

Defined as $<3.5\text{mmol/L}$. Common esp in elderly on diuretics, children in gastroenteritis.

Causes

↓*Intake (rarely sole cause)*: Inadequate K^+ in diet, IV fluid, TPN, Malnutrition

Transcellular shift: Alkalosis, insulin and glucose administration, β_2 agonists (e.g. salbutamol), phosphodiesterase inhibitors (e.g. theophylline), toluene intoxication (glue sniffing), calcium channel blockers (rare), bicarbonate, hyperventilation, certain types of periodic paralysis.

↑*Loss*:

- **Renal**: thiazide/loop diuretics, hypoMg, hyperaldosteronism, ↑steroids, liquorice, RTA1/2, salt wasting, renin-angiotensin system activation (Bartter's or Gitelman's syndromes)
- **GIT**: D & V, intestinal fistulae, villous adenoma, pyloric stenosis, laxative abuse, malabs.

Presentation

Symptoms: Mild: asymptomatic, weakness & myalgia (rhabdomyolysis), fasciculations, ↓tendon reflexes. Severe signs include: polyuria, arrhythmias, ileus, paraesthesia, tetany, paralysis.

Gitelman's syndrome: typically presents early adulthood with hypoBP, alkalosis and salt craving.

Investigations

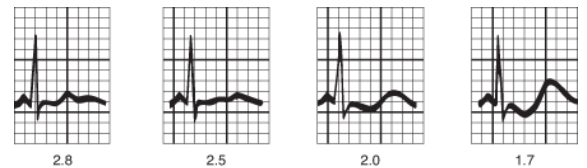
Urine tests: electrolytes & osmolality. Occ. 24-hour urine aldosterone, cortisol.

- Urinary $\text{K}^+ < 20\text{mmol/L}$: poor intake, shift into the intracellular space or GI loss.
- Urinary $\text{K}^+ \geq 20\text{mmol/L}$: renal loss. (if low urinary $\text{Na}^+ \rightarrow$ secondary hyperaldosteronism)

Blood tests: UEC, glu, CK, CMP, ABG, digoxin level. Occ. serum renin, aldosterone, and cortisol.

ECG: Peaked P waves, flat T waves, ↓ST, prominent U waves, ↑QT \rightarrow PVCs, 1&2°blk, AF, torsade or VT & VF

Imaging: Occ. Pituitary MRI (?Cushings), adrenal CT, Renal USS/angiogram (?RAS)



Management

Supportive: Correct met alkalosis/hypoMg, treat underlying cause, replace fluid losses (saline),

Potassium replacement: Each 1.0mmol/L serum $\text{K}^+ \sim 300\text{mmol}$ total body deficit.

- PO **Chlorvescent** (14mmol/Tab), **Kayciel** (20mmol/15ml), **Slow K** (8mmol but slow release)
- Foods: figs, nuts, tomato, fruit (oranges, bananas), potatoes, chocolate - but need Cl^- too
- IV **KCl** in NS (can use **KAcetate** or **KLactate** if acidotic) Max conc 40mmol/L.
 - Ideally use central line if higher concs. Never bolus \rightarrow VT/VF.
 - Maximum rate 0.5mmol/kg/hr . Cardiac monitoring if $>0.25\text{mmol/kg/hr}$ given.
 - 10mmol KCl in 100ml NS IV over 1hr \rightarrow $\uparrow[\text{K}^+]$ by $\sim 0.25\text{mmol/L}$ (halves after 1hr)

Gitelman's syndrome is treated with K^+ and Mg^{2+} supplementation and NSAIDs.

Counselling and psychiatric referral if diuretic/laxative abuse or induced vomiting in bulimia.

Complications

- Cardiac arrhythmias and sudden cardiac death (RF: CCF, MI, IHD, on digoxin, DKA)
- Muscle weakness, flaccid paralysis, rhabdomyolysis
- Abnormal renal function including tubulointerstitial nephropathy, nephrogenic DI, met alkalosis ($\uparrow\text{HCO}_3^-$ absorption) and enhanced renal Cl^- excretion
- Other: Ileus, ↑hepatic encephalopathy, factor in dev HT, Impaired glucose tolerance

Prevention

Potassium-sparing diuretics preferable else potassium supplementation (25-50mmol/day).