

RENAL FAILURE OR RENAL INSUFFICIENCY

Loss of Kidney Function → Filtration of blood

RENAL DISEASES:-

1. Glomerular dis. - These are often immunologically mediated & may be Acute or chronic.
2. Tubular dis. - These are mostly caused by toxic or infectious agent & are often acute.
3. Interstitial dis. → "Tubulo-Interstitial disease" due to toxic/infectious agents.
4. Vascular Disease - These include changes in the nephron as a consequences of increased intra-glomerular pressure such as impaired blood flow or hypertension

These pathological condition may lead to →

1. Acute Renal Failure(ARF) or Acute kidney Injury(AKI)
2. Chronic Renal Failure(CRF) or chronic kidney dis.(CKD)
3. Acute-on-Chronic Renal Failure (AoCRF)

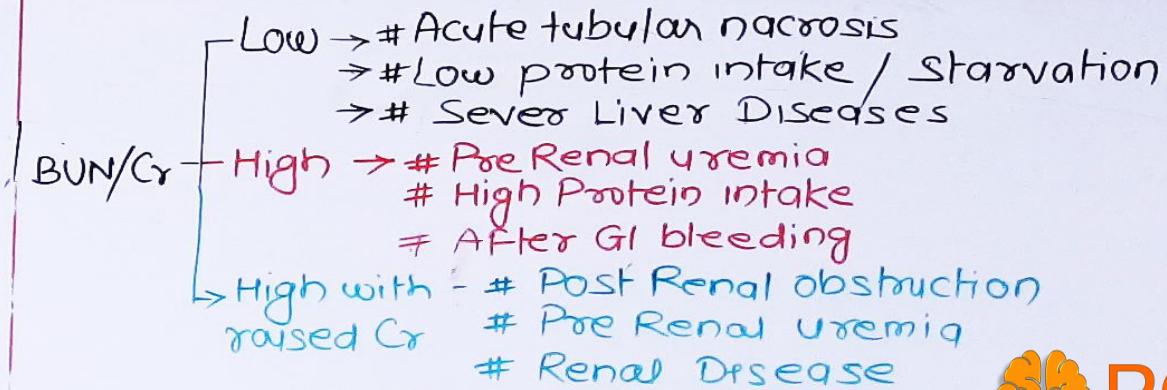
CHARACTERIZER BY -

"Azotaemia" → ↑ Blood Urea Nitrogen (BUN) $> 30 \text{ mg/dL}$
↑ Creatinine $> 1.2 \text{ mg/dL}$

Normal Range:- BUN = 7-20 mg/dL
Creatinine = 0.6 - 1.2 mg/dL

Ratio = BUN:C = 12 to 20 (Optimum - 15)

"Uraemia" = ↑ Urea level > 40 ($20-40 \text{ mg/dL}$)



Symptoms of Renal Failure :-

- | | |
|-----------------------|--------------|
| # ↓ urine output | # Confusion |
| # Peripheral Edema | # Seizures |
| # Shortness of breath | # Chest pain |
| # Drowsiness/Fatigue | # Coma |

Etiology of R.F.

1. Hypoperfusion at kidney → CVS disorders (HTN, HF), Liver failure, Dehydration, severe burn, Allergy, Severe infection, Inflammation
2. Urine Elimination problem → Kidney stones, Enlarged prostate gland, blood clots at urinary tract, nerve damage that control Bladder (Parasympathetic neuron)
3. Others → Severe UTI, Overload of toxins/heavy metals, drugs, Alcohol, LUPUS (Inflam. dis), chemotherapy, Haemolytic Uremic Syndrome

ACUTE RENAL FAILURE (ARF/AKI)

ARF is a rapid progressive loss of renal functⁿ that is characterized by → Oliguria ($<400 \text{ ml/day}$, in adult), Fluid & Electrolyte imbalance and sudden ↑ in metabolic waste in blood (Urea & Creatinine) with consequent development of Uremia & Azotemia

ETIOPATHOGENESIS:

1. Pre Renal ARF:- 20-25% Cases, Occurs due to sudden decreases in blood flow to nephron (Renal Ischemia) that lead to functional disorder and/or ↓ GFR.

- # Heart Failure ($\downarrow \text{CO}$) # Hypovolemia # Vascular dis.
- # Fluid Sequestration in liver failure

R. Ischemia $\xrightarrow{\downarrow \text{GFR}}$ $\downarrow \text{Urine}$ $\xrightarrow{\text{R. Hypoxia}}$ $\xrightarrow{\text{R. injury}}$ AKI — CKD (ARF) (CRF)

Therapy:- Improve Renal perfusion & Fluid infusion

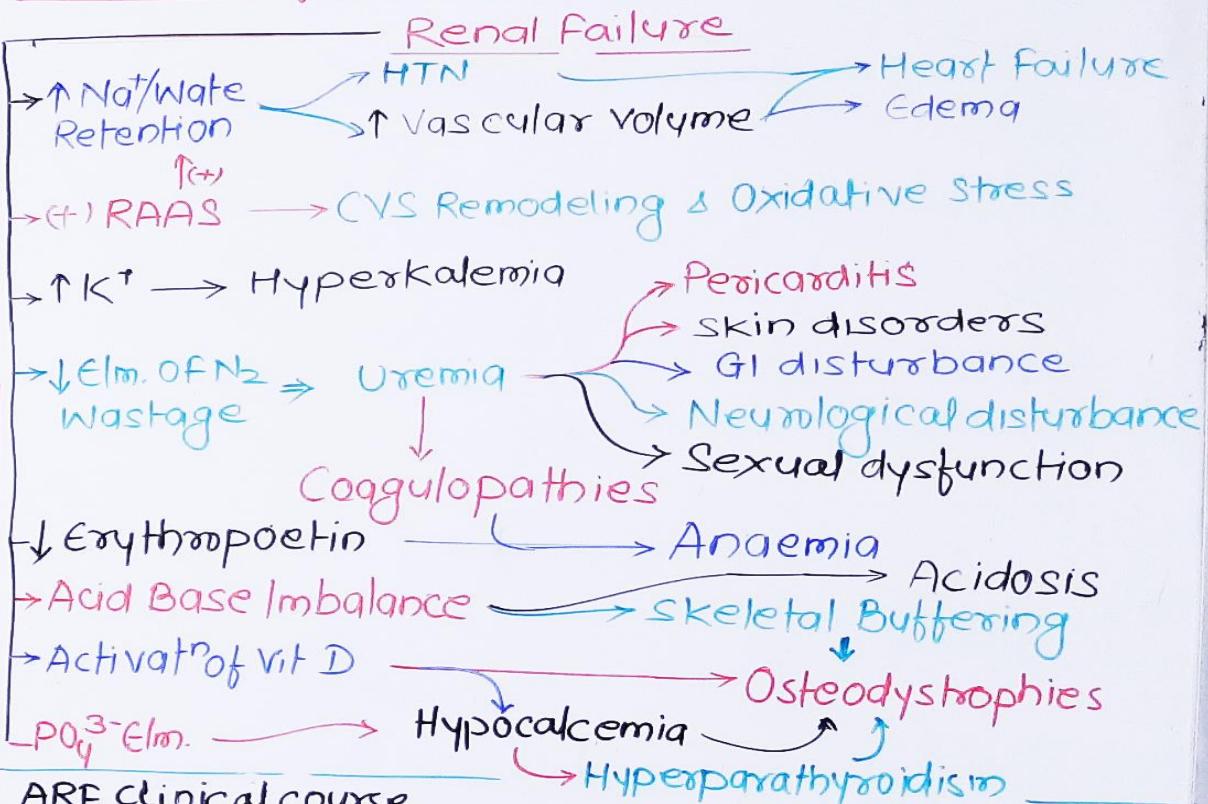
2. Intrinsic/Intra Renal ARF:- 60-70% Cases, occurs due to Intra Renal disease,- Acute Tubular necrosis (ATN, 45%), caused by R. Ischemia, Renal Vascular dis., Glomerular disease. & sever infections & toxins.

Renal Injury → Functional Disorders → ARF → CRF

3. Post-Renal ARF:- 10% Cases, Occurs due to obstruction of Renal tract (distal to collecting duct) & lower UT (Ureter, bladder neck, Urethra)

- # Blood Clots # Stones # Fungus balls
- # tumour # Retroperitoneal Fibrosis

Clinical Manifestation /Outcome :-



ARF Clinical course

1. Initiating Phase:- Onset on events until tubular injury

2. Maintenance phase - $\downarrow \text{GFR}$, \uparrow Retention of metabolites (Urea, Creatinine, ions), Edema, \rightarrow HTN, Uremia \rightarrow \rightarrow Neuromuscular irritability \rightarrow Seizure \rightarrow Coma \rightarrow death

3. Recovery phase \rightarrow "Repair of Renal tissue"

Diuresis \rightarrow Electrolyte & Metabolic Balance \rightarrow Healing (1 Year)

CHRONIC RENAL FAILURE / CHRONIC KIDNEY DISEASE

CRF/CKD is a progressive & irreversible damage of kidney structure (nephrons) that greatly reduce Renal function & marked decrease in GFR

R. Insufficiency, GFR - 50% - 20%

R. Failure, GFR - 20% - 5%

End stage Renal disease - GFR - < 5%

ETIO PATHOGENESIS :- chronic Nephropathies → CRF

1. Disease Causing Glomerular Pathology :-

Glomerular dis. lead to CRF by immune mechanism

Glom. Destructn → Alteratn in Filtration process

Proteinuria, Hypoalbuminaemia ↓ and Oedema. ← Nephrotic Syndrome

(A) Primary G. Pathology - "chronic Glomerulonephritis"

(B) Systemic G. Pathology - Originated from outside that can lead to change in nephron secondarily.

e.g.- Diabetic nephropathy, serum sickness nephritis, and Lupus erythematosus.

2. Disease Causing Tubulo-interstitial Pathology -

Tubulo-interstitial → Alteration in Tubular tissue Damage Reabsorption & Secretion

↓
Excretion of large volume of diluted urine

- (A) Vascular Causes - Hypertension → Nephrosclerosis (Renal vessels occlusion) → R. Ischemia → Tub. damage
- (B) Infection Causes - "Pyelonephritis (upper UTI)"
- (C) Toxic Causes - large dose/chronic uses of NSAIDs (Aspirin, phenacetin, Acetaminophen), Aminoglycoside and elements - lead, Cadmium, Uranium
- (D) Obstructive Causes : - chronic obstruction of U.T. lead to nephron damage due to Fluid back Pressure e.g., - Stones, blood clots, tumours, etc

PROGRESSIVE STAGES -

I. Decreased Renal Reserved : - Marginal damage, GFR (50%), BUN, Creatinine - Normal level

II Renal Insufficiency - 75% damage of Renal tissue GFR (25%), ↑ BUN & Cr, Polyuria, Uraemic Syndrome

III Renal Failure - 90% damage, GFR (10%), ↑ Na+/water, edema, Met. Acidosis, Hypocalcaemia & Signs of Uraemia

IV End-Stage Renal Dis. (ESRD) or CKD -

99% damage, GFR (< 5%), Uraemic Syndrome, P^o(Renal) and Secondary (Extra Renal) Symptoms

TREATMENTS -

- ① Dialysis
- ② Kidney Transplantation
- » Adjacent therapy to control etiological condition