

### Chronic kidney Disease

#### Definition:

- Gradual loss of kidney function
- Advanced disease can cause dangerous levels of fluid, electrolytes & wastes build up in the body
- Also called chronic kidney failure
- Black, Native American & Asian American are more at risk

#### Risk factors/causes:

- Diabetes
- Hypertension & cardiovascular diseases
- Glomerulonephritis
- Polycystic kidney disease (inherited)
- Smoking & drug abuse
- Obesity
- Age
- Family Hx of kidney disease

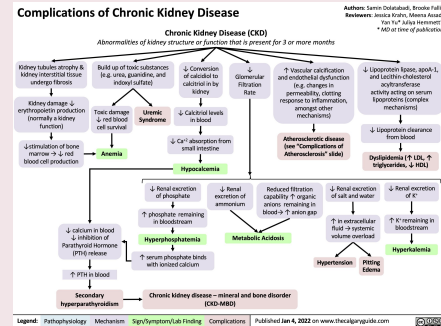
**Pathophysiology & mechanism:** Causes → ↓ number of nephrons → activation of vasoactive mediators, cytokines, RAAS, growth factors → structural & functional changes of surviving nephrons → hyperfiltration → ↑ intraglomerular capillary pressure → accelerated sclerosis of remaining nephrons → ↓ number of nephrons

#### Signs & symptoms:

- Nausea/vomiting
- Loss of appetite
- Frequent/difficulty urinating
- Foamy urine
- Ammonia-smelling breath
- Fatigue & weakness
- Ankle & feet swelling
- Anaemia
- Hypocalcaemia (↓ calcium)
- Hyperphosphatemia (↑ phosphate)
- Metabolic acidosis
- Hyperkalaemia (↑ potassium)

**Treatment:** Medication or surgery (kidney transplant)

### Chronic Kidney Disease



### Glomerulonephritis

**Definition:** Inflammation & damage of the tiny filters (glomeruli) in the kidneys (autoimmune origin)

#### Risk factors/causes:

- Infections
- Autoimmune
- Vasculitis
- Sclerotic conditions
- Inherited
- Cancers

#### Signs & symptoms:

- Nausea/vomiting
- Fatigue
- Less urination
- Pink or cola-coloured urine
- Foamy urine
- Hypertension
- Oedema (fluid retention)

#### Complications:

- Accumulation of wastes or toxins in the bloodstream
- Poor regulation of essential minerals & nutrients
- Loss of red blood cells
- Loss of blood proteins

**Treatment:** Therapies for associated kidney failure

### Nephritic Syndrome

**Definition:** Inflammation of the glomeruli (glomerulonephritis) & renal dysfunction

**Risk factors/causes:**

- Immunological (IgA nephropathy, tend to occur post-infection)
- Within the course of autoimmune disease (*Lupus nephritis*)
- Kidney disease (causes by many different bacteria, viruses, fungi, parasites, systemic, etc.)

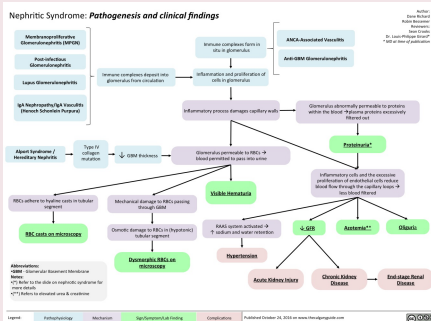
**Pathophysiology & mechanism:** Deposition of immune complexes (antibody + antigen) or antibodies triggers inflammation with leukocyte infiltration → injurs cells & degrades the glomerular basement membrane (GBM) → leakage of erythrocytes (RBC) + some proteinuria → S/Sx

**Signs & symptoms:**

- Blurred vision
- Hypertension
- Oliguria (low urine output)
- Haematuria (blood in urine)
- Proteinuria
- Azotemia (↑ levels of nitrogen-containing substance)

**Treatment:** Medication & surgery (kidney transplant)

### Nephritic Syndrome



### Diabetic Nephropathy

**Definition:** Glomerular loss (glomeruli [filtration] malfunction) & secondary disease to diabetes

**Risk factors/causes:**

- Hyperglycaemia (↑ blood sugar)
- Hypertension
- Smoking
- Obesity
- Family Hx of diabetes & kidney disease
- ↑ blood cholesterol

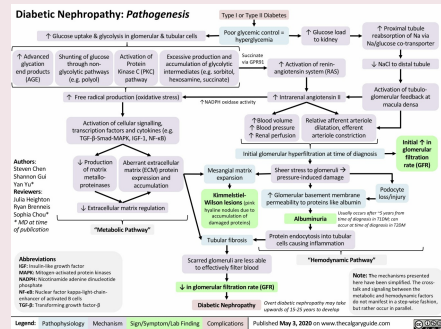
**Pathophysiology & mechanism:** ↑ glucose levels → ↑ blood volume, pressure & renal perfusion → damages the blood vessels (form glomeruli) → leaky vessels → extravasation of blood proteins (spilt into the capsule)

**Signs & symptoms:**

- Nausea
- Loss of appetite
- Fatigue/insomnia
- Swollen ankles, feet & hands
- Dry/itchy skin
- Difficulty concentrating

**Treatment:** Medication or surgery (kidney transplant)

### Diabetic Nephropathy



### Nephrotic Syndrome

**Definition:** [State of kidney failure] Kidney disorder that causes the body to pass too much protein in the urine (heavy proteinuria 3.0g/24 hours)

**Risk factors/causes:**

- Metabolic
- Immunological
- Idiopathic/primary
- Neoplastic
- Medication/drug use
- Infection
- Allergic
- Genetic syndromes

**Pathophysiology & mechanism:** Podocyte injury → podocyte damage, effacement (thinning), & detachment from the basement membrane → proteins leak through the filtration membrane → enter urine → S/Sx

**Signs & symptoms:**

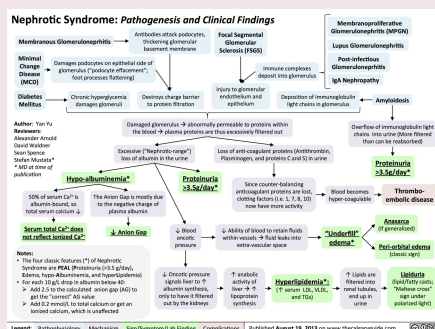
- Oedema (starts in the face, spreads peripheral)
- Vomiting
- Pale skin/fissures
- Foamy urine (excess protein)
- Fatigue
- Loss of appetite
- Weight gain (fluid retention)

**Complications:**

- Tachycardia (↑ BPM)
- Hyperlipidemia (↑ lipid levels)
- Proteinuria (↑ protein in urine)
- Blood clots (blood proteins help prevent them)

**Treatment:** Medication & surgery (kidney transplant)

### Nephrotic Syndrome



### Hypertensive Nephropathy

**Definition:** Progressive kidney damage due to long-term, poorly controlled high blood pressure

**Risk factors/causes:** Hypertension & lesion = *arteriolar nephrosclerosis*

**Pathophysiology & mechanism:** Hypertension → thickening of Bowman's capsule & nephron capillaries due to cell proliferation (accumulation) & collagen deposition → ↑ glomerular pressure → ↓ renal blood flow → alteration in inflammatory profile of different cells → ↓ permeability & filtration → glomerular sclerosis → hypertensive nephropathy

**Signs & symptoms:**

- Nausea/vomiting
- Loss of appetite
- Itching
- Confusion

**Complications of persistent ↑ BP:**

- Brain (strokes, hypertensive encephalopathy)
- Blood (↑ sugar levels)
- Eye retina (Hypertensive retinopathy)
- Heart (MI, hypertensive cardiomyopathy)
- Kidneys (hypertensive nephropathy)

### Hypertensive Nephropathy

