Diabetes in pregnancy guideline (GL983)

Approval

<table>
<thead>
<tr>
<th>Approval Group</th>
<th>Job Title, Chair of Committee</th>
<th>Date</th>
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<tbody>
<tr>
<td>Maternity &amp; Children's Services Clinical Governance Committee</td>
<td>Chair, Maternity Clinical Governance Committee</td>
<td>4th May 2018</td>
</tr>
</tbody>
</table>

Change History

<table>
<thead>
<tr>
<th>Version</th>
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| 2.0     | April   | L Critcher & J Eustace, Diabetes Specialist MWs & S Sengupta, Consultant Obs & Gyna | Pg 3 – Medications & Scans in Pregnancy added to criteria  
Pg 4 – Blood tests updated & Retinal screening added  
Pg 5, 7 & 8 – minor changes  
Pg 10 – Appendix 1 amended  
Pg 11 – VRII moved to App 2 (was App 4)  
Pg 12 – Appendix 3 minor changes |
| 2.1     | Jan     | S Sengupta, Consultant Obs & Gynae, L Critcher (Diabetes MW) | Live change to criteria for OGTT to state referral to be made for all women with risk factors regardless of gestation. |
| 2.2     | Feb     | S Sengupta, Consultant Obs & Gynae, J Eustace (Diabetes MW) | Live change to increase prophylactic aspirin dose to 150mg from 75mg and update Neonatal hypoglycaemia in line with latest guidance |

To be read in conjunction with

Neonatal hypoglycaemia GL359
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Management of pre-existing Diabetes (Type 1 and Type 2)

1.1 Antenatal Management

1.1.1 GP/CMW should refer women to the Diabetes Specialist Midwives (DSM) as soon as the pregnancy is confirmed.

1.1.2 DSM remains the first point of contact throughout the pregnancy and after delivery while in the hospital.

1.1.3 Complications of Diabetes in pregnancy are miscarriage, congenital anomalies, stillbirth, pre-eclampsia, macrosomia (increased risk of shoulder dystocia), increased operative delivery and admission to neonatal unit, birth injury or increased perinatal mortality and morbidity.

Scans in the pregnancy

1.1.4 Viability scan at 7-8 weeks

1.1.5 Foetal echocardiogram at 22-24 weeks

1.1.6 Foetal growth is monitored from 28 weeks every four weeks till thirty six weeks. Weekly or two weekly scanning may be required in some cases

Medications

1.1.7 Women should be on 5mg of Folic acid pre-pregnancy and continue to take it till 14 weeks of the pregnancy

1.1.8 Women should be commenced on 150mg of Aspirin form 12 weeks onwards (unless advised to do so earlier) to reduce the risk of early onset pre-eclampsia and to stop at 36 weeks.

1.1.9 Antihypertensives like ACE inhibitors and ARB (Angiotensin receptor blockers) and cholesterol lowering agents should be stopped ideally before pregnancy

Glucose control

1.1.10 Ensure all women with diabetes are given a blood glucose meter. Women will be asked to monitor their blood glucose levels six times a day. These should be before breakfast, lunch and dinner and one hour after breakfast, lunch and dinner.

The glycaemic target should be

- Fasting (pre breakfast) less than 5.3mmol/l
- Pre lunch and dinner – 4.0 – 6.0mmol/l
- Post-meal readings should be aimed at <7.8mmol/l one hour after food and <6.4mmol/l 2 hours after food
- Pre bed (at least 2 hours after dinner) less than 6.4mmol/l
1.1.11 Hypoglycaemic safety to be discussed with the woman and she should be given Hypo-kits and an adult relative should be taught how to recognise symptoms of hypoglycaemia and treat at home in emergencies.

1.1.12 If insulin requirements fall by 20% especially in the second of early third trimester, women should be advised to monitor foetal movements. This may indicate placental insufficiency. If concerned with reduced foetal movements they should be advised to ring triage on 0118 322 7304.

Blood Tests in Pregnancy

1.1.13 Bloods for antenatal booking as usual. In addition urea, creatinine and electrolytes, and HbA1c, thyroid function tests to be done at the initial visit and every trimester and PCR if persistent proteinuria of >/= 2 on two separate occasions. VTE assessment should be done in the antenatal period and repeated during admissions and in the postnatal period.

1.1.14 Delivery of women with pre-existing diabetes should be organised between 37+0 and 38+6 weeks. If there are medical or Obstetric complications like pre-eclampsia, macrosomia or growth restrictions delivery may have to be considered earlier. If delivery is anticipated before 36 weeks of gestation antenatal corticosteroids should be offered. The potential for baby to be admitted in Special Care Unit needs to be discussed.

Retinal Screening

1.1.15 Women will be advised to have retinal screening once in every trimester, this will be organised by the DSM in the first instance.

1.2 Intrapartum Management

1.2.1 All inpatients using their own insulin must be assessed by the admitting midwife for their suitability to self-administer insulin as per the RBH trust guidelines.

1.2.2 Women will continue with their normal medication (Metformin &/or insulin) until they are in active labour.

1.2.3 An IV cannula should be sited as soon as the woman is in established labour. A second IV cannula is required if the woman needs Variable Rate Insulin Infusion (VRII).

1.2.4 Once in labour regular insulin should be discontinued and VRII started.

1.2.5 Target blood glucose levels of 4.0mmol – 7.0mmol/l should be maintained during labour.
1.2.6 Monitor blood glucose every hour in the first stage of labour and every half hour for the second stage of labour for insulin dependent diabetics both Types 1 and 2.

1.2.7 For women on Metformin/diet controlled Type 2 blood glucose should be monitored every two hours. Increase monitoring to hourly if blood glucose >7.0mmol/l. If BM persistently (>2 readings) > 7.0mmol/l start VRII.

1.2.8 Some women with Type 1 DM will have continuous subcutaneous insulin infusion (CSII) or insulin pump. Plans to use this during labour and delivery will be decided on an individual basis and will be documented in the notes.

1.2.9 For VRII see appendix 2

1.3 Postnatal care

1.3.1 Newly delivered T1 and T2 DM women will need significantly smaller doses of insulin postnatally. The suggested postnatal doses will be written on consultant green page in the maternity notes and the postnatal page of the diabetes booklet.

1.3.2 If guidance regarding postnatal dose not found in the notes, please check pre-pregnancy dose in the diabetes booklet and reduce by 50%. If still unsure contact endocrine registrar on bleep 192/199

1.3.3 Monitor blood glucose four times a day before each meal and before bedtime.

1.3.4 Type 2 DM on Metformin/diet control may or may not need medication.

1.3.5 Aim for pre-meal glucose levels of 6.0mmol/l to 10.0mmol/l in the immediate postnatal period.

1.3.6 If BMs persistently >10.0mmol/l consult DSM or endocrine registrar.

1.3.7 If on VRII during labour, continue till they are able to tolerate food. VRII should only be discontinued at meal times. If not discontinued by 19:00 hrs it should remain and discontinued at breakfast the next day.

1.3.8 Women with Type 2 DM who were not treated pre-pregnancy should not need to continue VRII after delivery.

2.0 Management of Gestational Diabetes Mellitus (GDM)

2.1 Screening

Risk factors for Gestational Diabetes Mellitus (GDM) are as follows:

- Previous GDM.
- Afro-Caribbean and Asian origin.
• Previous baby with birth weight >4500gm
• BMI > 35kg/m2
• First degree relative with diabetes
• Glycosuria of 1+ on 2 occasions or >=2+ on 1 occasion
• Women on anti-psychotics
• For women with babies that are large for gestational age with or without polyhydramnios over 34 weeks

Referral to be made for all women with risk factors regardless of gestation.

Women with previous GDM should be tested as follows:
Women with previous GDM to have the Oral Glucose Tolerance Test as soon as possible after booking and, if normal, to repeat it at 24-28 weeks. All other risk factors: Oral glucose tolerance test referral to be made for women regardless of gestation.

2.2 Diagnosis
GDM will be diagnosed if:-
The fasting blood glucose is 5.6mmol/l or more and the 2 hour post glucose level is 7.8mmol/l or more.

2.3 Antenatal care
Aim to:
2.3.1 Maintain the fasting below 5.3mmol/l and pre-prandial blood glucose levels between 4.0mmol/l and 6.0mmol/l
2.3.2 Keep the post prandial blood glucose levels below 7.8mmol/l one hour post prandial and two hours post prandial below 6.4mmol/l.
2.3.3 The women will be asked to send readings on a regular basis to the DSMs by email or phone and, where diet/lifestyle changes fail to achieve the above glycaemic levels, will initiate the appropriate oral hypoglycaemic/insulin treatment.
2.3.4 Offer ultrasound scans for growth at 2-4 weekly intervals, as appropriate to the growth from 28/40
2.3.5 Deliver between 40 and 40+6 weeks; earlier if complications
2.3.6 For steroid prophylaxis, see Appendix 1
2.4 Intrapartum care

2.4.1 Patients using their own Insulin must be assessed by the admitting midwife for their suitability to self-administer Insulin prior to labour, as per RBH trust guidelines. Give the woman the leaflet and complete the self-assessment form. Women will continue with their normal diet and normal medication (Metformin and/or Insulin) until such time as they are assessed as being in active labour. Aim to keep blood glucose levels between 4.0mmol/l - 7.0mmol/l during labour.

2.4.2 For all GDM women take blood glucose minimum 2 hourly, and increase to hourly if it is above 7.0mmol/l. If persistently above 7.0mmol/l then consider using a Variable Rate Insulin Infusion to control blood glucose levels. This is important if delivery is not imminent, in order to prevent neonatal hypoglycaemia. (See Appendix 3).

For any woman with Diabetes requiring Caesarean section (Elective or Emergency) see Appendix 3

2.5 Postnatal care

The vast majority of women diagnosed with GDM will see their blood glucose levels return to normal within 24-36 hours.

2.5.1 Ask the woman to monitor her blood glucose levels minimum four times daily (pre-meals and pre-bed).

2.5.2 The ward staff may discharge the woman as long as her blood glucose is below 6.0mmol/l, or between 6.0 – 10.0mmol/l with a message left for the DSM to follow up. There is a discharge folder on the ward detailing the process of discharge.

2.5.3 At discharge the woman should be given a pathology form with her GPs name for copies to be sent to. It should be marked with a tick by the glucose test, and “fasting plasma glucose” should be written at the bottom. The test should be carried out 5 weeks postnatally and the woman should ask for the results from her GP at her 6 week postnatal check.

2.5.4 Occasionally the diabetes team will be concerned that a woman diagnosed with GDM may in fact have undiagnosed Type 2 or even Type 1 DM. This will be recorded in the notes and a plan made for surveillance on the green consultant page.

2.5.5 If levels remain above 10.0mmol/l after 24 hours, then the patient must not be discharged without being seen by the DSMs or a member of the Diabetes MDT, as they are likely to have pre-existing diabetes.
2.6 Neonatal Care (see Appendix 4)

(Appendix 1) Steroid Prophylaxis in pregnancy for diabetic women

1. Steroid prophylaxis is indicated if delivery is planned or occurs before 36 completed weeks

2. Steroids usually elicit a rise in maternal blood glucose levels which may be apparent immediately or take some time

3. Women on insulin will be advised to increase their insulin by 10-20% from steroid administration and for the next 48 hours. The increased doses will be documented in the maternity notes on the green consultant page.

4. Women who have been given steroids to take at home are advised to check their blood glucose levels measured every four hourly.

   If the BM reading is \( \geq 12.0 \text{mmol/l} \) but below 13mmol/l repeat test in 1 hour. If still \( \geq 12.0 \text{mmol/l} \) but \(<13.0\text{mmol/l} \) to call triage and come to the hospital for VRII. If \(<12.0\text{mmol/l} \) to continue to monitor four hourly OR

5. One single reading >13.0mmol/l they are advised to ring triage. They MUST be admitted in Delivery suite for VRII.

6. Diabetic ketoacidosis (DKA) is a serious risk for diabetic women receiving steroids and admission may be necessary for those who are Type1/ Metformin/ diet controlled diabetics. (See pages 13-15 for management of DKA)

7. Urine ketone testing should be carried out twice daily if admitted. If ketones are:

   1+ in the urine dipstick urine 4 hourly

   2+ or more in urine dipstick alert Obstetric registrar.

8. Women who have had steroids should eat and drink normally and continue their normal diabetes medication; if levels are rising treat using VRII
Variable rate insulin infusion (VRII) – Formerly known as Sliding Scale of Insulin

Indications for use
Unstable blood glucose levels despite usual subcutaneous insulin. This may occur during intercurrent illness or steroid treatment

CAUTION - PLEASE USE SEPARATE GUIDELINES FOR Management of DIABETIC KETOACIDOSIS

General Principles
Continue patients usual subcutaneous insulin as prescribed, this may be short and long acting. The VRII will be in addition to the regular insulin the woman is taking.

<table>
<thead>
<tr>
<th>Blood glucose (mmol/l)</th>
<th>Metered IV Insulin (Units/hr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0 or below</td>
<td>Stop Insulin measure blood glucose in 30 minutes</td>
</tr>
<tr>
<td>4.1–7.0</td>
<td>1.5</td>
</tr>
<tr>
<td>7.1 – 9.0</td>
<td>2.5</td>
</tr>
<tr>
<td>9.1–11.0</td>
<td>4.0</td>
</tr>
<tr>
<td>&gt;11.0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

PREPARATION
The VRII infusion is prepared with soluble insulin (Actrapid or HumulinS) 50 units in 50ml of Normal Saline (Sodium chloride 0.9%) in 50ml IV syringe administered IV through non-returnable valve via a Trust approved infusion pump.

BLOOD SUGAR CONTROL
Hourly monitoring of blood glucose
Aim to maintain BM between 4 - 7.8
Inform doctor if capillary blood glucose >10mmol/l for >2 hours or 4 hours
Alongside VRII there should be infusion of 0.45% saline with 5% glucose and 0.15% potassium chloride OR an alternative substrate solution to above is 5% glucose (be aware of hyponatremia with this regime) Selection of subsequent fluids should be based on electrolytes and fluid status.

***The fluid should run at 100ml/hr
Continue till able to eat and drink and back to their usual glucose lowering medications.

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(Appendix 3) Caesarean sections in diabetic women

ELECTIVE

- All inpatients using their own insulin must be assessed by the admitting MW for their suitability to self-administer insulin as per RBH trust guidelines. Give the woman the leaflet and complete the self-assessment form.

- Women may be admitted on the morning of the surgery to the Day assessment Unit (DAU) AT 07:30hrs. In some cases admission to the Iffley ward the day before may be suggested.

- Metformin can be taken normally until the day before surgery. Short acting insulin should be taken with meals on day before surgery, but long acting insulin will be reduced the night before surgery (for the dose see the diabetes booklet in maternity notes). No Metformin or insulin should be taken on the morning of the elective surgery.

- Check blood glucose one hour after admission. If the BM >8.0mmol/l check BM one hour later. Check blood ketones and if >0.6 mmol/l transfer to delivery suite for management with VRII.

- If the blood glucose is <3.5 mmol/l prior to midnight and patient able to swallow safely, correct hypoglycaemia by fast acting carbohydrates (Glucogel, Glucotab, Jelly babies, sweet drink which the woman may have) or use the glucogel tab in the HYPO box. Follow up with two slice of toast OR two digestive biscuits.

- If woman unable to co-operate and/or swallow safely use Glucagon injection (in the fridge in delivery suite/Iffley ward) or 75mls of 20% IV glucose. Inform medical staff and transfer the woman to the DS.

- Blood glucose will be controlled using a VRII which if needed will be set up by the anaesthetist in theatre. The anaesthetist will be responsible for the glycaemic management throughout the surgery.

EMERGENCY

- To avoid neonatal hypoglycaemia in theatre, aim for blood glucose to be maintained between 4-7 mmol/l.

- If GA is required then measure BM every half hourly and if regional analgesia is used measure BM every hour.

- Blood glucose will be maintained by the VRII if needed which will be managed by the anaesthetist.
Management of the Neonate of the diabetic woman

1. Diabetes in pregnancy carries the risk of hypoglycaemia, respiratory distress syndrome, polycythaemia, jaundice, hypothermia.
2. Babies of mothers who have been on insulin should be admitted to the Transitional Care bay on Marsh (Level 4)
3. Babies of diabetic mothers should be fed immediately after birth and 3-4 hourly depending on the blood glucose levels.
4. Observation of the clinical and neurological status should be documented.
5. If the mother intends to bottle feed start at 90-100ml/kg/day. Encourage breastfeeding over formula.
6. Neonatal blood glucose should be checked prior to the second feed and within 4 hours of the birth, unless symptomatic of hypoglycaemia.
7. Blood glucose should be checked as per the Neonatal Hypoglycaemia Prevention & Management (GL359) guideline.

8.  
   (i) Routine monitoring of term babies can be discontinued after 2 consecutive normal values. Recommence if concerns of hypoglycaemia.
   (ii) Pre-term babies (>37/40) should be continued for 48hrs.
GL359 Flowchart A1 - Management of Infants at risk of hypoglycaemia (for use with BLOOD GAS blood sugar monitoring)

**At birth**
- Dry and place the baby skin-to-skin care in a warm draught free room
- Put hat on the baby, and cover with a warm blanket
- Encourage and support early breast feeding within the first hour after birth
- For women who choose to formula feed give 10-15mls/kg within the first hour after birth
- Provide written and verbal information to parents (Patient Information Leaflet for Hypoglycaemia), see appendix 3

**Within 4 hours**
- Check pre-feed blood glucose level prior to second feed (within 4hrs of birth)
  - Is blood glucose level more than or equal to 2.0mmol/L?
    - Yes
      - Encourage frequent feeding and ensure no longer than 3 hours between feeds
      - Assess the need for helping the mother with feeding, hand expression, recognition of early feeding cues and signs of effective attachment and feeding
      - For women who choose to formula feed, give 10-15mls/kg per feed 3 hourly over the first 24 hours after birth
    - No
      - *If baby has a normal blood sugar with a temperature under 36.5C and the temperature responds to intervention the baby does not need to be on the protocol*

**Within 8 hours**
- Check pre-feed blood glucose level prior to third feed (within 8hrs of birth)
  - Is blood glucose level more than or equal to 2.0mmol/L?
    - Yes
      - Continue to support responsive breast feeding
      - If formula fed give 10-15mls/kg per feed 3 hourly over the first 24 hours
      - Ensure mother understands how to assess effective feeding and knows how to escalate concerns
      - No further blood glucose monitoring required unless there are clinical signs of hypoglycaemia (Box 2)
      - Observe feeding in hospital for 24 hours
      - Complete at least one recorded breast feeding assessment using local/BFI tool prior to transfer home
    - No
      - See Flowchart B Blood sugar < 1.0 - Blood neonatal/Regist/A/NP immediately

**Box 1. Indications for blood glucose monitoring**
- Intrauterine growth restriction (≤2nd centile)
- Infants of Diabetic mothers
- Large birth weight > 4.5kg
- Maternal beta-blocker use
- Preterm <37 weeks
- Arterial Cord pH <7.1 BE>12
- Hypothermia (Temp <36.5 °C)
- Neonatal Sepsis raised CRP
- Structural problems-Cleft lip or palate
- Known Metabolic Disorders like MCADD

**Box 2. Signs that may indicate hypoglycaemia**
- Lethargy
- Abnormal feeding behaviour especially after a period of feeding well
- High pitched cry
- Altered consciousness
- Hypothermia (<36.5°C)
- Hypotonia
- Seizures
- Grunting
- Cyanosis
- Apnoea

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**Job Title:** Diabetes Specialist MWs, Consultant Obstetrician  
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**Date last printed:** March 2020
GL359 Flowchart B1 - Management of Infant with blood glucose 1.0-2.0 on BLOOD GAS and no abnormal clinical signs

Does the baby have clinical signs consistent with hypoglycaemia (see box 1)?

Yes

See Flowchart C
Bleep neonatal Registrar/ANNP immediately

No

Any of:
- Blood glucose <1.0mmol/L
- 2 consecutive blood sugars <2.0mmol/L
- 3 blood glucose levels

No

Have you done the following?
- Support breast feeding (see Box 2)
- If mother is choosing to formula feed, aim to give 10-15ml/kg feed and continue 3 hourly
- Consider administration of 40% buccal dextrose gel 200mg/kg (Appendix 1)
- Recheck blood glucose before next feed (3 hours)

Is the blood glucose level >2.0 mmol/L?

No

Yes

Give feed: breast feed and/or offer expressed breast milk (3-5ml/kg)
- In formula fed infants aim for 80-100ml/kg/day in 3 hourly feed volumes
- Recheck blood glucose before next feed (3 hours)

Is the blood glucose level >2.0mmol/L?

No

Yes

Continue to support breast feeding and feed responsively
- After 2 consecutive pre-feed BG measurements >2.0mmol/L (or 48 hours if born <37 weeks) discontinue BG monitoring unless there are abnormal clinical signs (Box 1), in which case use Flowchart C
- Observe feeding for at least 24 hours
- Complete at least one breastfeeding assessment tool prior to transfer home

Box 1. Signs that may indicate hypoglycaemia
- Lethargy
- Abnormal feeding behaviour especially after a period of feeding well
- High pitched cry
- Altered consciousness
- Hypothermia (<36.5°C)
- Hypotonia
- Seizures
- Grunting
- Cyanosis
- Apnoea

Box 2. Supporting breast feeding
- Encourage continuous skin-to-skin contact
- Teach mother to hand express breast milk
- Give colostrum obtained to baby by the method suitable to parents
- Continue to encourage hand expression at least 8-10 times in 24 hours and support feeding on the breast until infant is feeding effectively

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GL359 Flowchart C - Management of symptomatic hypoglycaemia, prolonged hypoglycaemia, and/or blood glucose <1.0 on BLOOD GAS

Symptomatic (see box 1) hypoglycaemia is an emergency. Bleep neonatal registrar immediately for urgent paediatric review. Admit baby to neonatal unit for urgent intervention.

Registrar Bleep 138
SHO Bleep 333

Box 1. Signs that may indicate hypoglycaemia
- Lethargy
- Abnormal feeding behaviour especially after a period of feeding well
- High pitched cry
- Altered consciousness
- Hypothermia (<36.5°C)
- Hypotonia
- Seizures
- Grunting
- Cyanosis
- Apnoea

For recurrent or persistent hypoglycaemia, contact paediatric team for review, likely to need neonatal admission. May need investigations.
Consider increased feed frequency or volume, high energy feed or NG feeds but default treatment as below or if concerns.

Unable to obtain immediate IV

Treat IV with 10% glucose 2.5ml/kg
Start IV infusion of 10% glucose at 60-90ml/kg/d

Dextrose gel can be given while IV access is obtained OR intramuscular glucagon 200micrograms/kg

• Do not stop the establishment of breast feeding unless the baby is too sick to feed or there is a clinical contraindication to feeding. Support expression of breast milk.
• In formula fed babies continue feeds if no contraindication to enteral feeding.
• Recheck blood glucose on blood gas after 30 minutes.

Blood glucose <1.0 on blood gas or symptomatic hypoglycaemia:
Confirm hypoglycaemia screen completed and/or repeat.
Give IV 10% glucose 2.5ml/kg
Increase glucose delivery rate by increasing volume and/or concentration of glucose infusion (see appendix 5).

Repeat blood glucose every 30 minutes until blood glucose >2.0 on blood gas.

Blood glucose 1.0-2.5 on blood gas with no abnormal clinical signs:
Increase glucose delivery rate by increasing volume and/or concentration of glucose infusion (see appendix 5).
Continue to feed if no contraindication.

Blood glucose >2.5 on blood gas:
Slow wean of IV fluids.
Continue enteral feeding.
Continue to monitor blood glucose until infant is on full enteral feeds and blood glucose values are >2.0mmol/l for at least 24 hours.
3.0 Management of complications of Diabetes in pregnancy

3.1 Diabetic Ketoacidosis (DKA)

3.1.1 Results from a lack or relative lack of insulin, poor compliance.

3.1.2 DKA in adults with Type 1 DM is associated with a mortality rate of 5-10%. In pregnancy, it is associated with a foetal mortality rate of 9-27%.

3.1.3 DKA needs to be treated as an emergency.

3.1.4 Possible causes are Infection, hyperemesis gravidarum, neglect of diabetes care, steroid prophylaxis, faulty glucose meter or insulin pumps.

3.1.5 DKA in pregnancy may present with normal glucose levels.

3.2 Diagnosis of severe DKA

- Blood ketones >3.0mmol/l
- Venous/Arterial pH <7.0
- Serum bicarbonate <5.0mmol/l
- Hypokalemia <3.5mmol/l
- Abnormal AVPU
- SpO2 <92%
- SBP <90mmHg
- Pulse >100bpm or <60bpm
- Anion gap >16 (Serum anion gap= serum sodium – (serum chloride+ bicarbonate)

3.3 Investigations

3.3.1 Bloods should be sent for FBC, U&Es, glucose and ketones, bicarbonate, venous lactate, cultures if indicated, G&S ABG to be considered.

3.3.2 Urine for MC&S

3.3.3 Consider Chest X-ray and ECG

3.3.3 CTG as soon as woman is stabilised

3.4 Treatment

3.4.1 Assessment ABC

3.4.2 Site 2 IV cannulae both grey (16G)
3.4.3 Inform obstetric registrar, obstetric consultant, and anaesthetic consultant.

3.4.4 Request Medical review and endocrine registrar (bleep number 199/192)

3.4.5 HDU chart to be started and patient should have continuous CTG, SpO2 monitoring.

3.4.6 15 minute recording of BP and Pulse, hourly recording of respiration and MOWS and 4 hourly temperatures.

3.4.7 Hourly bloods for glucose, ketones, potassium and bicarbonates.

3.4.8 Commence IV fluids through the first cannula as follows:

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Volume</th>
<th>Duration</th>
<th>Potassium</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9% Sodium chloride</td>
<td>1 litre</td>
<td>1 hour</td>
<td>None</td>
</tr>
<tr>
<td>0.9% Sodium chloride</td>
<td>1 litre</td>
<td>1 hour</td>
<td>Replace as below</td>
</tr>
<tr>
<td>0.9% Sodium chloride</td>
<td>1 litre</td>
<td>2 hours</td>
<td>Replace as below</td>
</tr>
<tr>
<td>0.9% Sodium chloride</td>
<td>1 litre</td>
<td>4 hours</td>
<td>Replace as below</td>
</tr>
<tr>
<td>0.9% Sodium chloride</td>
<td>1 litre</td>
<td>6-8 hours</td>
<td>Replace as below</td>
</tr>
</tbody>
</table>

**Potassium replacement chart**

<table>
<thead>
<tr>
<th>Potassium level</th>
<th>KCl per litre of fluid</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3.5mmol/l</td>
<td>40mmol</td>
<td>Refer to endocrine registrar/outreach team</td>
</tr>
<tr>
<td>3.5-5.5mmol/l</td>
<td>20mmol</td>
<td></td>
</tr>
<tr>
<td>&gt;5.5mmol/l</td>
<td>No Potassium</td>
<td></td>
</tr>
</tbody>
</table>

Commence Variable Rate Insulin Infusion through the second cannula

1. If blood glucose >14mmol/l start
   1 litre of Sodium chloride +20 mmol/l KCl at 100ml/hr.
   AND
   IV insulin in prefilled syringe (contains 50units of soluble insulin in 49.5ml of 0.9% Sodium chloride)
   If NO PREFILLED syringe available then add 50 units of Actrapid insulin to 49.5 ml of 0.9% Sodium chloride mixed in a syringe and use with a syringe driver pump to deliver at a rate dependent on the glucose level (see below)
2. If blood glucose is <14mmol/l start 10% IV Glucose (500ml) with Kcl 10mmol at 100ml/hr.

AND

IV insulin in prefilled syringe (contains 50 units of soluble insulin in 49.5ml of 0.9% Sodium chloride)

If NO PREFILLED syringe available then add 50 units of Actrapid insulin to 49.5 ml of 0.9% Sodium chloride mixed in a syringe and use with a syringe driver pump to deliver at a rate dependent on the glucose level (see below)

**VARIABLE RATE INSULIN INFUSION (VRII)**

<table>
<thead>
<tr>
<th>Blood Glucose Range</th>
<th>Metered IV Insulin (Units/hr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0 or below</td>
<td>Stop Insulin measure blood glucose in 30 minutes</td>
</tr>
<tr>
<td>4.1 – 7.0</td>
<td>1.5</td>
</tr>
<tr>
<td>7.1 – 9.0</td>
<td>2.5</td>
</tr>
<tr>
<td>9.1 – 11.0</td>
<td>4.0</td>
</tr>
<tr>
<td>&gt;11.0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

- Resolution of DKA is defined as blood ketone <0.6mmol/l and venous pH <7.3
- Maintain Potassium between 4.0-5.5mmol/l
- When DKA resolves offer light diet if able to tolerate, if not eating and drinking continue IV fluids.
- Continue VRII till food is tolerated.
- Once DKA resolved and food tolerated discontinue VRII

### 4.0 Hypoglycaemia

Hypoglycaemia occurs when the blood glucose is <4.0mmol/l

It may present with headache, sweating, blurred vision, dizziness/shaking, palpitation, anxiety, hunger, weakness and fatigue, feeling faint, slurred speech and confusion.
Management of Hypoglycaemia

- **Blood Glucose 2.5-4.0 mmol/l:**
  - If able to swallow:
    - Treat with Glucotabs 4-6 tabs OR Lucozade OR Can of coke OR 4-5 Jelly babies
    - Follow up with toast and bicuit
    - Repeat after 15 min till BM>4.0 mmol/l
    - Once BM>4.0 mmol/l repeat the test in 1 hour
  - If unable to swallow:
    - Check ABC
    - Cannulate
    - Seek medical assistance
    - Give Glucagon IM (in fridge of DS and IIffey ward)
    - Repeat after 15 min till BM>4.0 mmol/l
    - Once BM>4.0 mmol/l repeat test in one hour

- **Blood Glucose 2.0-2.5 mmol/l (Likely to have neurologic symptoms):**
  - If able to swallow safely:
    - Treat with Glucotabs 4-6 tabs OR Lucozade OR Can of coke OR 4-5 Jelly babies
  - If unable to swallow safely:
    - Check ABC
    - Cannulate
    - Seek medical assistance
    - Give Glucagon IM (in fridge of DS and IIffey ward)
    - 75ml 20% glucose IV every 5 minutes till medical help arrives

- **If BM<2.0mmol/l they may be conscious, but at great risk of coma:**
  - If unable to swallow safely:
    - Involve senior staff immediately and manage as HDU patient until fully recovered to eat, drink and manage own diabetes safely