

# HYPOGLYCAEMIA

## DEFINITION

### Asymptomatic hypoglycaemia

- Low glucose common in preterm and small for gestational age infants
- No simple correlation between blood glucose concentration and neuroglycopenia
- Blood glucose  $\geq 2.6$  mmol/L is safe

### Symptomatic hypoglycaemia

- Blood glucose  $< 2.6$  mmol/L + any of the following symptoms, provided these resolve once hypoglycaemia has been corrected:
  - convulsions
  - abnormal neurological behaviour, including hypotonia and poor response to stimulation
  - apnoea

***Symptoms cannot be attributed to hypoglycaemia if they persist after adequate treatment. Jitteriness alone does not constitute symptomatic hypoglycaemia***

## PREVENTION

- Keep all infants warm
- Feed all high risk infants within 2 hr of birth if possible
- In all starved high risk infants, institute IV infusion of glucose 10% (see below)

### At risk infants

**Perform blood glucose estimation in following cases:**

- Small for dates
- Preterm
- Any ill infant
- Infant of diabetic mother
- Haemolytic disease of the newborn
- Severe fluid restriction

**Monitor all at risk patients using near-patient monitoring**

- First 24 hr, 3-4 hrly
- Second 24 hr, 4-6 hrly
- Then as necessary
- Babies on TPN, at least daily
- Babies fed enterally, immediately before feeds

***Always verify a low near-patient test result ( $< 2.6$  mmol/L) in a symptomatic baby by sending a sample for laboratory blood glucose estimation***

## MANAGEMENT

***Never use concentrated ( $> 20\%$ ) glucose solutions in babies***

### Asymptomatic hypoglycaemia in at-risk infant

- Correct hypothermia (see **Hypothermia** guideline)
- Increase frequency and/or volume of feeds

***Milk is more beneficial than glucose 10% as it is more energy dense (70 kcal/100 mL v 40 kcal/100 mL) and contains fats that promote ketoneogenesis and glucose uptake***

- Repeat glucose measurement after 1 hr. If low, check laboratory blood glucose
- Consider giving IV glucose if:
  - unable to increase/tolerate feed frequency or volume **or**
  - intensive feeding does not produce normoglycaemia
- Give glucose 6 mg/kg/min (glucose 10% at 90 mL/kg/day) by IV infusion

- If infant develops symptoms or becomes profoundly hypoglycaemic (<1.1 mmol/L), follow **Symptomatic hypoglycaemia** protocol (see below) immediately
- Continue enteral feeding during IV infusion

**Step down**

- Once normoglycaemia achieved, wean from infusion as tolerated

**Symptomatic hypoglycaemia**

- Aim for blood glucose  $\geq 2.6$  mmol/L
- Give glucose 10% 2.5 mL/kg by IV bolus into peripheral vein and follow with an infusion of at least 90 mL/kg/day (~6 mg/kg/min), which may be increased if necessary. Continue enteral feeds
- Record whether symptoms respond to treatment within 30 min – very important for definitive diagnosis of symptomatic hypoglycaemia
- Recheck blood glucose after 30 min. If still low, give another 2.5 mL/kg bolus and increase infusion rate to 120 mL/kg/day (8.3 mg/kg/min)
- Record response and repeat glucose measurement in 1 hr. If still low, check blood glucose by laboratory estimation, and if hypoglycaemia confirmed, increase delivered glucose content by increasing either volume (to 150 mL/kg/day), or concentration (12.5-20%)

**Give glucose 20% centrally as extremely hypertonic.  
If UVC used, ensure tip not near liver**

**Failure to respond**

- If >12 mg/kg/min of glucose required to achieve normoglycaemia, hyperinsulinaemic state is very likely. Obtain blood sample **at the time of hypoglycaemia** for simultaneous measurement of:
  - blood glucose
  - plasma insulin and C-peptide
  - free fatty acids
  - ketones
  - cortisol
  - growth hormone
  - acylcarnitines
  - collect next passed urine for organic acid analysis
- Administer glucagon 200 microgram/kg (maximum 1 mg) IM, SC, or IV. Check blood glucose within 30 min of glucagon administration, and hrly thereafter until stable
- If persistent hyperinsulinism suspected, seek advice from paediatric endocrinologist/metabolic paediatrician, and consider early transfer to a unit specialising in the management of such infants

**Routine addition of glucose polymers such as Maxijul is not recommended.  
If a decision is made to use Maxijul, discuss with paediatric dietitian.  
Beware risk of necrotizing enterocolitis**

**Prescription to make up 50 mL of varying concentrations of glucose solution**

Infusion concentration (%)	Volume of 10% glucose (mL)	Volume of 50% glucose (mL)
12	47.5	2.5
15	44.0	6.0
17	41.0	9.0
20	37.5	12.5

**Step down**

- Once blood glucose normal, wean infant on to milk feeds either continuously or by hrly boluses

**MONITORING**

- Hypoglycaemic patients:
  - if symptomatic, every 30 min

- if asymptomatic, every hr
- continue until normoglycaemic
- Once normoglycaemic, 3-4 hrly until 24 hr has elapsed since last hypoglycaemic episode

## SEVERE PERSISTENT OR RECURRENT HYPOGLYCAEMIA

### Causes of recurrent, persistent neonatal hypoglycaemia

- Hyperinsulinism
- Endocrine deficiency, especially panhypopituitarism
- Disorder of fatty acid metabolism
- Disorder of carbohydrate metabolism
- Disorder of amino acid metabolism
- Rate of glucose infusion required is good guide to likely cause

Substrate or endocrine deficiency	<5 mL/kg/hr of glucose 10% required (<8 mg/kg/min)
Hyperinsulinism	>6 mL/kg/hr of glucose 10% required (>10 mg/kg/min)

### When to investigate further

- Persistent recurrent hypoglycaemia, especially in 'low risk' baby
- Unexpectedly profound hypoglycaemia in a well baby
- Hypoglycaemia in association with metabolic acidosis
- Hypoglycaemia in association with other abnormalities:
  - midline defects
  - micropenis
  - exomphalos
  - erratic temperature control
- Family history of SIDS, Reye's syndrome, or developmental delay

### Investigations

- Paired insulin and glucose estimations while hypoglycaemic (hyperinsulinism confirmed if insulin >10 picomol/L when glucose <2 mmol/L or glucose:insulin ratio <0.3)
- Urinary ketones and organic acids
- Plasma cortisol and growth hormone
- Plasma amino acids
- Plasma acylcarnitine, free fatty acids and betahydroxybuturate