

## 5.5. VESICLES AND PUSTULES

### 5.5.1 INFECTIONS

R23.8/L08.9

#### 5.5.1.1 Herpes group: Varicella, herpes zoster and simplex

##### DESCRIPTION

Itchy, umbilicated vesicles that occur in:

- crops on the trunk (varicella), or
- painful vesicles in a linear distribution (herpes zoster), or
- a group of vesicles that coalesce to form an ulcer with an erythematous base on the lips or mouth (simplex).

Often secondarily infected with bacteria.

##### DIAGNOSTIC CRITERIA

- Tzanck smear – multinucleated giant cells are seen

##### NON-DRUG TREATMENT

- condition is infectious – avoid spread
- avoid rubbing when eye involved

##### DRUG TREATMENT

###### Varicella

- calamine lotion, applied on the skin

For immunosuppressed and newborns

- aciclovir, IV, 10–20 mg/kg/dose 8 hourly administered over 1 hour for 7–14 days

If there is evidence of good clinical response, change to:

- aciclovir, oral, 10–20 mg/kg/dose 4–8 hourly

Prophylaxis for close contacts

- varicella-zoster immunoglobulin, IM, 0.5 mL, single dose immediately

###### Herpes zoster

- aciclovir, IV, 5–10 mg/kg/dose 8 hourly for 7–14 days  
OR  
aciclovir, oral, 10–20 mg/kg/dose 4–8 hourly for 7 days

For pain

- carbamazepine, oral, 5 mg/kg/dose, 8 hourly

**Herpes simplex**

- aciclovir, oral, 10–20 mg/kg/dose 4–6 hourly for 7 days
- aciclovir 5%, topical, applied 4 hourly
- chlorhexidine 0.2 %, 15 mL as a mouthwash  
Use as needed.  
Do not swallow.

**Secondary bacterial infection**

- erythromycin, oral, 6.25–12.5 mg/kg/dose 6 hourly for 5 days

## CHAPTER 6 GENITO-URINARY SYSTEM

### 6.1 NEPHROLOGICAL/UROLOGICAL DISORDERS

#### 6.1.1 POST STREPTOCOCCAL GLOMERULONEPHRITIS

N05.9

##### DESCRIPTION

Acute post-streptococcal glomerulonephritis is an immune mediated inflammatory condition caused by the deposition of immune complexes in the glomerular basement membrane and/or mesangium of the glomeruli.

##### DIAGNOSTIC CRITERIA

###### Clinical features

- predominantly occurs in children 3–12 years old
- manifests 1–3 weeks after preceding pharyngitis or impetigo
- characteristic features include:
  - facial or generalised oedema
  - painless macroscopic haematuria (smoky or tea coloured urine)
  - oliguria, and
  - hypertension

##### SPECIAL INVESTIGATIONS TO CONFIRM APSGN

<b>Urine analysis</b>	
Macroscopic appearance	smoky, brown, bloody
Urine test strips	1+ to 3+ haematuria; ± trace to 2+ proteinuria
Microscopic examination	dysmorphic red blood cells; red blood cell and granular casts
<b>Blood investigations</b>	
<b>Streptococcus serology</b> ASO or Anti-DNAseB titre	positive in the absence of prior antibiotic treatment (ASO often negative in preceding skin infections)
<b>Complement study</b> C <sub>3</sub> C <sub>4</sub>	decreased normal
<b>S-biochemistry</b>	
Serum Electrolytes	dilutional hyponatraemia, hyperchloraemic hyperkalaemic metabolic acidosis is common
S-Urea & creatinine	mildly elevated in the acute phase
Full blood count	dilutional anaemia; thrombocyte count is normal

**NON-DRUG TREATMENT**

- bed rest is necessary with:
  - severe hypertension
  - left heart failure
  - pulmonary oedema, or
  - central nervous system symptoms.
- monitor fluid balance:
  - no fluids while pulmonary oedema is present
  - restrict fluid intake to 300–400 mL/m<sup>2</sup>/24 hours (25 mL/kg/24 hours) while oliguric, i.e. urine flow < 1 mL/kg/hour **or** fluid overloaded
  - fluid should only be given orally or via nasogastric tube
  - only if anuric and enteral feeds are impossible, give IV fluids, i.e. 5–10% dextrose water, with a volumetric controller
- weigh daily and record intake and output strictly. In small children fluid balance is best monitored with regular weighing.
- dietary measures. Restrict:
  - potassium intake until result of serum electrolytes are available. Bread and jam is relatively safe.
  - sodium while oedema and/or hypertension is present
  - protein to 0.8 g/kg/day if urea exceeds 20 mmol/L

**DRUG TREATMENT****Eradication of streptococci**

- phenoxymethylpenicillin, oral, 12.5 mg/kg/dose 6 hourly for 10 days  
**OR**  
If unable to take oral medication  
benzathine benzylpenicillin (depot formulation), IM, 600 000–1.2 million units, two doses given 5 days apart

Penicillin allergy

- erythromycin, oral, 10 mg/kg/dose, 6 hourly for 10 days

**Hypertension**

Hypertension usually develops acutely and is mostly related to fluid overload.

**Hypertensive crisis:** Patient with signs of hypertensive encephalopathy, i.e.:

- convulsions
- retinal haemorrhages
- blindness

**Hypertensive urgency:** Symptomatic patient with significant elevation of blood pressure with complaints of headache, blurred vision and nausea but lacks the above clinical manifestations.

Initiate treatment for Acute Hypertension: See Section 4.9

**CAUTION**

Great care is required to reduce the blood pressure in a controlled manner to avoid potentially serious consequences of impaired auto-regulation of cerebral blood flow.  
Do not lower blood pressure precipitously – rather titrate small doses against response.

Medicines for sustained control should be initiated as soon as possible so that the effect will be maintained when the emergency measures are discontinued.  
Rate of BP reduction depends upon starting BP and age of the child.

**For management of acute hypertensive emergency – Post streptococcal glomerulonephritis**

- furosemide, IV, 1–2 mg/kg

If oliguric

- furosemide, IV, 5 mg/kg/dose  
IV bolus must be administered slowly over 5 minutes due to risk of ototoxicity.

**AND**

- amlodipine, oral, 0.2 mg/kg/dose. May be repeated 6 hours later, thereafter every 12 hours

**OR**

atenolol, oral, 1 mg/kg/dose. If no improvement, repeat after 6 hours. Once improved, give once daily at the appropriate dosage.

If no hypertensive crisis but persistent significant hypertension

- atenolol, oral, 12 mg/kg/24 hours as single dose preferably at night

**OR**

propranolol, oral, 0.5–4 mg/kg/dose, 12 hourly  
Maximum dose: 8 mg/kg/24 hours

**OR**

hydralazine, oral, 0.25–1.25 mg/kg/dose, 6 hourly

**Volume overloaded** - hypertensive, orthopnoea and raised JVP

- restrict sodium chloride intake
- restrict fluid intake equal to 50% of urine output plus insensible loss, i.e. 400 mL/m<sup>2</sup>/day
- if pulmonary oedema - do not give fluids

For anuric patient with acute volume overload and unresponsive to furosemide – refer urgently.

- furosemide, slow IV, 1–2 mg/kg/dose. Repeat after 30 minutes, if needed and 4–6 hourly if required.

Maximum dose: 5 mg/kg/dose.

Do not give an IV infusion after administering furosemide.

Refer.

Place patient in Fowler's position and give oxygen via nasal prongs.

- morphine, IV, 0.1 mg/kg. Repeat after 4 hours if required.

**REFERRAL****Urgent**

- anuric patient with acute volume overload and unresponsive to furosemide
- uncontrolled hypertension
- progressive or severe renal failure
- cardiac failure or pulmonary oedema not responding to treatment

**For specialist advice**

- macroscopic haematuria persisting for more than 4 weeks or persistent proteinuria
- family history of renal disease
- streptococcal aetiology unproven (ASOT and anti-dnase B negative, normal C<sub>3</sub> levels, decreased C<sub>4</sub> levels)
- decreased complement levels not normalised within 6 weeks

**6.1.2 URINARY TRACT INFECTION**

N39.0

**DESCRIPTION**

Bacterial infection of the urinary tract.

**Simple urinary tract infection** – infection is limited to the lower urinary tract and there are no associated urological anomalies.

**Complicated urinary tract infection** – infection of the urinary tract involving the renal parenchyma or which is associated with underlying urological anomalies.

**DIAGNOSTIC CRITERIA****Clinical**

Signs and symptoms are related to the age of the child and are often non-specific.

Uncomplicated urinary tract infections may cause very few signs and symptoms.

Complicated infections may present with a wide range of signs and symptoms.

Neonates may present with:

- |                |                      |
|----------------|----------------------|
| • fever        | • vomiting           |
| • hypothermia  | • prolonged jaundice |
| • poor feeding | • failure to thrive  |
| • sepsis       | • renal failure      |

Infants and children may present with:

- |                     |                       |
|---------------------|-----------------------|
| • failure to thrive | • frequency           |
| • persisting fever  | • dysuria             |
| • abdominal pain    | • enuresis or urgency |

In any child with fever of unknown origin, the urine must be examined.

**Special investigations**

If a bag specimen reveals the following, a urine specimen must be collected aseptically for culture and sensitivity:

- positive leukocytes or nitrites on dipsticks
- motile bacilli and increased leukocytes or leukocyte casts on urine microscopy

Urine specimen is collected aseptically

- by supra pubic aspiration or transurethral bladder catheterisation in acutely ill children less than 2 years of age or in smaller children who are unable to co-operate
- by mid-stream clean catch method in older children

Criteria for the diagnosis of UTI

- any culture from a suprapubic urine sample
- a culture of  $> 10^4$  col/mL urine of a single organism from a catheter specimen
- a pure culture of  $> 10^5$  col/mL in a mid-stream clean catch sample or consistent culture of a pure growth even with counts as low as  $10^4$  col/mL.

**NON-DRUG TREATMENT**

- exclude complications of urinary tract infection
- ensure adequate nutrition and hydration. Maintain hydration with oral and/or IV fluids if necessary.
- for recurring infections:
  - avoid irritant soaps and bubble baths
  - prevent constipation
  - treat pinworm
  - perineal hygiene
  - regular complete emptying of the bladder and/or double voiding, i.e. making an additional attempt at voiding after the initial flow of urine has ceased.

**DRUG TREATMENT****Antibiotic therapy**

All acutely ill babies must be treated parenterally for the first few days until clinically well and able to tolerate feeds.

Children  $> 3$  months old, who are unwell but not acutely ill and who are not vomiting may be treated with oral antibiotics.

Duration of oral antibiotic therapy is for a minimum of 7–10 days.

The choice of antibiotics used depends on the expected culture and sensitivity of the organism.

Review antibiotic choice once culture and sensitivity results become available.

- cefuroxime, IV, 25 mg/kg/dose 8 hourly for 7 days  
**OR**  
amoxicillin/clavulanic acid, IV, 25 mg/kg/dose 8 hourly

If there is evidence of good clinical response, change to:

- amoxicillin/clavulanic acid, oral, 30 mg/kg/dose of amoxicillin component 8 hourly  
**OR**  
cefuroxime, oral, 15 mg/kg/dose 12 hourly for 7 days

**Prophylactic antibiotic therapy for UTI**

Indications:

- infants and young children from 2 months–2 years until the imaging studies are completed
- recurrent infections
- structural and/or functional abnormality of the urinary tract

For continent children

- cephalexin, 10 mg/kg/dose as a single dose at night

For children not yet continent

- cephalexin 5 mg/kg/dose, 12 hourly

**OR**

nitrofurantoin, oral, 12 mg/kg at night

Contra-indicated in children with renal impairment.

Do not use for no longer than 4 weeks continuously.

For pain

- paracetamol, oral, 10–15 mg/kg/dose, 6 hourly as required  
Avoid NSAIDs.

**URGENT REFERRAL**

- if obstruction is suspected refer for consideration of an MCUG

**REFERRAL**

- all children with proven urinary tract infections for renal and bladder ultrasound assessment
- boys with recurrent urinary tract infections to exclude obstructive causes (posterior urethral valves)
- poor response to adequate therapy
- complications such as renal failure

**6.1.3 NEPHROTIC SYNDROME**

N04

**DESCRIPTION**

Nephrotic syndrome is a clinical syndrome associated with massive proteinuria due to increased permeability of the glomerular basement membrane.

In children it is mostly idiopathic, e.g.:

- minimal change nephrotic syndrome (MCNS)
- focal segmental glomerular sclerosis (FSGS).

Features of nephrotic syndrome are:

- massive proteinuria of  $> 40 \text{ mg/m}^2/\text{hour}$  or a protein to creatinine ratio on a random urine sample of  $> 0.2 \text{ g/mmol}$
- hypo-albuminaemia  $< 25 \text{ g/L}$
- oedema
- hyperlipidaemia (hypercholesterolaemia)
- haematuria or hypertension may be present, but is not diagnostic criteria

**DIAGNOSTIC CRITERIA****Special investigations**

- urine test strips: 3–4++ proteinuria with or without trace to 1+ haematuria
- urine microscopy: hyaline and lipid casts. May have occasional red and white blood cells.
- urine protein: creatinine ratio: > 0.2 g/mmol
- serum albumin: < 25 g/L
- S-urea and creatinine and electrolytes usually normal
- S-complement usually normal
- S-cholesterol: increased
- exclude infections e.g. Streptococcal antibody, Hepatitis B antigen carrier, syphilis, HIV and CMV
- exclude connective tissue disorder, e.g. SLE

A presumptive diagnosis of MCNS can be made in children:

- in whom secondary causes have been excluded
- between 2–6 years of age
- with :
  - normal blood pressure
  - normal renal function
  - or only a trace of haematuria, but no red cell casts
  - normal complement levels
  - no evidence of chronic infection or connective tissue disease

**NON-DRUG TREATMENT**

- assess hydration status
  - Normovolaemic** – normal moist mucosa and normal blood pressure with well perfused limbs
    - restrict salt intake
    - no fluid restriction
    - weigh daily (1 kg = 1 L of fluid)
  - Hypovolaemic** – often preceded by diarrhoea, vomiting, dry mucosa, hypotensive, cyanosed, cold extremities
    - check urine Na, K, creatinine and osmolarity
    - give fluid bolus: sodium chloride 0.9%, IV, 20 mL/kg, immediately over 10 minutes
    - replace fluid loss as for dehydrated child e.g. oral rehydration for gut losses, etc.
    - monitor urine output strictly and weigh regularly

Continued weight gain or anuria is an indication for referral.

- dietary measures
  - restrict sodium. No salt should be added to food and salt preserved foods are restricted.
  - normal energy intake
  - adequate protein diet with normal serum creatinine
  - in patients with raised creatinine and non remitting nephrotic syndrome protein intake needs to be restricted to 0.8 g/kg/day plus equivalent of protein lost in urine per day

**DRUG TREATMENT****Symptomatic treatment of oedema**

Loop diuretics should not be prescribed routinely.

For patients with severe oedema with a low albumin

- albumin, human 20% (salt free), IV, 1 g/kg administered over 2–4 hours

**AND**

Follow with or simultaneously

- furosemide, IV, 2 mg/kg, slow IV infusion over 5 hours  
i.e. 0.4 mg/kg/hour

Mild to moderate oedema

- spironolactone, oral, 1.5–2.5 mg/kg/dose, 12 hourly

**WITH/WITHOUT**

- hydrochlorothiazide, oral, 1 mg/kg, once daily. Do not exceed 25 mg daily

**Non-remitting nephrotic syndrome**

For thrombotic complications

- aspirin, soluble, oral, 1–2 mg/kg, once daily

Supplementation of multivitamins and minerals in non-remitting nephrotic syndrome

- multivitamin, oral, 5 mL daily  
inclusive of pyridoxine, other water soluble vitamins of B group and vitamin C 30 mg and vitamin D 400 IU
- folic acid, oral, 5 mg daily
- calcium, oral, 10–15 mg/kg/dose, twice daily  
Maximum dose: 1 000 mg daily.

All children with non-remitting nephrotic syndrome should receive renoprotective treatment as for patients with chronic renal failure

**ACE inhibitor**

To decrease proteinuria, irrespective of presence or absence of systemic hypertension.

Monitor renal function and potassium especially in children with impaired renal function or volume depletion.

Adverse effects of ACE inhibitor:

- hyperkalaemia (higher risk when potassium sparing diuretic is used simultaneously)
- acute renal failure in volume depleted patients.

Begin with low dosage of ACE inhibitor and titrate against response and blood pressure.

- enalapril 0.1 mg/kg once daily  
Dose may be increased to 0.5 mg/kg/day, as a single dose or two divided doses.

**OR**

captopril, oral, 0.5–2.5 mg/kg/dose, twice daily

**OR**

perindopril 0.05–0.15 mg/kg once daily

**Immunisation**

All routine vaccinations should be given.

Once in remission

- pneumococcal vaccine (23 strain), IM, 0.5 mL in children > 2 years
- varicella zoster vaccine, SC, 0.5 mL. Repeat once after 4 weeks.

**Note:**

Live virus vaccine should not be given while the patient is receiving steroids or other immunosuppressive treatment.

**Antibiotics**

During periods of severe oedema

- phenoxymethylpenicillin, oral, 125–250 mg, 12 hourly

**Corticosteroids**

Corticosteroid treatment should only be initiated in consultation with a paediatric nephrologist or paediatrician.

Steroids are indicated in children with histologically confirmed MCNS or in those in whom this diagnosis is highly probable.

The response to corticosteroid treatment is an indication of the underlying histology and may give some information regarding the long-term prognosis. A rapid response to steroid treatment is usually indicative of MCNS.

Urine should be tested every morning and should remain protein free before decreasing the dose. If proteinuria recurs, go back one step in the suggested dose.

If the first course is tapered too rapidly, the child tends to develop more frequent relapses. Relapses occur in up to 85% of all children with MCNS.

If there is no response to steroid treatment after 6 weeks, the patient is steroid resistant and should be referred.

Start with high dose

- prednisone, oral, 2 mg/kg/dose as a single dose in the morning  
Maximum dose: 80 mg daily.  
Once the urine test strips is negative for proteinuria on 3 consecutive days, give the same dose every alternative day and then taper dose slowly over the next 4 months.

Dose (mg/kg) alternative days	Period of treatment (weeks)
2	4–6
1.5	4
1	4
0.5	4

Additional steroids or steroid supplementation is necessary during periods of acute stress, e.g. surgery or septic shock.

Under subspecialist supervision or advice, cyclophosphamide and pulse steroid therapy may be considered.

All other immunosuppressive medications should only be used once a histological diagnosis has been made.

#### REFERRAL

- where a presumptive diagnosis of MCNS cannot be made  
The patient should be referred for renal biopsy to make a definite diagnosis and to plan treatment.

### 6.1.4 RENAL FAILURE, ACUTE

N17.9

#### DESCRIPTION

Acute renal failure is a syndrome characterised by a rapid decline in glomerular filtration rate and retention of nitrogenous waste products. It is important to differentiate prerenal, renal and postrenal failure.

#### DIAGNOSTIC CRITERIA

##### Clinical features

- in neonates exclude congenital abnormality of the urinary tract
- oliguria is the most common manifestation, i.e. :
 

neonates	output < 1 mL/kg/hour
older children	output ≤ 0.3 mL/kg/hour
- prerenal – shock and dehydration
- postrenal – exclude obstructive uropathy
- renal – oedema and volume overload
- hypertension
- signs of an underlying infection/septicaemia, e.g. fever, skin rash, etc.

#### DIAGNOSTIC CRITERIA

- urine culture – to exclude acute complicated pyelonephritis
- urine:
  - macroscopic appearance: brownish with acute tubular necrosis
  - microscopic appearance: red blood cell casts, leukocyte, hyaline and granular casts
- urine test strips:
  - haematuria
  - proteinuria
  - glycosuria
  - leucocytes
  - nitrites
- urine biochemistry:

	Pre-renal failure	Intrinsic renal failure
○ U-Osmol (mOsmol/L)	↑ > 320	equal to serum Osmol
○ FeNa % *	< 1 %	≥ 3 %

\* FeNa % = fractional excretion of Na (%)  
=  $[\text{U-Na}/\text{U-Creatinine} \times \text{S-Creatinine}/\text{S-Na}] \times 100$

#### Note:

S-creatinine is measured in micromol/L and urine creatinine in millimol/L  
To convert millimol/L to micromol/L ÷ by 1 000

**Special investigations**

- ultrasound of kidneys and bladder
- S-urea, urate, creatinine, electrolytes and osmolarity, glucose, calcium, phosphate and ALP usually reveals:
  - hyperkalaemia
  - hypocalcaemia
  - hyponatraemia
  - hyperphosphataemia
  - metabolic acidosis
- full blood count, differential and platelet count
- clotting profile
- cultures and DIC workup as indicated
- check ECG on the vital signs monitor to exclude life threatening hyperkalaemia
- chest X-ray to evaluate cardiomegaly, pleural effusions and pulmonary oedema

**NON-DRUG TREATMENT**

- treat the underlying cause
- monitor fluid intake and output, blood pressure
- weigh daily
- nutritional support
  - high-energy diet with supplementary nasogastric feeds, if required
  - infants should preferably be given breast feeds or a milk formula
  - daily requirements
 

protein	0.8–1 g/kg maximum
carbohydrate	2–3 g/kg
fat	2 g/kg
  - restrict NaCl, K and phosphate intake
  - restrict protein intake when S-urea > 25 mmol/L

**DRUG TREATMENT**

Avoid nephrotoxic or renally excreted medications, e.g. NSAIDs, aminoglycosides, vancomycin, cough and cold mixtures, radiocontrast drugs, etc.

**Fluid management**

For a well-hydrated patient without abnormal fluid losses, give maintenance fluid only.

For an anuric patient use an electrolyte free solution only to replace insensible losses, i.e. dextrose 5% or 10 %.

Insensible water loss:

neonate and young baby	30–40 mL/kg/day
older children	25 mL/kg/day (400 mL/m <sup>2</sup> /day)

Replace fluid losses with an appropriate solution, e.g. of diarrhoea or naso-gastric drainage.

Severe polyuria, i.e. urine output > 4 mL/kg/hour, due to tubular dysfunction and impaired urinary concentration occurs during the recovery (diuretic) phase of acute tubular necrosis. Replace fluid and electrolyte losses, e.g. K, Cl and Na. Darrows half strength with dextrose 5% is usually the appropriate solution to use in this case.

Treat shock

See Section 1.1.6

### Hyperkalaemia

Monitor ECG for signs of hyperkalaemia.

Discontinue all sources of intake of potassium.

Treat when serum potassium > 6.5 mmol/L

Monitor response to treatment and adjust accordingly.

- salbutamol, solution, 2.5–5 mg/dose, nebulise over 20 minutes  
0.5–1mL salbutamol in 1 mL sodium chloride 0.9%
- sodium bicarbonate 4.2 %, IV, 4 mL/kg  
Do not mix calcium and sodium bicarbonate containing solutions.
- sodium polystyrene sulfonate, oral/rectal, 1 g/kg in dextrose water
- calcium gluconate 10 %, IV, 0.5–1 mL/kg/dose slowly over 3–5 minutes
- dextrose water 50%, IV, 2 mL/kg over 20 minutes ± insulin, 0.1 units/kg  
Check for hypoglycaemia hourly if insulin is used.

If hyperkalaemia persists despite above treatment

- refer for dialysis

### Other complications

Metabolic acidosis - if S-pH ≤ 7.1

- sodium bicarbonate 4.2 %, IV, 4 mL/kg over 2–4 hours  
Do not mix calcium and sodium bicarbonate containing solutions.

### Hypertension

See Section 4.9

### Infection

Avoid nephrotoxic antibiotics.

**Uraemic convulsions** – See Section 13.4.

Refer for urgent dialysis

Exclude specific causes of convulsions, e.g. hypoglycaemia, hyper/ hyponatraemia, hypocalcaemia or hypertension and treat accordingly.

**Anaemia** – for acute blood loss/active haemolysis and Hb < 7 g/dL

- packed red cells, 10 mL/kg over 6 hours

### Pulmonary oedema, acute heart failure, volume overload and hypertension

No IV fluid.

Pulmonary oedema is an indication for dialysis.

Digitalis is dangerous as it cannot be excreted.

Intubate and initiate positive pressure ventilation as necessary.

- furosemide, IV, 2–5 mg/kg over 5 minutes
- morphine, IV, 0.1 mg/kg
- oxygen, 100%, 2–3 L/minute by nasal cannula

**then**

- refer

**REFERRAL****Urgent for dialysis when:**

- fluid overload causing pulmonary oedema
- anuria > 24 hours
- central nervous system signs, e.g. convulsions or coma
- uraemic diathesis
- uraemic pericarditis
- hyperkalaemia or hyponatraemia not responding to conservative treatment
- persistent metabolic acidosis pH < 7.1 or serum bicarbonate < 10 mmol/L
- uncontrollable hypertension
- severe hyperphosphataemia and hypocalcaemia

**6.1.5 RENAL FAILURE, CHRONIC**

N18.9

**DESCRIPTION**

Chronic renal failure is that stage of renal function in which the kidney is unable to maintain the integrity of the internal environment. Chronic renal failure has been arbitrarily defined according to repeated measurements of creatinine clearance over time:

- persistent S-creatinine > 88 micromol/L in all infants (whole first year of life)

The following clearances can be calculated:

Levels of chronic renal failure	Creatinine clearance
chronic renal impairment	> 60 and < 80 mL/minute
chronic renal failure	> 20 and ≤ 60 mL/minute
end stage renal failure	≤ 20 mL/minute

**DIAGNOSTIC CRITERIA****Clinical**

Renal function may deteriorate without clinical symptoms.

- poor weight gain and stunting is often present over a long period
- children are likely to present with renal failure during episodes of acute intercurrent illness
- signs and symptoms may be due to:
  - disordered fluid and electrolyte excretion, or
  - disordered regulatory functions
- obligatory salt wasting may cause severe dehydration and metabolic acidosis:
  - obstructive uropathy      ○ tubulo-interstitial nephropathy
  - chronic pyelonephritis      ○ hypoplastic/dysplastic kidneys
- respiratory distress may be caused by compensatory tachypnoea due to acidosis
- poor appetite, chronic constipation, polydipsia and polyuria
- chronic anaemia
- renal osteodystrophy, i.e. bone pain and skeletal deformities
- volume overload: oedema, hypertension, heart failure, pulmonary oedema

- uraemic symptoms and signs:
  - nausea
  - vomiting
  - itching
  - uraemic pigmentation, i.e. brownish skin pigmentation
  - puffy appearance
  - uraemic frost
- bleeding tendency (mucosa)
- convulsions due to hyponatraemia, hypernatraemia, hypocalcaemia, uraemia or hypertension.

#### Special Investigations

- urine volume
  - normal, or
  - increased: > 6 mL/kg/day, or
  - oliguric: <1.0 mL/kg/day
- urine test strips
  - may be normal or reveal proteinuria, haematuria, glycosuria
  - nitrites and leucocytes may indicate UTI – do urine MCS
- urine microscopy
  - may be normal or reveal casts
  - pus cells, leukocyte casts and bacteria may indicate UTI - do urine MCS
- S-urea
  - increased, depending on hydration, nutritional state and protein intake
- S-creatinine
  - increased – depends on age and muscle mass
- theoretical creatinine clearance =  $[\text{Constant} \times \text{height (cm)}] \div \text{S-creatinine (micromol/L)}$

Age group	Constant
pre-pubertal children	40
adolescent girl	45
adolescent boy	55

- S-electrolytes
  - hyperkalaemia
  - increased chloride
  - decreased bicarbonate
- urine Osmol
  - iso-osmolar, i.e. 300–350 mOsm/L
- calcium, phosphate and ALP
  - decreased calcium
  - increased phosphate
  - increased ALP
- parathyroid hormone
  - increased
- sonar
  - to exclude obstruction
  - small shrunken kidneys are indicative of chronic renal failure
- there is no place for renal biopsy in patients with end stage renal failure

**NON-DRUG TREATMENT**

- determine and treat the underlying cause
- monitor fluid intake and output, blood pressure
- weigh daily
- if in respiratory distress
  - place in Fowler's position, and give
  - oxygen, 100%, 2–3 L/minute by nasal prongs
- dietary management
  - potassium
    - Monitor serum potassium levels closely.
    - Limit potassium intake if serum potassium >5.5 mmol/L.
    - Restrict fruit juices, dried fruit, all citrus fruits, bananas, guavas and tomatoes.
    - All vegetables should either be soaked for 24 hours before cooking or water should be decanted twice during cooking.
  - phosphate
    - Restrict intake when blood levels reach or exceed the upper limit of normal for age, usually > 1.6 –1.8 mmol/L.
    - Limit dairy products, protein intake, grains and cereals, soft drinks, etc.
  - protein
    - Restrict once blood urea exceeds 20 mmol/L.
    - If urea exceeds 25 mmol /L protein, restrict protein intake to 0.8 g/kg/24 hours to alleviate acidosis, nausea and vomiting.
  - restrict salt intake
    - No salt added to food during preparation and consumption or salty foods.
    - Generally, salt is restricted for hypertensive, oedematous patients, but not for patients with salt losing nephropathies who are polyuric.
  - high-energy diet with supplementary nasogastric feeds or nocturnal fluids is necessary for children with poor appetite and polyuria/nocturia

**DRUG TREATMENT**

Avoid nephrotoxic or renally excreted medications, e.g. NSAIDs, aminoglycosides, vancomycin, cough and cold mixtures, radiocontrast drugs, etc.

**Fluid management**

Volume required depends on the underlying cause of the renal failure. For ambulatory patients fluid management is guided by type of renal failure and presence or absence of oedema and hypertension.

Do not give parenteral fluids to hospitalised patients who are volume overloaded and oliguric/anuric.

Replace urine output and losses, volume for volume, with an appropriate solution, usually a potassium free solution, e.g. sodium chloride 0.45%.

Insensible water loss:

neonate and young baby	30–40 mL/kg/day
older children	25 mL/kg/day (400 mL/m <sup>2</sup> /day)

If dehydrated and hypotensive, give:

- sodium chloride 0.9%, IV, immediately as a bolus and reassess.

A repeat fluid bolus may be necessary, but strict monitoring of urine output and fluid losses is required.

For an anuric patient use an electrolyte free solution only to replace insensible losses, i.e. 5 or 10 % dextrose water.

- multivitamin, oral, 5 mL, daily  
Containing vitamins B<sub>1</sub>, B<sub>6</sub>, B<sub>12</sub> and C.

**AND**

- folic acid, oral, 5 mg daily

### Hyperphosphataemia/osteodystrophy

In combination with restricted dietary intake of phosphate:

- calcium carbonate, oral, 1–4 tablets chewed 3 times daily with meals  
1 tablet is equivalent to 0.168 g elemental calcium

In patients with serum calcium < 2.2mmol/L, give activated Vitamin D supplementation early. If serum phosphate is > 2.5 mmol/L, treat the hyperphosphataemia first to decrease below this level before beginning the alfacalcidol. – See above.

- alfacalcidol oral, 0.25 mcg, initially twice weekly  
Increase dose as necessary to maintain serum calcium in upper normal range.  
Doses as high as 0.5 mcg twice daily may be required.

### Chronic metabolic acidosis

If serum bicarbonate < 18 mmol/L

- sodium bicarbonate, oral, 1 mmol/kg/dose 2–3 doses per day after meals  
Adjust according to response.

**Note:**

The intravenous formulation can be given orally.

**OR**

Shohl's solution, oral, 1-2 mmol/kg/dose, 2–3 times daily after meals

Adjusted according to response.

citric acid	140 g
sodium citrate	98g
water to	1 L
1 mL = 1 mmol of alkali	

### Hyperkalaemia

Discontinue all drugs that may cause hyperkalaemia, e.g. potassium sparing diuretics, spironolactone, ACE inhibitors.

Exclude volume depletion as an underlying cause for hyperkalaemia.

If serum potassium remains > 5.5 mmol/L

- sodium polystyrene sulfonate, oral/rectal, 1 g/kg/dose in dextrose water, once or twice daily

Treat accompanying metabolic acidosis.

**Anaemia**

Ensure adequate intake of haematinics.

Ensure adequate iron stores - check levels of serum ferritin, transferrin, transferrin saturation and total iron binding capacity.

Check levels of serum B<sub>12</sub> and red cell folate before starting erythropoetin treatment.

For persistent anaemia – refer to tertiary centre for nephrologist assessment.

**Hypertension:** See Section 4.9

**Renoprotective treatment**

All children with persistent proteinuria, i.e. creatine clearance more than 60 mL/min should receive the following under nephrologist supervision:

ACE inhibitor, e.g.:

- enalapril, oral, 0.1 mg/kg/dose, once daily

Dose may be increased to 0.5 mg/kg/day, as a single dose or two divided doses.

**OR**

captopril, oral, 0.5–2.5 mg/kg/dose twice daily

**OR**

perindopril, oral, 0.05-0.15 mg/kg/dose, once daily

ACE inhibitors may cause hyperkalaemia, worsening metabolic acidosis and declining renal function.

Monitor serum urea and electrolytes, i.e. serum potassium and bicarbonate, and renal function within 7 days.

If serum creatinine has doubled, hydration status should be checked, diuretics should be stopped and dose of ACE inhibitors halved.

If renal function does not improve, or hyperkalaemia > 5.5 persists, stop ACE inhibitor treatment.

**Immunisation**

All children should receive routine immunisation according to EPI schedule.

Check immunity against Hepatitis B.

In the absence of any immunity, vaccinate as for any non-immune individual.

- hepatitis B vaccine, IM, 1 mL, 3 doses at monthly intervals

1 mL = 3 mcg

If the antibody level is considered non-protective or insufficient, give 2 booster doses one month apart.

**REFERRAL**

- all children with chronic kidney disease, including those with:
  - persistent proteinuria or haematuria
  - inherited kidney diseases
  - renal tubulopathies
  - congenital malformation of kidneys
  - chronic bilharziasis, etc.
- patients with dyslipidaemia or hypercholesterolaemia

**6.1.6 ENURESIS**

R32

**DESCRIPTION**

Enuresis is bedwetting after the age of 5 years.

Primary monosymptomatic enuresis refers to incontinence during sleep only. It is of great importance to differentiate between monosymptomatic enuresis and enuresis with associated bladder dysfunction during daytime, because the treatment of these two conditions is totally different.

**DIAGNOSTIC CRITERIA****Clinical**

- clinical evaluation of all enuretic children should begin with a structured interview
- exclude symptoms of underlying systemic disease e.g.:
  - diabetes mellitus
  - diabetes insipidus
  - urinary tract infections
  - neurological disturbances
  - structural abnormalities

**Special investigations**

- urine examination should be done in all patients
- exclude organic causes
- ultrasound investigation may be necessary to identify structural abnormalities of the kidneys, pelvis and ureters

**NON-DRUG TREATMENT**

Enuresis is a benign condition with a spontaneous annual resolution rate.

Intervention must carry no risk or have minimal side effects. The cure rate of “treatment” should be significantly greater than the spontaneous cure rate before it can be considered effective.

- motivate, counsel and reassure child and parents
- advise against punishment and scolding
- spread fluid intake throughout the day
- restrict excessive fluid intake before retiring to bed
- diapers should never be used as this will lower the self esteem
- bell systems are effective but should only be used in older children
- consider behaviour modification and bladder training exercises in children with diurnal enuresis

**DRUG TREATMENT**

For short term treatment only for a patient who was abused and who has enuresis – in consultation with a specialist

- desmopressin, oral, 200–400 mcg at night for 3 months  
Adverse effects include fluid retention, hyponatraemia and cerebral oedema.

In children over 5 years with voiding dysfunction and accompanying diurnal enuresis

- oxybutinin, oral, 2.5–5 mg, 8–12 hourly

**REFERRAL**

- suspected underlying systemic illness or chronic kidney disease
- persistent enuresis in a child over 8 years

**6.2. GENITAL CONDITIONS****6.2.1 CONTRACEPTION**

Z30

**Adolescents**

In general, adolescents are eligible to use any method of contraception and must have access to a variety of contraceptive choices. Age alone does not constitute a medical reason for denying contraception.

Dual method use, i.e. use of hormonal contraceptives (oral or injectable) as well as barrier contraception is advisable as precaution against pregnancy and sexually transmitted infections.

Adolescents are not good candidates for intra-uterine contraceptive devices.

**Safety issues**

While some concerns have been expressed regarding the use of certain contraceptive methods in adolescents, e.g. the use of progestogen-only injectables by those < 18 years, these concerns must be balanced against the advantages of avoiding pregnancy. It is clear that many of the same issues regarding appropriate contraceptive use applicable to older clients apply to adolescents.

Some non-contraceptive advantages of oral contraceptives include less menstrual blood loss, regulated cycles and decreased incidence of ovarian and breast cysts.

Return to fertility is rapid once the medication is discontinued. There is no evidence of increased risk of infertility, malignancy of the cervix, uterus, ovaries or breasts or of increased risk for STIs when oral contraceptives are used.

**Emergency contraception**

Should be provided to all females with signs of breast development who have a negative pregnancy test.

- norgestrel 0.5 mg and ethinyl oestradiol 0.05 mg, oral, 2 tablets immediately and 2 tablets 12 hours later

**6.2.2 ABNORMAL UTERINE BLEEDING**

N93.8

**REFERRAL**

- all adolescent patients with oligomenorrhoea or amenorrhoea or dysfunctional uterine bleeding associated with unexplained symptoms and signs, including those with:
  - accompanying hypertension
  - features of Cushing's syndrome
  - striae
  - galactorrhoea
  - male pattern alopecia

- family history of infertility and hirsutism
- if polycystic ovary syndrome cannot be excluded. Clinical features include:
  - oligo-ovulation or anovulation, usually manifests as oligomenorrhoea or amenorrhoea
  - clinical manifestations of androgen excess (hyperandrogenism) including hirsutism, acne and male pattern of hair loss
  - acanthosis nigricans due to hyperinsulinism
  - elevated levels of circulating androgens (hyperandrogenaemia)
  - polycystic ovaries as defined by ultrasonography
  - substantial proportion of women are obese
- exclude pregnancy

### 6.2.3 VAGINAL DISCHARGE IN PREPUBESCENT CHILDREN

N89.8

#### DESCRIPTION

Vaginal discharge may be thin grey and foul smelling as caused by *Gardnerella vaginalis* or due to anaerobic bacteria such as *Bacteroides* and *Peptostreptococcus*. Other pathological organisms include *Chlamydia* and *Trichomonas*.

In prepubescent girls it may be due to poor hygiene or irritants, such as bubble baths, deodorants and detergents used to wash underwear.

Foreign bodies, pinworms and sexual abuse should always be excluded in the prepubescent girl. Gonorrhoea in the prepubescent girl is almost invariably due to sexual abuse.

#### DIAGNOSTIC CRITERIA

##### Clinical

- presence of overt discharge
- absence of foreign body/allergy
- specific diagnosis dependent on microbiological investigation

##### Special Investigations

- vaginal aspirate or pus swab should be sent for microscopy and cultures
  - presence of *Gonococci*, *Trichomonas* or *Chlamydia* indicates the likelihood of sexual abuse
- serological testing for syphilis (STS) and HIV (with consent)

#### NON-DRUG TREATMENT

- if the likelihood of sexual abuse exists, ask child about history of previous abuse, if possible when caregiver is not present
  - if there is a history of sexual abuse, manage as Sexual Abuse: See Section 6.2.5
  - if there is no history do not force disclosure
- exclude pinworm infestations
- advise parents and child regarding hygiene, toilet habits and avoidance of irritants

#### DRUG TREATMENT

Treat STIs appropriately.

For Monilial infection

- nystatin cream 100 000 iu/g, topical, apply 8 hourly for 7 days

Indigenous bacterial vaginosis

- metronidazole, oral, 7.5 mg/kg/dose, 8 hourly for 7 days

**AND**

- amoxicillin, oral, 30 mg/kg/dose, 8 hourly for 7 days

For resistant discharge

- conjugated oestrogen cream 0.625 mg/g, vaginally, at night for a maximum of two weeks. Warn parents about bloody discharge due to withdrawal afterwards.

### 6.2.4 SEXUALLY TRANSMITTED INFECTIONS

A50–A64

**Sexual abuse should be excluded in young children who have acquired gonorrhoea.**

#### Gonorrhoea

- ceftriaxone, IM, immediately as a single dose
  - < 25 kg 125 mg
  - > 25 kg 250 mg

**OR**

If not available and > 2 years old and not allergic to penicillin  
amoxicillin, oral, 50 mg/kg immediately  
Maximum dose: 3 g

#### Syphilis

Only if early disease

- benzathine benzylpenicillin (depot formulation), IM, 50 000 unit/kg, single dose  
Maximum dose: 2.4 million units

If present for more than one year

- benzathine benzylpenicillin (depot formulation), IM, 1.2 million units, weekly for 3 doses

#### Penicillin allergy

- erythromycin, oral, 6.25–12.5 mg/kg/dose, 6 hourly
  - If infection is present for less than 1 year treat for 15 days.
  - If longer than 1 year treat for 30 days.

Do titres after 6 months and 1 year to confirm decrease.

Treat again if:

- clinical signs and symptoms persist
- sustained or increase of titre

#### Trichomonas vaginalis and gardnerella vaginalis

- metronidazole, oral, 7.5 mg/kg/dose, 8 hourly for 7 days

**OR**

Older children  
metronidazole, oral, 2 g, immediately

**Chlamydia trachomatis**

- erythromycin, oral, 6.25–12.5 mg/kg/dose, 6 hourly for 10–14 days

**AND**

> 8 years old

- doxycycline, oral, 100mg twice daily for 7 days

**6.2.5 SEXUAL ABUSE AND PREVENTION OF INFECTION/CONCEPTION**

T74.2

**DESCRIPTION**

The following indicate that sexual abuse has or may have occurred:

- sexually transmitted or vaginal infections
- painful urination, frequency of micturition or frequent urinary infections
- pregnancy in children under the age of 16
- pain, itch, bruises or bleeding from the external genitalia or anal area
- sexualised behaviour or other unexplained behavioural problems
- unexplained difficulty in walking or standing
- recurrent unexplained abdominal pain
- unexplained behavioural changes, e.g. depression, anxiety disorders, aggression, fear, parasuicide, enuresis, encopresis and pseudoseizures

**MANAGEMENT OBJECTIVES**

- psychological support of the victim and family
- prevent or minimise the unwanted complications of the assault
  - physical trauma
  - psychosocial trauma
  - sexually transmitted infections
  - pregnancy
- support the due legal process
  - medical documentation of evidence
  - collection of appropriate specimens
- conduct baseline investigations
  - HIV test
  - RPR
  - hepatitis screening
  - vaginal swabs for acid phosphatase and microbiology after consent

**NON-DRUG TREATMENT**

- obtain informed consent from the patient and written consent from parent/guardian in case of minors before HIV testing and PEP. Children over the age of 14 years may sign their own consent. Every effort should be made to encourage testing.
- the patient's HIV-status should be determined before initiating PEP. Prophylaxis given to a previously infected HIV person will have no clinical benefit and may lead to the development of viral resistance.
- it is the patient's choice to have immediate HIV testing. **However, no PEP will be given in the case of refusal of HIV testing.**
- a patient presenting after 72 hours will not be given PEP but should be counselled about the possible risk of transmission. HIV testing should still be offered at the time of presentation and 3 months later.

- perform a pregnancy test before initiating PEP
- HIV Elisa positive tested sexually abused children under the age of 15 months must be referred to have an HIV DNA PCR (polymerase chain reaction) performed. If HIV uninfected or if the child has no access to PCR, they should receive prophylaxis.
- explain the side effects of the ARV drugs, e.g. tiredness, nausea and flu-like symptoms
- emphasise the importance of compliance with ARV treatment
- counsel all sexually assaulted patients and caregivers in the case of children
- psychosocial support
- medical risks, e.g. transmission of sexually transmitted infections including HIV, hepatitis-B and pregnancy
- psycho-emotional-social effects of the sexual assault according to their level of understanding and maturity
- identify need for support and refer if needed
- discuss issues relating to stress management at subsequent visits
- post traumatic stress may eventually cause exhaustion and illness. Inform the patient of the signs and symptoms of post traumatic stress, including:
  - general irritability
  - trembling
  - pain in neck and/or lower back
  - change in appetite
  - change in sleep pattern
- medico-legal assessment of injuries
- complete appropriate registers

**Note:**

Refer very young or severely traumatised children to a specialised unit or facility.

Children with external signs of genital trauma may need an examination under anaesthesia and should be referred. Trauma to the genital area increases transmission. The character of the exposure should be classified as:

- low risk – non receptive or non traumatic intercourse
- high risk – penetration and traumatic intercourse

**Blood tests**

- the patient should sign a consent form for both testing and PEP
- voluntary rapid HIV testing should be made available and should be done on all opting for PEP
- further blood tests should include full blood count (FBC)
- a full blood count should be repeated at 2 and 4 weeks
- blood should be taken at 6 weeks, 3 months and 6 months for HIV testing

**DRUG TREATMENT****Note:**

- if the patient presents within 72 hours of being raped, PEP should be offered
- consent for HIV testing must be obtained from all patients before initiating PEP
- initiate PEP as soon as possible provided the patient is not HIV-infected prior to the incident
- for low risk exposure, initiate dual therapy
- for high risk exposure and children with physically traumatic assaults, refer for management of these physical injuries and to consider the use of triple therapy. During referral dual therapy should be initiated immediately.
- in children under the age of 15 months antiretroviral therapy should be used while arranging transfer and awaiting confirmation of HIV results
- initiating therapy within 24 hours is most likely to be effective at preventing transmission of HIV
- for those refusing an HIV test, no PEP will be provided
- do a pregnancy test in all women and female adolescents. In the case of children who are clearly pre-pubertal this is omitted.

**If not pregnant:****STI prophylaxis****children under 8 years**

- ceftriaxone, IM, immediately as a single dose
 

< 25 kg	125 mg
> 25 kg	250 mg
- Hepatitis-B vaccination: See Section 2.3.4

**PEP treatment**

As the body surface area is very difficult to calculate, the following guidelines are provided:

- zidovudine, oral, 12 hourly. Maximum 300 mg/dose.
 

6 months–3 years	9 mg/kg/dose
4–12 years	7.5 mg/kg/dose
- lamivudine, oral, 4 mg/kg/dose 12 hourly. Maximum 150 mg/dose.

**AND**

If significant exposure has occurred

- lopinavir/ritonavir 80/20, oral, 230 mg/m<sup>2</sup>/dose of lopinavir component 12 hourly
  - Administer with food.
  - A high-fat meal increases absorption, especially of the solution.

Dosages may be varied by up to 1 mg/kg/dose more or less to allow a convenient volume of medication.

Follow up visits should be at 6 weeks, 3 months and 6 months after the rape. HIV testing should be performed at each of these visits.

**REFERRAL**

- all patients with severe physical or psychological injuries
- pregnant rape patients
- infants with significant evidence of sexual assault need referral after beginning dual therapy as soon as possible

**Note:**

Refer as soon as possible within 24 hours if there are inadequate resources with regard to:

- counselling
- laboratory for testing
- medico-legal examination
- drug treatment

## CHAPTER 7 ENDOCRINE SYSTEM

### 7.1 ADRENAL HYPERPLASIA, CONGENITAL

E25.0

#### DESCRIPTION

Autosomal recessive enzymatic defects of the cortisol biosynthetic pathways in the adrenal gland. The presentation depends on the severity and type of the enzyme defect.

#### DIAGNOSTIC CRITERIA

##### Clinical

- neonates with ambiguous genitalia
- adrenal insufficiency – See Section 7.2
- accelerated growth velocity or precocious pseudopuberty

##### Investigations

See Acute adrenal Insufficiency: Section 7.2

- elevated 17-hydroxyprogesterone in the serum
- elevated serum renin

#### NON-DRUG TREATMENT

- surgical correction of genital abnormalities after endocrine treatment
- psychological support for child and family

#### DRUG TREATMENT

**Glucocorticoid and mineralocorticoid replacement. To be initiated in consultation with subspecialist.**

- hydrocortisone, oral, 0.5 mg/kg/day in three divided doses. Specialist initiated.  
The morning dose should be given as early as possible.
- fludrocortisone acetate, oral, 5 mcg/kg/day as single daily dose  
Range: 50–200 mcg daily.

For salt losing patients

- sodium chloride, oral, 0.5–1 g for every 10 kg body weight per day

Glucocorticoids are administered for life. Once growth is complete, prednisone may be given once or twice daily or betamethasone given as a single daily dose.

The dose is individualised by monitoring growth, bone age and hormonal levels.

#### REFERRAL

- all cases for confirmation of the diagnosis, counselling and initiation and monitoring of treatment

**7.2 ADRENAL INSUFFICIENCY, ACUTE**

E27.4

**DESCRIPTION**

Acute failure of adrenal function, suspected when a patient presents with hypotension, hypoglycaemia, hyponatraemia, hyperkalaemia, and metabolic acidosis.

Patients at present or recently on chronic steroid therapy are at risk for adrenal insufficiency if they fail to augment the steroid dose during times of stress (fever, trauma, and surgery).

**DIAGNOSTIC CRITERIA****Clinical**

- acute circulatory collapse. The features include:
  - tachycardia
  - pallor
  - cool clammy skin
  - coma
  - hyperkalaemia
  - hyponatraemia
  - hypotension
  - poor peripheral perfusion
  - disturbed consciousness
  - hypoglycaemia
  - signs of dehydration
  - metabolic acidosis
- a history of weakness, anorexia, vomiting, weight loss, salt craving, hyperpigmentation (primary adrenal insufficiency), auto-immune endocrinopathies and steroid-dependence
- ambiguous genitalia

**Investigations**

Take blood for estimation of

- serum electrolytes and blood glucose
- In all suspected cases, take a sample of clotted blood for estimation of plasma cortisol prior to treating the patient. Send this sample with the patient to the central hospital if laboratory facilities are not locally available.

**DRUG TREATMENT****Stabilisation**

- dextrose 5% in sodium chloride 0.9%, IV, 20 mL/kg bolus as needed  
**OR**  
 Ringer-Lactate with dextrose 5%, IV, 20 mL/kg bolus as needed  
**OR**  
 dextrose 10%, IV, 3 mL/kg glucose as needed
- hydrocortisone, IV, 2–3 mg/kg immediately, then 2–3 mg/kg/day every six hours

Manage hyperkalaemia – See Section 7.8

**Prevention**

In patients on chronic steroid therapy, it is important to increase corticosteroid dose in all stressful situations, e.g. pre-surgery, burns, trauma and dental procedures.

Adrenal insufficiency is a life threatening emergency

**REFERRAL**

- all cases immediately after stabilisation

**7.3 DIABETES INSIPIDUS**

E23.2

**DESCRIPTION**

Diabetes insipidus should be suspected in any child with polydypsia and polyuria.

Infants may present with failure to thrive.

Central diabetes insipidus is due to deficiency of antidiuretic hormone.

Nephrogenic diabetes insipidus occurs if the kidney is unable to respond to antidiuretic hormone.

**DIAGNOSTIC CRITERIA**

- pathological polyuria defined as excretion of  $> 1.5 \text{ L/m}^2$  of urine  
In infants the corresponding value is  $> 2.5 \text{ L/m}^2$
- serum osmolality  $> 300 \text{ mOsm/kg}$ , with urine osmolality  $< 300 \text{ mOsm/kg}$  is suggestive of diabetes insipidus
- a positive water deprivation test - only conducted under specialist supervision

**DRUG TREATMENT****Central diabetes insipidus**

- desmopressin intranasal solution, intranasal, 5–30 mcg/day 12–24 hourly

**OR**

desmopressin, oral, 50–300 mcg/day twice daily

Increase the dose to the lowest amount which gives an antidiuretic effect.

The patient must have a phase of urinary dilution or breakthrough urination before the next dose to ensure that water intoxication does not result

**Nephrogenic diabetes insipidus**

Treat the underlying cause.

**REFERRAL**

- all cases for evaluation

**7.4 DIABETES MELLITUS****DESCRIPTION**

A syndrome of abnormal carbohydrate metabolism, associated with a relative or absolute impairment of insulin secretion with varying degrees of peripheral resistance to the action of insulin.

**7.4.1 DIABETES MELLITUS, INSULIN DEPENDENT (TYPE 1)**

E10

**DESCRIPTION**

Most diabetic children have type 1 diabetes, and:

- have auto-immune destruction of the pancreatic beta cells as the underlying cause
- have an absolute requirement for insulin therapy
- will develop diabetic ketoacidosis (DKA) if not given insulin

**DIAGNOSTIC CRITERIA**

- polydipsia
- polyphagia
- heavy glycosuria
- random blood glucose of  $\geq 11.1$  mmol/L
- polyuria – this can present as 2° enuresis in young children
- fasting blood glucose of  $\geq 7.0$  mmol/L – fasting is not usually needed for the diagnosis
- an oral glucose tolerance test is not needed
- weight loss or failure to gain weight
- weakness or tiredness
- recurrent protracted infections

**NON-DRUG TREATMENT**

- **general measures**
  - educate child and caregiver about all aspects of the disease
  - medical alert bracelet should be worn at all times
  - follow-up by medical practitioner or at clinic/hospital at least every 3 months

- **diet: healthy lifelong eating habits**

A newly diagnosed patient and family must be referred to a dietician.

Principles of the prudent diet:

- children should be encouraged to reduce the intake of fats and salt and to increase dietary fibre content.

All diabetics should be given a meal plan, e.g. “constant carbohydrate meal plan” or “carbohydrates counting meal plan”. There is no one ‘diabetic’ diet. The diet should be individualised with consideration given to usual eating habits and other lifestyle changes.

Six main nutrition factors contribute to better sugar control, i.e. lower HbA1c levels. These are:

1. following a meal plan. Keep day to day intake consistent.
2. avoiding extra snacks that are not part of the meal plan
3. avoiding over-treatment of low blood sugars (hypoglycemia)
4. prompt correction of high blood sugars
5. adjusting insulin levels for meals in patients using the “carb counting meal plan”
6. consistency of night snacks