Newborn hypoglycaemia

Clinical Guideline Presentation

45 minutes
Towards CPD Hours
Learning outcomes

At the end of this session about Newborn Hypoglycaemia the participant will be able to outline:

- Risk factors
- How it is defined
- Preventative care for the baby at risk
- Management of hypoglycaemia
- Discharge planning
# Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>BGL</td>
<td>Blood glucose level</td>
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<tr>
<td>EBM</td>
<td>Expressed breast milk</td>
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<tr>
<td>FGR</td>
<td>Fetal growth restriction</td>
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<tr>
<td>LGA</td>
<td>Large for gestational age</td>
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<tr>
<td>SGA</td>
<td>Small for gestational age</td>
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<tr>
<td>&lt;</td>
<td>Less than</td>
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<td>&gt;</td>
<td>Greater than</td>
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<tr>
<td>≥</td>
<td>Greater than or equal to</td>
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Physiology

Fetal life:
• Main sources of energy–glucose, lactate and amino acids
• Energy stored (glycogen & adipose tissue)

After birth:
• Insulin levels fall, catecholamines & pancreatic glucagon released for gluconeogenesis and glycogenolysis
• Adaptation to fast and feed cycle promotes oxidative fat metabolism
Physiology

Glycogenolysis

- Insulin levels fall and epinephrine and glucagon levels rise
- Stored glucose breaks down

Gluconeogenesis

- Glucose synthesised from non-carbohydrate sources during first 8–12 hours of life
Hypoglycaemia defined

• BGL < 2.6 mmol/L
• Severe if BGL < 1.5 mmol/L or unrecordable
• Symptomatic baby

Clinical hypoglycaemia occurs when the BGL is low enough to cause signs of impaired brain function— influenced by the extent and duration of low BGL.
Causes

- Increased levels of insulin
- Increased glucose utilisation
- Inadequate glucose supply
- Inadequate body stores (glycogen, fat)
- Decreased counter-regulatory hormones
- Disorders of glycogenolysis
- Disorders of gluconeogenesis
Maternal risk factors

- **Medications**—beta blockers, insulin, oral hypoglycaemics, betamethasone
- **Diabetes**—poorly controlled of any type
- **Family history**—genetic hypoglycaemia or congenital hyperinsulinaemia
- **Intrapartum glucose**—> 20 g/hour IV
- **Maternal conditions**—pre-eclampsia, eclampsia, hypertension
Baby risk factors

- Increased glucose requirements, e.g. hypothermic or cold stress, birth asphyxia, infection, congenital heart disease, respiratory disease
- FGR; preterm; LGA; SGA
- Delayed/inadequate feeding
- IV therapy—abrupt cessation or infiltration
- Polycythaemia/hyperviscosity
- Seizures
- Increased levels of insulin
- Congenital anomalies
- Inborn errors of metabolism
- Hypothyroidism
- Meconium aspiration syndrome
- Endocrine disorders, e.g. congenital adrenal hyperplasia
Screening and assessment

Physical assessment:
• Identify if FGR, SGA, LGA
• Physical assessment for associated signs

Screening:
• Before second feed, no more than 3 hours of age
• Before third feed, no more than 6 hours of age
• If normal every 3–6 hours
Validate with diagnostic test if,
- BGL < 2.6 mmol/L
- Borderline result in baby with risk factors
- Symptomatic hypoglycaemia

Use glucometer suitable for neonates

Use point of care analyser, blood gas analyser or laboratory specimen
Prevention

• Keep baby warm
• Skin-to-skin
• Breast feed within 1 hour of birth
• If maternal choice give baby formula
  ◦ 30–40 mL/kg/day (no or low risk baby)
  ◦ 60–75 mL/kg/day (at risk baby)
• If enteral feeding not possible or contra-indicated
  ◦ IV glucose 10% at 60 mL/kg/day
Clinical signs/symptomatic hypoglycaemia

**Neurogenic**
- Jitteriness/persistent tremor
- Irregular or rapid breathing
- Sweating, irritability, pallor

**Neuroglycopenic**
- Poor feeding
- Abnormal cry—weak/high pitched

**Other**
- Apnoea, bradycardia, cyanosis, tachycardia
Well, hypoglycaemic baby

If BGL 1.5–2.5 mmol/L and Baby is ≥ 35 weeks gestation and feeding well

Give glucose gel 40% 0.5 mL/kg and breastfeed baby
Repeat BGL 30 minutes after glucose gel given
If ≤2 mmol/L:
• Admit to neonatal unit
• IV glucose
• Continue breast feeding baby if able

If >2 mmol/L:
• Glucose gel and
• Feed baby—7.5mL/kg/24 hours on day 1
• Continue monitoring and feeding baby

Queensland Clinical Guidelines: Newborn hypoglycaemia
BGL < 1.5 mmol/L or baby symptomatic

- **Urgent** treatment—admit to neonatal unit
- Confirm screening BGL with diagnostic sample
- Diagnostic blood and urine samples
- IV glucose urgently
- IM/subcut glucagon if IV glucose delayed more than 10 minutes
- Continue feeds if able—include any formula in total volume
Glucose gel

- Effective adjunct to oral feeding
- Give 0.5 mL/kg (200 mg/kg) of 40% glucose gel
- Recheck BGL after 30 minutes
- Repeat dose if required

To administer:
- Dry baby’s buccal mucosa with gauze
- Rub gel into buccal mucosa
- Breast feed baby immediately

Glucose gel for neonatal use is supplied as Glucose® 15 g glucose in 37.5 g tube
Glucose gel

• Criteria to escalate:
  ◦ BGL remains less than 2.6 mmol/L
  ◦ Baby unwell or feeding poorly

• Admit to neonatal unit:
  ◦ BGL less than 2.6 mmol/L after 2 doses of glucose gel and EBM or formula feed
  ◦ BGL less than 1.5 mmol/L at any time
  ◦ Baby becomes unwell or feeds poorly
Diagnostic samples

**Blood**
- Insulin, cortisol, growth hormone, adrenocorticotropic hormone
- Ketones (beta hydroxybutyric acid)
- Free fatty acids
- Acyl-carnitine profile
- Blood gas, electrolytes, glucose, haemoglobin, haematocrit, lactate

**Urine**
- Metabolic screen
  - First sample after hypoglycaemic episode
  - Treatment may be started

Take blood samples immediately **before** treatment **during** hypoglycaemic episode
**IV therapy**

- Indicated if BGL < 1.5 mmol/L (or unrecordable)
- Use UVC/PICC if greater than 12% glucose

- Increase volume, then concentration for immediate effect
- Commence glucose 10% at 60 mLs/kg (4.2 mg/kg/minute)
- Give bolus 1–2 mL/kg and increase infusion rate
Weaning glucose infusion

General principles:
• Reduce glucose infusion to 8 mg/kg/minute
• Wean glucose infusion and increase feeds
• Wean glucagon (if used)
• Wean hydrocortisone (if used)
**Medications**

**Indication**
BGL not normalised after 40% glucose gel or IV glucose

**Short term**
- Glucagon—effective for babies of diabetic mother or other hyperinsulinaemic condition
- Hydrocortisone—increases glucogenesis

**Long term**
- Diazoxide (with hydrochlorothiazide)—for persistent hypoglycaemia
- Octreotide—inhibits insulin
Discharge

Criteria
Pre-prandial BGL for 3 feed-fast cycles
- Baby < 48 hours of age: > 2.6 mmol/L
- Baby > 48 hours of age: > 4 mmol/L

Follow up
- GP and child health nurse
- If severe, symptomatic, recurrent, atypical—specialist follow up

Educate parents about
- Causes, risks, potential sequelae, management
- Escalation signs and plans

Provide parent information brochure

Reduce risk in next pregnancies
- Maternal lifestyle
- Genetic counselling
- Diabetes management

Consider 6 hour fast test
Six hour fast test

- Identifies baby requiring additional investigations or management
- Indications
  - Known risk of genetic/persistent form of hypoglycaemia
  - Baby without hypoglycaemic disorder risk

Check BGL at 4, 5 and 6 hours post feed (skip one feed)—omit further feeds during test

- If BGL < 3 mmol/L or baby is symptomatic:
  - Perform investigations and then feed baby
- If BGL ≥ 3 mmol/L:
  - Finish test and feed baby