

Hypernatraemia

Definition

Serum Na^+ > 145mmol/L

Causes

1. Water loss in excess of sodium

- Vomiting or Diarrhoea, especially with continuing hyperosmolar feeding/rehydration
- Severe burns
- Diuretic drugs (loop and thiazide diuretics)
- Drugs impairing renal concentration (amphotericin, lithium, aminoglycosides)
- Post obstructive diuresis
- Diuretic phase of acute tubular necrosis

2. Pure water loss with inadequate access to free water or loss of thirst

- Diabetes insipidus (central or nephrogenic)
- Impaired thirst drive (e.g. Hypothalamic lesion)
- Osmotic diuresis (hyperglycemia, mannitol)

3. Na excess

- Intravenous hypertonic saline or Na bicarbonate
- Cushing's syndrome or hyperaldosteronism

Clinical features

Severe symptoms mainly develop when the serum $[\text{Na}^+]$ > 158 mmol/l.

- Drowsiness
- Confusion
- Ataxia
- Headache
- Hyperreflexia
- Seizures
- Reduced GCS

Evaluation

- History and clinical examination
- Fluid status, fluid balance and drug charts
- Serum electrolytes, creatinine, osmolality and urine Na^+ and osmolality

Management

Management

- **Always discuss with the nephrologist on-call if serum Na⁺ > 158 mmol/L**
- If seizures are suspected or present, seek senior advice
- Treat the cause, as above (if possible). Intravenous fluid replacement with 5% dextrose should be initiated as below.

1. Hypernatremia with water depletion (dehydrated)

For chronic hypernatremia (duration more than 48 hours)

- **5% dextrose** solution intravenously as the rate of **1.35 ml/kg/hour**.
E.g. a 60 kg man should receive an infusion at the rate of 80 ml/hour
- The goal is to **lower the serum Na⁺ by a maximum of 10 mmol/L/24 hours (0.4mmol/L/hour)**. Too rapid reduction of the sodium in hypernatremia can cause cerebral edema, convulsions and permanent brain injury
- **Measure serum Na⁺ every 4 to 6 hours in this first 24 hours** and then once every 12 to 24 hours if the target rate of correction is achieved
- The rate of infusion can be titrated upwards or downwards depending on the achieved rate of correction of the serum Na⁺

For Acute hypernatremia (48 hours or less)

- Acute hypernatremia is rarely seen.
- **5 % dextrose** infusion at **3 ml/kg/hr**, until the serum Na⁺ is lowered below 145 mmol/L. Monitor the serum Na⁺ every 2 hours until it reaches 145 mmol/L.
- Once the serum Na⁺ is lowered below 145 mmol/L, reduce the infusion rate of 5% dextrose to 1 ml/kg/hour until the serum Na⁺ reaches 140 mmol/L
- The goal is to **lower the serum sodium by 1 to 2 mmol/L/hour** and to restore normonatremia in less than 24 hours.
- In patients with central diabetes insipidus, desmopressin may be needed. Seek specialist consultation before use of desmopressin
- **Monitor for hyperglycaemia**, particularly in patients with diabetes mellitus and those who are under physiological stress

2. Hypernatremia with Na excess (oedema)

- Stop intravenous NaCl or oral and/or IV Na bicarbonate
- If symptomatic, correct with additional water, as above
- If asymptomatic – achieve Na loss
 - Frusemide 20mg intravenously or 40mg orally
 - Replace hourly urine output with water (5% Dextrose)
 - Repeat frusemide and 5% dextrose replacement after 4 hours if necessary

Key Points

- Do NOT lower serum Na by more than 10mmol/L in 1st 24hrs – may induce cerebral edema and DEATH in patients with chronic hyponatremia
- Always measure serum Na every 4 to 6 hours in the initial 24 hours (every 1 to 2 hours during the correction of acute hypernatremia)
- Seek registrar or consultant advice