

# Renal failure

Acute kidney disease

Chronic kidney disease

Chronic Kidney disease

• 10-20% normal GFR remain

• develop over a min. of 3 months [DEPTH OF BIOLOGY]

• subtle decrease in kidney function

• slowly it can lead to permanent renal failure.

## Acute kidney injury (AKI)

↳ Decrease in kidney function in less than 3 months

[DEPTH OF BIOLOGY]

Healthy GFR → 100-120 mL/min

- It is less with increasing age.
- slightly less in women

• Most common cause of CKD is **hypertension**

• In this the wall of artery who supply the blood to kidney is thickened.

↓  
Results in narrowing of lumen

↓ means

less blood and  $O_2$  to kidneys

↓ results in

Ischemic injury to nephron's glomerulus

[DEPTH OF BIOLOGY]



• Immune cells like Macrophages and fat laden  
\*Macrophages called **foam cells** [DEPTH OF BIOLOGY]

↓ slips into

Damaged Glomerulus and start secreting growth  
factor like transforming growth factors  $\beta_1$  or  $\text{TGF}\beta_1$

$\text{TGF}\beta_1$  → causes → **Mesangial cells** → To  
regress back to their more immature  
stem cell state known as **Mesangioblast**

↓ [DEPTH OF BIOLOGY]

secrete extracellular structural Matrix.

• This excessive extracellular Matrix leads to  
**Glomerulosclerosis**.

↓  
with hardening and scarring it diminishes the  
Nephrons ability to filter blood.

↓  
overtime it leads to CKD

• Another Most Imp. cause of CKD is **Diabetes** (excessive  
glucose in blood) — Most common cause.

As it [DEPTH OF BIOLOGY]  
start sticking to the protein in this blood — a process  
called **Non enzymatic glycation** because no enzymes  
are involved.

↓  
This process of glycation particularly affect the efferent  
arteriole and makes it stiff and more narrower.

↓  
process called **Hyaline Arteriosclerosis**

↓ [DEPTH OF BIOLOGY]



This creates an obstruction that makes it difficult for blood to leave the glomerulus and increase pressure within glomerulus leading to **hyperfiltration**

[DEPTH OF BIOLOGY]

In response to high pressure state the supportive mesangial cell secretes more and more structural matrix expanding the size of glomerulus.

Over many years this process of glomerulosclerosis once again, diminishes the Nephron's ability to filter the blood and lead to chronic kidney disease.

**Hypertension & Diabetes** → responsible for majority of CKD

Other causes [DEPTH OF BIOLOGY]

• **systemic diseases**

↳ lupus  
↳ Rheumatoid Arthritis

also cause glomerulosclerosis.

• **Infection** → HIV

• **Medications** → NSAID's and toxins

II Now →

Normally, urea → urine

• But when GFR ↓ urea less gets filtered out

↓  
gets accumulated in blood

↓  
cause Azotemia

[DEPTH OF BIOLOGY]

cause general symptoms like → Nausea  
↳ loss of appetite



So, Urea ↑↑↑ → affect functioning of CNS causing encephalopathy

↓ [DEPTH OF BIOLOGY]

further accumulation in brain

↓

even to progress coma and death.

# This build up of urea also called **Pericarditis**  
• Inflammation in pericardium (lining of heart)

\* In this condition urea ↑↑ in blood. [DEPTH OF BIOLOGY]

• so less blood clot formation occurs.

\* Also cause → **Uremic frost**  
urea crystal deposits in skin and they look like powdery snowflakes

• Kidney also balance electrolyte →

• In chronic kidney disease less K is excreted and more build up in the blood

↓

and lead to hyperkalemia

↓

It can cause cardiac Arrhythmia

• Kidney can also balance Ca level. [DEPTH OF BIOLOGY]

• Normally, kidney help to activate vit. D

↓

which helps in ↑ red absorption of Ca from diet.

But in CKD → less activate of vit. D

↓

lower absorbed Ca in Diet

↓

results in

[DEPTH OF BIOLOGY]

**Hypocalcemia**



Ca level decreases in blood  
↓ leads to

Activation of PTH

↓ leads to decrease in Bone Ca level

↓  
overtime bone become weak and brittle  
Renal osteodystrophy

• Kidney also release hormone [DEPTH OF BIOLOGY]

low fluid → Renin → ↑ se pressure

Now in CKD the fall in GFR leads to more and more renin

↓  
which leads to Hypertension — itself a cause

• Kidney also secrete erythropoietin

stimulate the production of RBC from the bone marrow.

In CKD → Erythropoietin ↓ → RBC ↓ → Anemia

• Diagnosis

\* changes in GFR overtime

• In CKD → GFR = 90ml/min. [DEPTH OF BIOLOGY]

• In irreversible kidney damage = < 60ml/min

\* Biopsy → look for glomerulosclerosis.

• Treatment

• Manages underlying cause

• In severe cases → Dialysis

→ Kidney Transplant

[DEPTH OF BIOLOGY]



## # Symptoms

- Blood in urine
- electrolyte Imbalance
- reduced urine output
- Pale skin [DEPTH OF BIOLOGY]
- obstruction in the urinary tract
- Dehydration
- poor appetite

## # Diagnosis

- By ultrasound
- Blood test