANCE USING ULTRASOUND SCAN

<table>
<thead>
<tr>
<th>TIMING</th>
<th>PARAMETERS</th>
</tr>
</thead>
</table>
| 11-14 weeks of gestation | • **Early scan** is performed to:  
  - confirm gestational age using crown-rump length measurement  
  - assess for major structural malformation including acrania and anencephaly |
| 18-20 weeks of gestation | • **Detailed structural anatomy scan** which includes the spine and heart (four-chamber, outflow tract and three-vessel views) |
| 28-36 weeks of gestation | • **Serial growth scan** is performed every four weeks to assess fetal growth and amniotic fluid volume.  
  - The rate of fetal growth should be used to facilitate decisions with treatment, and timing and mode of delivery. |

REFERRAL

- Pregnant women with pre-existing diabetes and women with GDM who have poor glycaemic control or fetal complications should be referred to secondary or tertiary care.

TIMING AND MODE OF DELIVERY

- In pregnant women with pre-existing diabetes with:  
  - no complications, deliver between 37+0 and 38+6 weeks  
  - maternal or fetal complications, deliver before 37+0 weeks
- In women with GDM:
  - on diet alone with no complications, deliver before 40+0 weeks  
  - on oral antidiabetic agents or insulin, deliver between 37+0 and 38+6 weeks  
  - with maternal or fetal complications, deliver before 37+0 weeks
- Mode of delivery should be individualised, taking into consideration the estimated fetal weight and obstetric factors.
### MEDICATION TABLE

#### Oral Antidiabetic Agents

<table>
<thead>
<tr>
<th>Drugs</th>
<th>Formulations</th>
<th>Minimum Dose</th>
<th>Maximum dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metformin</td>
<td>Metformin 500 mg tablet</td>
<td>Initial dose 500 mg OD</td>
<td></td>
</tr>
<tr>
<td>Metformin SR 850 mg</td>
<td>Usual dose 850 mg BD</td>
<td>850 mg TDS</td>
<td></td>
</tr>
<tr>
<td>Metformin XR 500 mg/ 750 mg</td>
<td>Initial dose 500 mg OD</td>
<td>2000 mg OD</td>
<td></td>
</tr>
</tbody>
</table>

#### Insulin Types

<table>
<thead>
<tr>
<th>Types of Insulin preparation</th>
<th>Onset of Action</th>
<th>Peak Action (hours)</th>
<th>Duration of Action (hours)</th>
<th>Timing of Administration of Insulin</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Short Acting, Regular</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actrapid</td>
<td>30-60 min</td>
<td>2-4</td>
<td>6-10</td>
<td>30 min before meal</td>
</tr>
<tr>
<td>Humulin R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insugen R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insuman R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rapid Analogues</strong></td>
<td>0-20 min</td>
<td>1-3</td>
<td>3-5</td>
<td>5-15 min immediately before/after meals</td>
</tr>
<tr>
<td>Aspart</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lispro</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intermediate-acting, NPH</strong></td>
<td>1-2 hour</td>
<td>4-8</td>
<td>8-12</td>
<td>Prebreakfast/ Prebed</td>
</tr>
<tr>
<td>Insulatard</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humulin N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insugen N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insuman N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Long Acting Analogues</strong></td>
<td>30-60 min</td>
<td>Less Peak</td>
<td>16-24</td>
<td>Same time everyday (Flexible once daily injection)</td>
</tr>
<tr>
<td>Glargine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Determir</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Premixed Insulin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixtard 30</td>
<td>30 min</td>
<td>Dual</td>
<td>18-23</td>
<td>30-60 min before meals</td>
</tr>
<tr>
<td>Humulin 30/70</td>
<td>30 min</td>
<td>Dual</td>
<td>16-18</td>
<td>30-60 min before meals</td>
</tr>
<tr>
<td>Novomix 30</td>
<td>10-20 min</td>
<td>1-4</td>
<td>16-20</td>
<td>5-15 min before meals</td>
</tr>
<tr>
<td>Humalog mix 25/75</td>
<td>15 min</td>
<td>0.25-2.5</td>
<td>16-18</td>
<td>5-15 min before meals</td>
</tr>
<tr>
<td>Humalog mix 50/50</td>
<td>15 min</td>
<td>0.25-2.5</td>
<td>16-18</td>
<td>5-15 min before meals</td>
</tr>
</tbody>
</table>

#### Initiating Insulin Therapy in Pregnancy

<table>
<thead>
<tr>
<th>Glycaemic abnormality</th>
<th>Suggested Insulin Type and Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>FPG &gt;5.3 mmol/L</td>
<td>Start 0.2 units/kg of intermediate-acting insulin at bedtime, increase by 2 units every 3 days until targets are reached.</td>
</tr>
<tr>
<td>1-hr postprandial &gt;7.8 mmol/L</td>
<td>Start 6 units of short-acting insulin, increase by 2 units every 3 days until targets are reached. If preprandial short acting insulin dose exceeds 16 units TDS, consider adding 6-10 units intermediate-acting insulin in the morning and titrate accordingly until targets are achieved.</td>
</tr>
<tr>
<td>2-hr postprandial &gt;6.7 mmol/L</td>
<td></td>
</tr>
</tbody>
</table>

#### Estimation of total daily insulin requirement by gestation/trimester

<table>
<thead>
<tr>
<th>Pregnancy gestation</th>
<th>Total daily insulin requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st trimester</td>
<td>0.7 units/kg/day</td>
</tr>
<tr>
<td>2nd trimester</td>
<td>0.8 units/kg/day</td>
</tr>
<tr>
<td>3rd trimester</td>
<td>0.9 units/kg/day</td>
</tr>
</tbody>
</table>
ALGORITHM B: INTRAPARTUM GLUCOSE MONITORING FOR DIABETES IN PREGNANCY IN ACTIVE LABOUR

**T1DM**
Start intravenous (IV) dextrose infusion

**T2DM or GDM on insulin/metformin**
Stop subcutaneous insulin/metformin
Check capillary blood glucose (CBG) 1- to 2-hourly

**GDM on diet alone**
Check CBG 4-hourly

*CBG results (Target: 4.0-7.0 mmol/L)

- **<4.0 mmol/L**
  - Inform doctor immediately
  - If symptomatic, give bolus IV dextrose (20 ml of D50%)
  - If asymptomatic, offer nourishing fluid
  - Repeat CBG in 30 minutes and follow CBG results (*)

- **4.0-7.0 mmol/L**
  - Continue monitoring CBG as previously

- **7.1-10.0 mmol/L**
  - Repeat CBG in 1 hour

- **>10.0 mmol/L**
  - Start IV insulin infusion

**Refer to ALGORITHM C**

T1DM: Type 1 diabetes mellitus
T2DM: Type 2 diabetes mellitus
GDM: Gestational diabetes mellitus
**ALGORITHM C: INSULIN INFUSION AND TITRATION IN ACTIVE LABOUR**

Start intravenous (IV) insulin infusion*

Check capillary blood glucose (CBG) hourly

**CBG results**
(Target: 4.0-7.0 mmol/L)

- **<4.0 mmol/L**
  - Withhold insulin infusion
  - Inform doctor immediately
  - If symptomatic, give bolus IV dextrose (20 ml of D50%)
  - If asymptomatic, offer nourishing fluid
  - Repeat CBG in 30 minutes

- **≥4.0 mmol/L**
  - Titration of insulin infusion:

<table>
<thead>
<tr>
<th>CBG (mmol/L)</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drop &gt;2.0 from previous reading</td>
<td>Reduce by 1.0 unit</td>
</tr>
<tr>
<td>4.0-7.0</td>
<td>Maintain current dose</td>
</tr>
<tr>
<td>7.1-8.5</td>
<td>Add 0.5 unit</td>
</tr>
<tr>
<td>8.6-10.0</td>
<td>Add 1.0 unit</td>
</tr>
<tr>
<td>&gt;10.0</td>
<td>Add 2.0 unit</td>
</tr>
</tbody>
</table>

Check CBG in 1 hour

*IV insulin infusion initiation rate*
- Type 1 diabetes mellitus: 0.01-0.02 unit/kg/hour
- Type 2 diabetes mellitus/gestational diabetes mellitus: 0.05-0.07 unit/kg/hour
- If requirement exceed 0.1 unit/kg/hour, refer the endocrinologist/physician