Sodium

- Sodium and Sodium Imbalances

- K pp 61-74
- C pp. 36-39

Objectives

- Upon completion of this lecture the learner should be able to :
- Discuss the functions, physiology, and pathophysiology of sodium .
- Discuss the incidence, morbidity, and mortality of sodium emergencies .
- Identify etiologies and risk factors predisposing to sodium emergencies.

Objectives continued

- Identify abnormal signs, symptoms, and clinical features of sodium emergencies.
- Discuss why rapid intervention is contraindicated in a patient with a sodium emergencies.
- Discuss what prehospital managements are appropriate in sodium emergencies.

Sodium - Distribution

- Extracellular
  - ~ 98% ECF (intravascular, third space, bone)
  - Na^+ is the most abundant extracellular cation
- Intracellular
  - 2% ICF
- Normal ECF (serum) Na^+ 135 – 145 mEq/L
- Normal intracellular Na^+ 10-14 mEq/L

Sodium - Function

- Na - K Pump
  - Na^+ in (depolarization) / Na^+ out (repolarization)
  - Neuromuscular conduction
  - Smooth and skeletal
- Cardiac
  - Conduction
  - Contraction
- Cellular
  - Acid-base buffering

Hyponatremia

- The most common inpatient electrolyte abnormality
- Mortality
  - High : quoted at 33-86% in various studies
- Etiologies
  - Dilutional
  - Sodium loss

Hyponatremia - causes

- Dilutional :
  - Trauma
  - Sepsis
  - CHF
  - Cirrhosis
  - Renal failure
  - Water intoxication
    - Psychogenic polydipsia
    - Tap water enema
    - Infants given free water

Hyponatremia - Causes

- Sodium Loss (a sodium loss that is in excess of the water loss)
- GI losses - nausea, vomiting, diarrhea
- Sweating (especially if loss is replaced with free H_2O)
- Renal loss
  - Diuretics (most common cause in the elderly)
  - Adrenal insufficiency
- SIADH (low Na, low tonicity)
  - Drugs : diuretics (thiazides), narcotics
  - Adrenal insufficiency
  - Chronic illnesses: TB, cancer
  - Trauma
  - Stroke

Clinical Presentations of Hyponatremia

- Signs and symptoms of other underlying or associated conditions
  - Pneumonia , …
- CNS symptoms
  - ALOC
  - Headache
  - Seizures
  - Weakness, hemiparesis, ataxia

Treatment of Hyponatremia

- CO_2M_3BIG
- Treat the underlying condition
  - Ccorrecting at the rate at which they developed

Hypernatremia - Causes

- Decreased water intake (opposite of dilutional)
- Water loss in excess of na^+ loss
  - Insensible loss
  - Thyroid storm
- Excess salt intake
  - Seawater
  - Salt tablets
  - $NaHCO_3$

Clinical Presentations of Hypernatremia

- Signs and symptoms of underlying or associated condition
  - Pneumonia , …
- CNS symptoms
  - ALOC
  - Headache
  - Seizures
  - Depression, irritability

Treatment of Hypernatremia

- CO_2M_3BIG
- Treat the underlying condition
  - Correcting at the rate at which they developed

Summary

- We have discussed :
  - The functions and homeostasis of sodium Na^+
  - Some of the regulators of Na^+ balance
  - Pathophysiology and causes of Na^+ abnormalities
  - Clinical presentations and associations of Na^+ abnormalities
  - Treatment of associated conditions (hypovolemia)
  - The prehospital managements appropriate in sodium emergencies .