NHS
Greater Glasgow and Clyde

CLINICAL GUIDELINE

Starvation Ketoacidosis in Pregnancy

A guideline is intended to assist healthcare professionals in the choice of disease-specific treatments.

Clinical judgement should be exercised on the applicability of any guideline, influenced by individual patient characteristics. Clinicians should be mindful of the potential for harmful polypharmacy and increased susceptibility to adverse drug reactions in patients with multiple morbidities or frailty.

If, after discussion with the patient or carer, there are good reasons for not following a guideline, it is good practice to record these and communicate them to others involved in the care of the patient.

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Important Note:

The Intranet version of this document is the only version that is maintained.
Any printed copies should therefore be viewed as 'Uncontrolled' and as such, may not necessarily contain the latest updates and amendments.

Greater Glasgow and Clyde

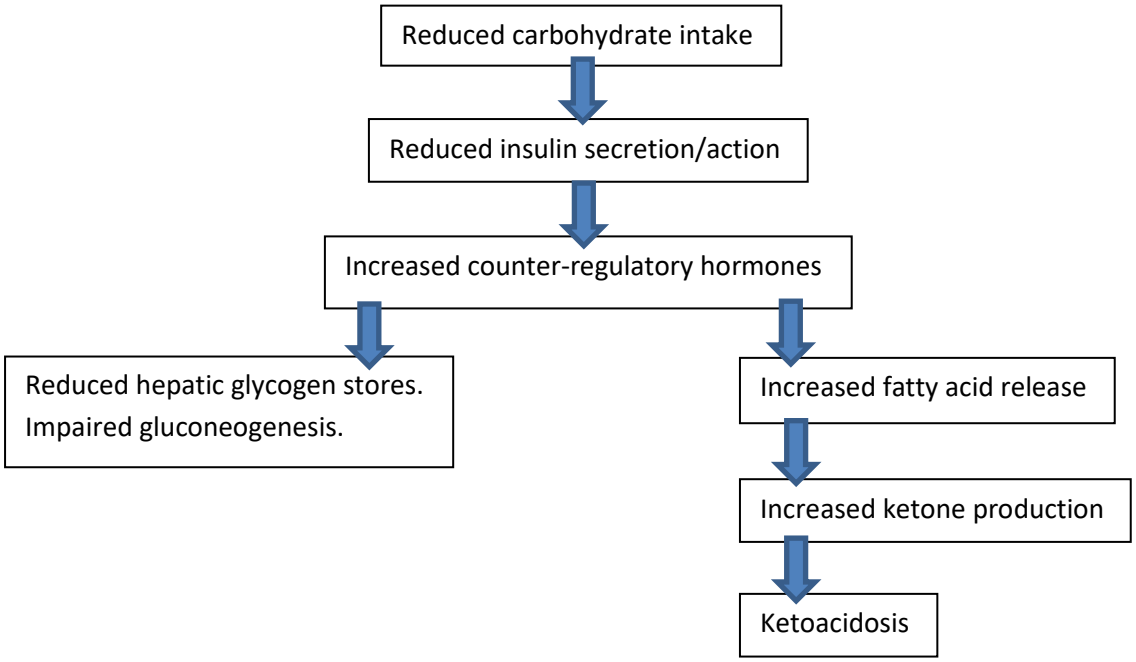
Obstetric Guidelines

Starvation ketoacidosis in pregnancy

Introduction

Any cause of metabolic acidosis in pregnancy should be promptly recognised and managed in order to prevent fetal acidemia, hypoxia and intrauterine death. Severe metabolic acidosis in pregnancy is usually secondary to diabetic ketoacidosis, sepsis or rare metabolic conditions, but can be caused by starvation or poor nutrition. Metabolic changes in pregnancy include increased insulin resistance, increased lipolysis and elevated level of free fatty acids which are driven by factors such as increased oestrogen and human placental lactogen. As a result, pregnant women are more susceptible to ketosis than non-pregnant patients and a relatively short period of starvation may precipitate ketoacidosis, particularly in the 2nd and 3rd trimesters when there is increasing insulin resistance with gestation.

Pathophysiology of starvation ketoacidosis



Assessment

All women who attend Maternity Assessment Unit with nausea and vomiting should be assessed for signs of dehydration:

- Tachycardia
- Hypotension
- Dry mucous membranes
- Feeling thirsty
- Headache, dizziness, confusion
- Ketonuria

and given IV fluids if this is suspected (for example, 0.9% saline 500ml stat). If admitted due to ongoing nausea and vomiting, management should include:

- Urine dip at each void to check for urinary ketones
- 4 hourly observations, which should include blood pressure, heart rate, temperature and respiratory rate

If there are persistent large urinary ketones (≥ 2+ ketonuria) or anuria despite adequate fluid resuscitation or increased RR/HR, then investigations for ketoacidosis should be considered, including:

- Blood glucose
- Blood ketones
- Check UEs, bicarbonate and HbA1c (and calculate anion gap)
- Venous (or arterial) gas to check pH and bicarbonate and lactate

Calculating the anion gap can help to differentiate the cause of a metabolic acidosis.

$$\text{Anion gap} = (Na+K) - (Cl+HCO_3)$$

The normal range is 12-16 and an increased gap is associated with starvation ketoacidosis. If the anion gap is normal, or lactate is raised, then other causes should be looked for (such as sepsis, renal disease, diarrhoea).

Diagnosis of starvation ketoacidosis is made if:

- Blood ketones positive (or ≥0.6 on ketone meter)
- Bicarbonate <18mmol/l
- pH <7.35

Initial management of starvation ketoacidosis

Transfer to LW/HDU level care

Commence IV Pabrinex (1 pair (ampoules 1&2) once daily)

Fluids should be commenced for both resuscitation and correction of electrolyte imbalances.

- 0.9% Sodium Chloride 125ml/hr +/- additional Potassium Chloride (KCl) depending on K^+ result

Alongside this, 10% glucose 125ml/hr should be commenced

- Glucose infusion should **not** be given unless sodium levels are normal and Pabrinex has already been administered (as glucose infusion can precipitate Wernicke's encephalopathy if there is thiamine deficiency)
- There is no evidence that short term glucose infusions has a clinically significant impact on the fetus/neonate

Plasma potassium (mmol/l)	
Anuric/K^+>5 mmol/l	No additional KCl required
3.5-5 mmol/l	Add 10mmol KCl into 500ml bag
<3.5 mmol/l	Add 20mmol KCl into 500ml bag

Please note KCl infusion rate should not be exceed 10mmol/hour.

CTG monitoring should be performed if ≥ 28^{+0} weeks. Fluid resuscitation may have a beneficial effect on fetal heart rate and this should be taken into account if intervention being considered for suspected fetal compromise.

Ongoing management

There is limited evidence regarding ongoing management for starvation ketoacidosis, but a common sense approach, with adaptations from the Diabetic Ketoacidosis Care Pathway 1, can be used.

2 hourly assessments of capillary glucose and blood ketones

4 hourly bloods (including glucose, UEs, bicarbonate and venous/arterial gas)

4 hourly observations, including blood pressure, heart rate, respiratory rate, oxygen saturations and temperature

Accurate fluid balance should be recorded

Treatment should be ongoing until:

- Ph >7.35
- Bicarbonate ≥18mmol/L
- Ketone negative
- Maternal observations within normal limits

It's important to remember that this may be the first presentation of undiagnosed diabetes. This diagnosis cannot be ruled out by a normal blood glucose result (due to the incidence of euglycaemic DKA in the pregnancy population). Therefore if:

- Acidotic
- Blood glucose >10mmol/L
- HbA1c ≥ 48 (if performed during pregnancy)

Then commence the DKA Care Pathway 1.

Diabetic Ketoacidosis Care Pathway 1 (nhsggc.org.uk)

Contact diabetic team for discussion about further treatment

Even if this is felt unlikely to be a first presentation of diabetes mellitus, control of blood glucose >10mmol/L should still be achieved with use of a variable rate intravenous insulin infusion (VRIII).

VRIII should be also be considered if there is no improvement to bloods after 12 hours of initial management, but delivery is likely to be indicated in order to expedite maternal recovery.

Medication that can exacerbate ketoacidosis

This includes medications such as corticosteroids (e.g. Betamethasone) and β-agonists (e.g. salbutamol, terbutaline) and can cause clinical deterioration due to increase in insulin resistance.

Birth

Consider birth if resolution of maternal condition does not occur within 12 hours of commencing treatment or if there is evidence of fetal compromise.

This should be a senior decision as birth prior to adequate resuscitation may increase risk for the mother and there is risk for the neonate if preterm and/or no antenatal corticosteroids have been given.

Postnatal care

If the initial cause of the starvation has not resolved, then the woman remains at risk of a further episode of ketosis (unless delivered). Nausea and vomiting should be optimally managed and there may be a need for maintenance fluids while this improves.

IV Pabrinex, or oral thiamine if tolerating tablets, should be continued during recovery.

If maintenance fluids are required for more than 3 days, then specialist advice should be sought from nutritionist/dietician. The importance of MDT input in cases of starvation ketoacidosis should not be underestimated.

Regular 4 hourly observations and urinary ketones should be checked while the patient remains at risk of further starvation ketoacidosis.

Once eating and drinking normally, follow up should be at the next available antenatal clinic with the named consultant. This should include observations (including heart rate) and urinalysis as well as a fetal growth scan.

The recent UKOSS study on DKA in Pregnancy highlighted a high perinatal mortality rate associated in women who had an episode of DKA. Although the pathophysiology may be different, the possible causes of stillbirth (fetal acidosis, maternal dehydration with reduced placental perfusion and clinically significant electrolyte imbalances) will be relevant to women who have had starvation ketoacidosis and this should be taken into consideration when caring for these patients.

References

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