HYPERNATRAEMIC DEHYDRATION

DEFINITION

- Serum sodium >145 mmol/L
  - mild: 146–149 mmol/L
  - moderate: 150–160 mmol/L
  - severe: >160 mmol/L

Most common cause is failure to establish adequate oral intake while attempting breastfeeding

CAUSES

Common

- Diarrhoea, vomiting
- Infection
- Poor feeding
- Osmotic diuresis
- Excessive insensible losses in extremely premature babies
- Stoma losses
- Iatrogenic
  - excessive sodium bicarbonate/sodium chloride administration
  - improperly prepared formula

Less common

- Renal dysplasia
- Obstructive uropathy
- Diuretic phase following acute kidney injury
- Diabetes insipidus (central, nephrogenic)

ASSESSMENT

History

- Gestation at birth **–** preterm <37 weeks' gestation babies at higher risk of hypernatraemic dehydration

Maternal history

- Primiparous mother
  - may require more support with feeding
- Maternal breast characteristics (flat, inverted nipples)
- Maternal health post-delivery – maternal infection can impede feed establishment

Feeding history

- Frequency of feeds: <6 times within 24 hr
- Prolonged feeding: >45 min
- Delayed change from meconium to transitional stools
- Reduced urinary frequency

Medication history

- Diuretic use

Known neonatal medical condition

- Midline brain defect
- Renal disease

Table 1: Expected stool and wet nappies in the first week of life

Day	Wet nappies	Stool
1–2	≥2/day	>1/day
3–4	≥3/day	≥2/day, changing in colour and consistency
5–6	≥5/day	≥2/day, yellow in colour

CLINICAL SIGNS

- Irritability/high pitched cry: unsettled during breastfeeding
- Jaundice
- Weight loss >10%

Severe signs

- Lethargy/altered level of consciousness
- Signs of dehydration (sunken fontanelle, doughy skin, dry mucous membrane and reduced skin turgor) may be absent
- Increased tone
- Hyperreflexia
- Seizures (usually during rehydration)

Investigations

- U&E
- Calcium
- Total bilirubin
- Blood glucose
- CRP
- If clinical concerns of sepsis, blood culture
- Paired urinary and serum electrolytes
- If neurological symptoms observed, cranial imaging

MANAGEMENT

- Treat shock as priority (if present)
- Once circulating volume restored slow reduction in sodium concentration, ≤0.5 mmol/hr
- Severe hypernatremia (>160 mmol/L) is a medical emergency – if not confident discuss management with **KIDS NTS** team for likely transfer to tertiary care

Mild: 146–149 mmol/L

- Does not require hospital/NNU admission, unless co-existing concerns merit this e.g.:
  - jaundice needing phototherapy
  - infection concerns
- Advise midwife/infant feeding team to support mother to continue to breastfeed and offer supplemental feeds
- Midwife to weigh baby in community as appropriate

Moderate: 150–159 mmol/L

- Admit to hospital/NNU
- Top up feeds:
  - encourage mother to breastfeed
  - top-up feeds with MEBM, or formula if insufficient maternal milk, hospital/NNU admission
  - top-up feeds at 100 mL/kg/day
- Restrict breastfeeding to 20 min/feed
- If concerns with suck and swallow, discuss NGT feeds with middle grade/ANNP
- Monitor blood gas and serum sodium 6–8 hrly
- Monitor blood glucose
- If serum sodium falling >0.5 mmol/L/hr consider reducing top-up volumes
- Weigh baby every 24 hr

Severe: >160 mmol/L

- Admit baby to high dependency or neonatal/paediatric intensive care unit
- Monitor closely for abnormal neurology
    - lethargy
    - irritability
    - jittery
    - hyperreflexia
    - seizures
- If baby shocked give sodium chloride 0.9% 10 mL/kg bolus
- Day appropriate enteral or IV fluids for all babies
- If breastfeeding difficulties continue, discuss NGT feeds with consultant
- If enteral feeds not tolerated discuss IV fluids with consultant
- Maintain strict input and output charts
- Monitor serum sodium levels 6-hrly
- Monitor blood glucose
    - **do not** correct hyperglycaemia with insulin – can reduce plasma osmolality rapidly and precipitate cerebral oedema
- If serum sodium levels continue to increase inform consultant on-call and consider discussing with nephrology consultant (Birmingham Children’s Hospital)
- Ensure serum sodium levels falling <0.5 mmol/L/hr
- Weigh daily
- Aim to correct hypernatremia over 48–72 hr
- Neurodevelopmental follow-up for all babies with moderate and severe hypernatraemia