



**SNS COLLEGE OF ALLIED HEALTH SCIENCES**  
SNS Kalvi Nagar, Coimbatore - 35  
Affiliated to Dr MGR Medical University, Chennai



**DEPARTMENT OF CARDIOPULMONARY PERFUSION CARE**

**TECHNOLOGY**

**COURSE NAME: PATHOLOGY II**

**II YEAR**

**UNIT III : PATHOLOGY OF KIDNEY**

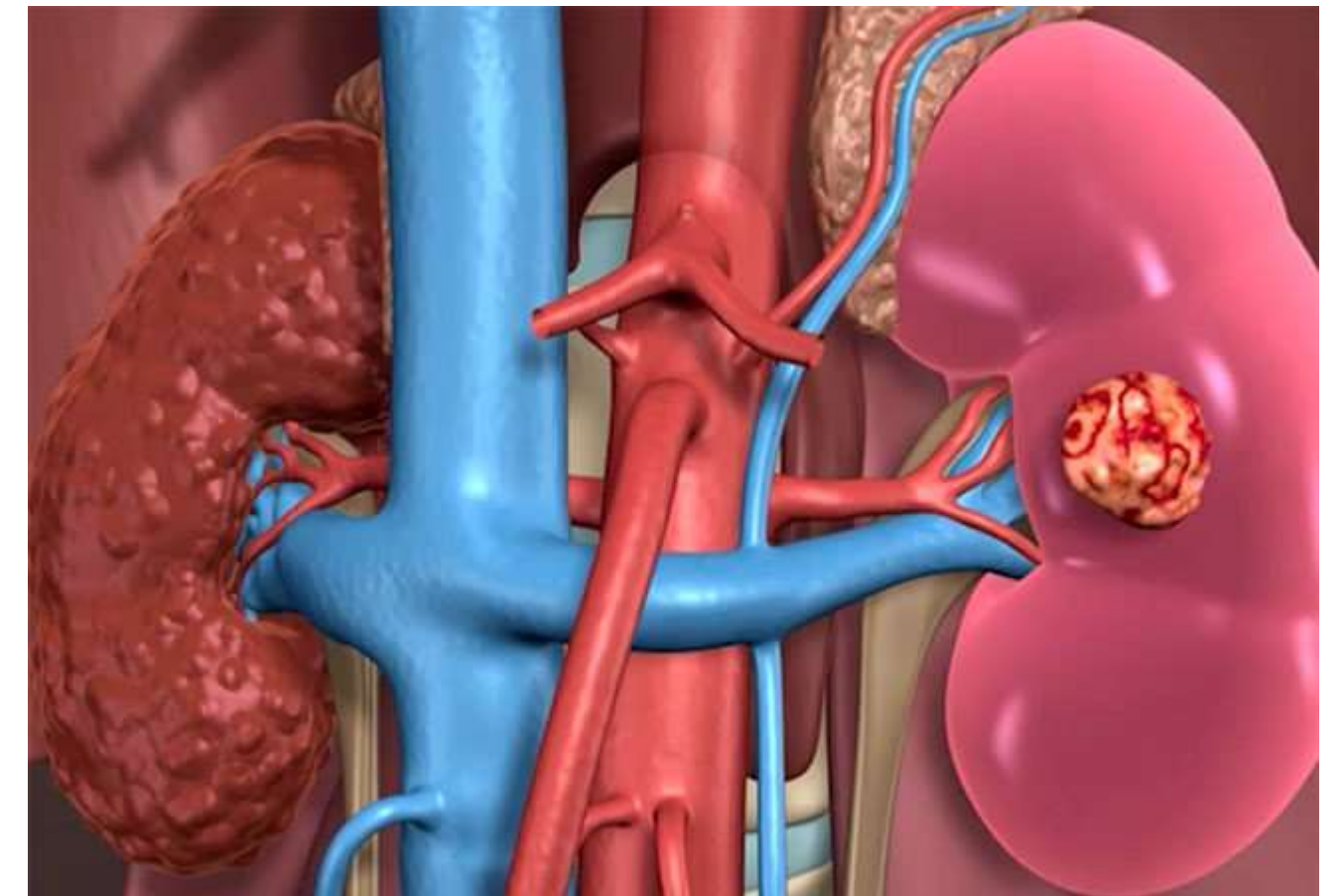
**TOPIC 3 : CHRONIC KIDNEY FAILURE (CKF)**



# Chronic Kidney Failure



- Chronic renal failure is a syndrome characterised by progressive and irreversible deterioration of renal function
- It is due to slow destruction of renal parenchyma, eventually terminating in death when sufficient number of nephrons have been damaged.





# Epidemiology



- According to Nephrology Dialysis Transplantation there are **~7.85 million** CRF patients in India.

## **Etiologically,**

- diabetes (41%)
- hypertension (22%)
- chronic glomerular nephritis (16%)
- chronic interstitial disease (5.4%)
- ischaemic nephropathy (5.4%)
- obstructive uropathy (2.7%)
- miscellaneous (2.7%) and unknown cause (5.4%) constituted the spectrum





# Etiopathogenesis



- All chronic nephropathies can lead to CRF.

Classification of CKF is of two major conditions

## Diseases causing glomerular pathology

*Primary glomerular pathology* -- > chronic glomerulonephritis

*Systemic glomerular pathology*

- systemic lupus erythematosus
- Diabetic nephropathy

## Diseases causing tubulointerstitial pathology

*Vascular* -- > hypertension

*Infectious* -- > chronic pyelonephritis

*Toxic* -- > intake of high doses of analgesics

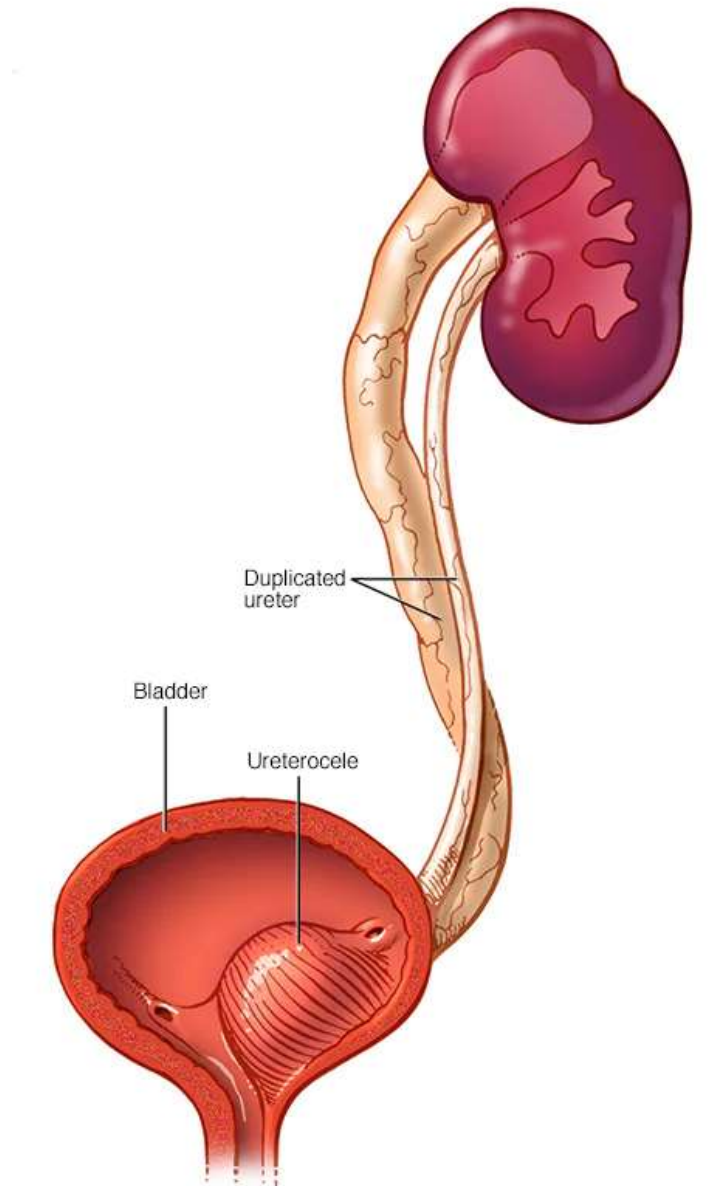
*Obstructive* -- > stones, blood clots, tumours



# Leading Cause of CKD



- Diabetes
- Hypertension
- Obstructed urine flow
- Kidney diseases
- Kidney artery stenosis
- Certain toxins - including fuels, lead etc.
- Fetal developmental problem
- Malaria and yellow fever
- Some medications - for example, NSAIDs
- Illegal substance abuse - such as heroin or cocaine.
- Injury - a sharp blow or physical injury to the kidney



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# Stages of Chronic Renal Failure

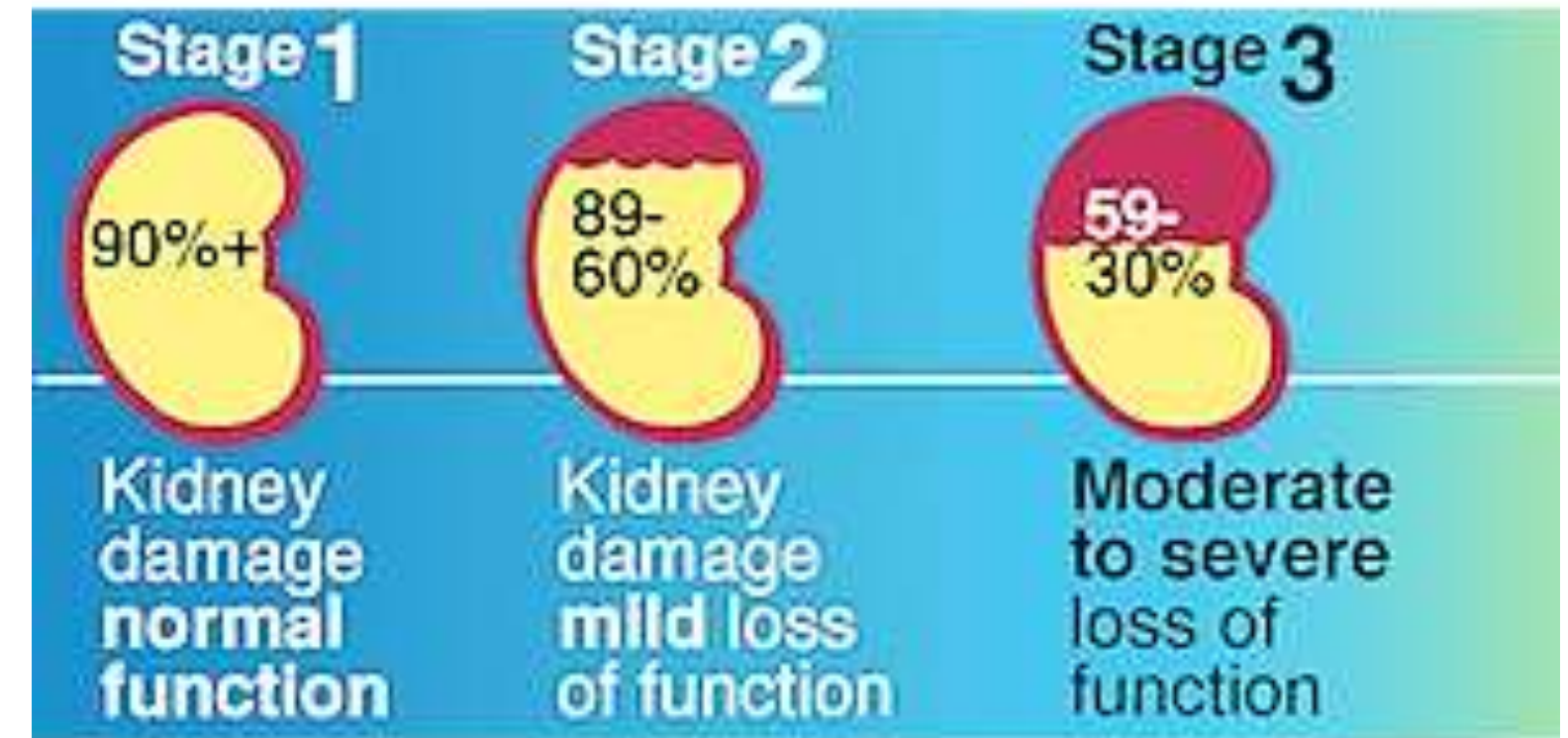


## ***Decreased renal reserve***

- Minimal damage to renal parenchyma
- GFR is about 50%
- BUN and creatinine values are normal

## ***Renal insufficiency***

- 75% destruction of renal parenchyma
- GFR is about 25%
- Elevation in BUN and serum creatinine
- Polyuria and nocturia occur due to tubulointerstitial damage





# Stages of Chronic Renal Failure



## ***Renal failure***

- 90% destruction of renal parenchyma
- GFR is approximately 10%
- Tubular cells are essentially nonfunctional
- Patient enters into oedema, metabolic acidosis, hypocalcaemia & mild uremia



## ***End-stage kidney***

GFR is 5%

- Uremic syndrome occurs with progressive primary (renal) and secondary systemic (extra-renal) symptoms



# Stages of Chronic Renal Failure



**Stage 1** = with normal or high GFR (GFR > 90 mL/min)

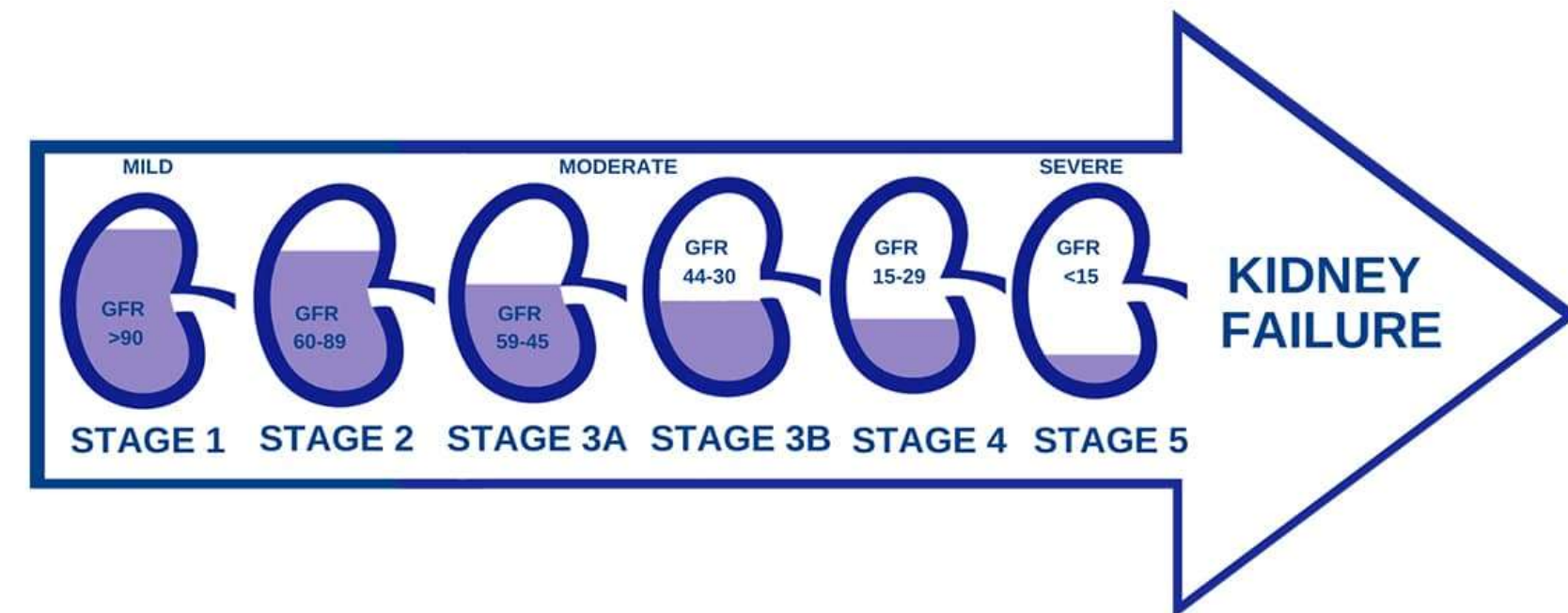
**Stage 2** = Mild **CKD** (GFR = 60-89 mL/min)

**Stage 3A** = Moderate **CKD** (GFR = 45-59 mL/min)

**Stage 3B** = Moderate **CKD** (GFR = 30-44 mL/min)

**Stage 4** = Severe **CKD** (GFR = 15-29 mL/min)

**Stage 5** = End **Stage CKD** (GFR <15 mL/min)







**Compensatory hypertrophy of surviving nephrons**

# Pathophysiology



**adaptive hyper filtration & hypertrophy.**

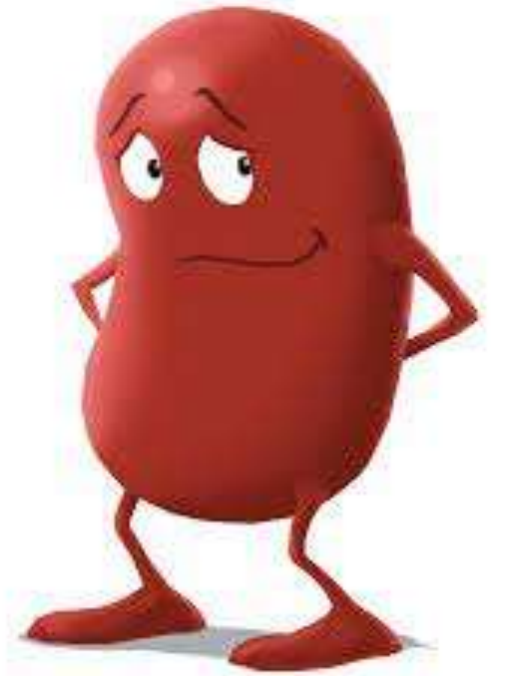
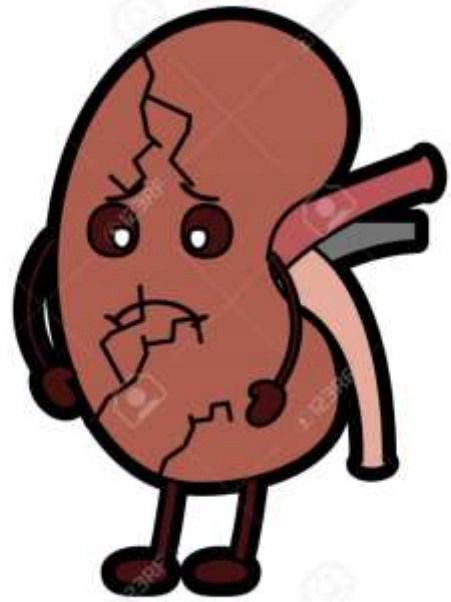
**Loss of excretory function**

**Decreased pH, K<sup>+</sup>, nitrogenous waste excretion.**

**Loss of non-excretory renal function.**

**Like failure to produce erythropoietin & to convert inactive form of calcium**

**sclerosis of remaining nephrons, & total function loss.**





# Clinical Manifestations



## *Primary uraemic (renal) manifestations*

- **Metabolic acidosis** - Excess of hydrogen ions occurs, while bicarbonate level declines in the blood, resulting in metabolic acidosis.
- **Hyperkalaemia** - A decreased GFR results in excessive accumulation of potassium in the blood
- **Sodium and water imbalance** – sodium and water cannot pass sufficiently into Bowman's capsule leading to their retention
- **Hyperuricaemia** - Uric acid crystals may be deposited in joints and soft tissues resulting in gout
- **Azotaemia** - biochemical abnormality, because of elevation



# Clinical Manifestations



## ***Secondary uraemic (extra-renal) manifestations***

- **Anaemia** - Decreased production of erythropoietin
- **Integumentary system** - Deposit of urinary pigment (sallow-yellow colour)
- **Cardiovascular system** - congestive heart failure (hypervolemia)
- **Respiratory system** - pulmonary congestion and pulmonary oedema
- **Digestive system** - Azotaemia directly induces mucosal ulcerations
- **Skeletal system** - *renal osteodystrophy*
  - ***Osteomalacia*** – deficiency of vitamin D (*Less deposition of calcium*)
  - ***Osteitis fibrosa*** – *elevated levels of parathromone*, deposits of excess calcium salts in joints and soft tissues and weakening of bones



# Complications



- Fluid retention
- Hyperkalemia
- Cardiovascular disease
- Weak bones and an increased risk of bone fractures
- Anemia
- erectile dysfunction or reduced fertility.
- Damage to your central nervous system.
- Decreased immune response.
- Pregnancy complications that carry risks for the mother and the developing fetus.
- Irreversible damage to the kidneys (end-stage kidney disease)



# Diagnosis



- **Urine Tests** – urinalysis, 24 hrs urine tests, GFR
- **Blood Tests** – Creatinine and Urea (BUN), Acid Base Balance, Erythropoitin
- **Other Tests** – Renal Biopsy, Abdominal CT Scan, Abdominal MRI





# Management



## Pharmacological Management

- Antihypertensive and Cardiovascular Agents
- Anti-seizure Agents
- Erythropoietin
- Antidiuretics
- Antacids - Hyperphosphatemia and hypocalcemia are treated with aluminum-based antacids that bind dietary phosphorus in the GI tract.



## Renal Replacement Therapy

- Dialysis
- Renal Transplantation



**THANK YOU**