

# APPROACH TO CHRONIC KIDNEY DISEASE



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# INTRODUCTION

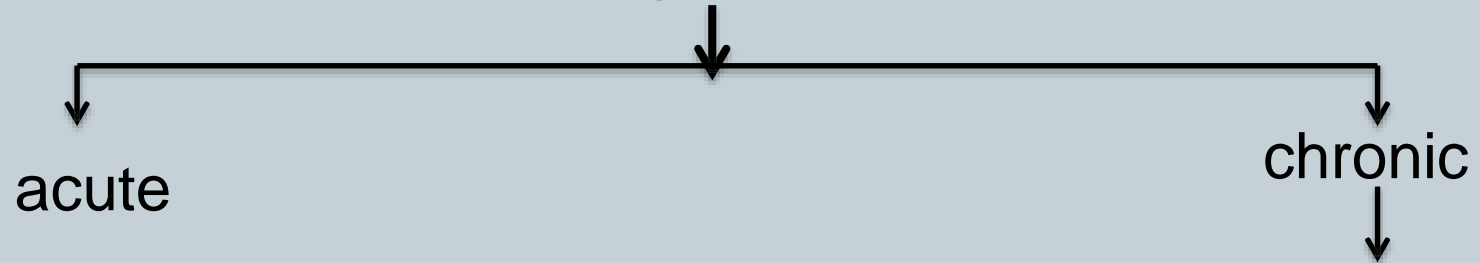


- Encompasses a spectrum of different pathophysiologic processes associated with abnormal kidney function, and a progressive decline in glomerular filtration rate (GFR).
- As infectious diseases are decreasing, we are facing increasing number of noninfectious diseases like diabetes, HT and so also CKD patients .
- Associated with increasing morbidity and mortality, and increasing healthcare burden day by day.

# Approach



deranged RFT's



acute

chronic

- identify cause
- calculation of GFR
- stage
- look for uremia
- investigate
- look for progression

# Patient with deranged RFT's



- History and physical examination
- Symptoms: loss of appetite and weight, nausea, hiccups, peripheral edema, muscle cramps, pruritus, and restless legs.
- Lab investigations and imaging
- Important because acute/subacute renal diseases are potentially reversible and responds to disease specific therapy.
- Rule out acute on chronic failure

# ETIOLOGY



- Diabetic glomerular disease
- Hypertensive nephropathy
  - 1) Primary glomerulopathy with hypertension
  - 2) Vascular and ischemic renal disease
- Glomerulonephritis
- Autosomal dominant polycystic kidney disease
- Other cystic and tubulointerstitial nephropathy

# Calculation of GFR



- **Modification of Diet in Renal Disease study**

Estimated GFR (mL/min per 1.73 m<sup>2</sup>)

$$= 1.86 \times (\text{PCr})^{-1.154} \times (\text{age})^{-0.203}$$

Multiply by 0.742 for women

Multiply by 1.21 for African Americans

- **Cockcroft-Gault equation**

Estimated creatinine clearance (mL/min) =

$$(140 - \text{age} * \text{body weight, kg}) / 72 * \text{Pcr (mg/dL)}$$

Multiply by 0.85 for women

# Staging of CKD



STAGE	GFR, ml/min per 1.73 m <sup>2</sup>
0	>90
1	≥90
2	60-89
3a	45-59
3b	30-44
4	15-29
5	<15

# Kidney Disease Improving Global Outcome (KDIGO) classification of chronic kidney disease

Prognosis of CKD by GFR and albuminuria categories: KDIGO 2012

				Persistent albuminuria categories description and range		
				A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30–300 mg/g 3–30 mg/mmol	>300 mg/g >30 mg/mmol
GFR categories (ml/min/1.73 m <sup>2</sup> ) description and range	G1	Normal or high	≥90			
	G2	Mildly decreased	60–89			
	G3a	Mildly to moderately decreased	45–59			
	G3b	Moderately to severely decreased	30–44			
	G4	Severely decreased	15–29			
	G5	Kidney failure	<15			



# INVESTIGATIONS



- BASIC: Urine microscopy, serum creatinine
- Serum electrolytes, Vitamin D, PTH, hemoglobin, serum iron, B12, folate
- Serial measurements and charting of renal functions
- 24 hour urine albumin, albumin to creatinine ratio
- Hepatitis B, C and HIV
- Imaging studies like renal ultrasound
- Renal Biopsy

# Treatment of CKD – action plan



STAGE	DESCRIPTION	GFR, mL/min PER 1.73 m <sup>2</sup>	ACTION
1	Kidney damage with normal or ↑ GFR	≥90	Diagnosis and treatment, treatment of comorbid conditions, slowing progression, CVD risk reduction
2	Kidney damage with mild ↓ GFR	60–89	Estimating progression
3	Moderate ↓ GFR	30–59	Evaluating and treating complications
4	Severe ↓ GFR	15–29	Preparation for kidney replacement therapy
5	Kidney failure	<15 (or dialysis)	Kidney replacement (if uremia present)

# MANAGEMENT



treatment aimed at specific cause



look and treat acute on chronic renal failure



slowing progression



management of complications



Preparation for Renal Replacement therapy



Renal Replacement therapy

# Treatment of specific diseases



- Not as important as in acute/ subacute disease
- But early implementation of disease specific therapy helps to slow the progression
- For Diabetes – excellent glycemic control fasting blood sugar (90-130mg/dL), HbA1c < 7%.
  - review of oral hypoglycemic agents
  - insulin requirement decreases
- Early diagnosis and prompt treatment of glomerulonephritis
- Other disease specific therapy

# Treatment of acute on chronic failure



- sequentially measure and plot the rate of decline of GFR in all patients, for early detection
- Causes: volume depletion, uncontrolled hypertension, urinary tract infection, new obstructive uropathy, exposure to nephrotoxic agents and reactivation or flare of the original disease, such as lupus or vasculitis.
- Prevention and treatment is according to cause

# Slowing progression



- **Protein Restriction**

- daily intake of 0.60-0.75 g/kg/d
- at least 50% of high biologic value
- in stage 5, 0.90 g/kg/d and energy intake of 35 kcal/kg to avoid PEM

- **Reducing Intraglomerular Hypertension and Proteinuria**

Control of systemic and glomerular hypertension

Target BP is 130/80

ACE Inhibitors and ARB's, calcium channel blockers  
diltiazem and verapamil

# COMPLICATIONS



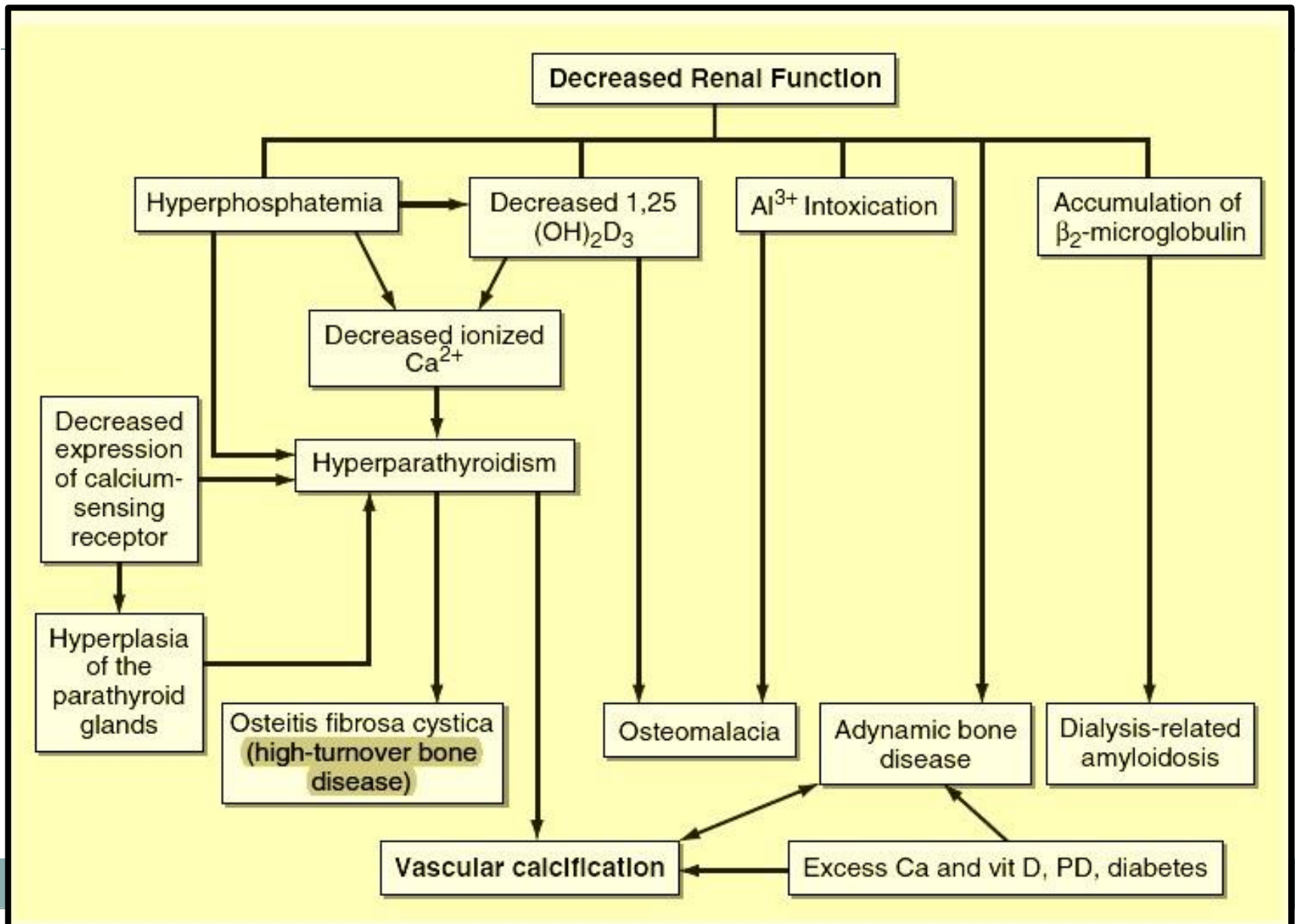
- Fluid and electrolyte disorders
- Acid base disorders
- Disorders of Calcium and Phosphate Metabolism
- Hematologic abnormalities
- Neuromuscular abnormalities
- Cardiovascular abnormalities
- Dermatologic abnormalities
- Gastrointestinal and nutritional abnormalities
- Endocrine-metabolic disturbances

# FLUID, ELECTROLYTE, AND ACID-BASE DISORDERS

- Volume expansion, hyponatremia → responds to fluid restriction  
loop diuretics + metolazone
- Hyperkalemia
- Hyperchloremic metabolic acidosis
- Hyperphosphatemia



# Disorders of Calcium & Phosphate Metabolism



# Treatment



- Optimal management is prevention
- low-phosphate diet as well as the appropriate use of phosphate-binding agents
- calcium acetate and calcium carbonate
- Sevelamer (non-calcium-containing polymer that functions as phosphate binder)
- Calcitriol analogues like paricalcitol
- Target PTH level between 150 and 300 pg/mL

# CARDIOVASCULAR ABNORMALITIES



- Leading cause of mortality in CKD patients
- IHD, Heart failure, hypertension
- Increased risk due to shared risk factors and CKD related factors
- CKD related factors include anemia, hyperphosphatemia, hyperparathyroidism, sleep apnea, and generalized inflammation
- Microalbuminuria is major risk factor

# MANAGEMENT OF CARDIOVASCULAR DISORDERS



- For hypertension,
  - target is 130/80 mmHg
  - salt restriction
  - ACE inhibitors and ARB's slow progression but cause hyperkalemia
- Hyperlipidemia, homocystinemia
  - lifestyle changes, diet, exercises
  - vitamin supplementation, statins
- Pericardial disease, heart failure
  - urgent dialysis

# HEMATOLOGIC ABNORMALITIES



- **Anemia**
  - normocytic normochromic
  - mainly due to erythropoetin deficiency
  - treatment with erythropoetin, supplementation of iron, vit B12, folate and blood transfusions
- **Abnormal hemostasis**
  - both increased bleeding tendencies and thromboembolism
  - desmopressin, cryoprecipitate
  - avoid LMWH, use conventional heparin

# NEUROMUSCULAR ABNORMALITIES



- Affects both central and peripheral nervous system, autonomic nervous system and muscular system
- Sensory distal polyneuropathy mainly in lower limbs
- Restless leg syndrome
- Responds mainly to renal replacement therapies

# GASTROINTESTINAL AND NUTRITIONAL ABNORMALITIES



- Anorexia, nausea, vomiting, gastritis, peptic ulcer and mucosal ulcerations
- Uremic fetor
- Protein energy malnutrition in advanced CKD
- Treated with dietary and lifestyle modification

# Preparation for renal replacement therapy



- Renal replacement therapy has extended lives of thousands of CKD patients worldwide
- Social, psychological, and physical preparation is necessary
- Prepare patients with an intensive educational program so that decisions will be more easier and appropriate for them
- No arbitrary blood urea nitrogen or creatinine level has been assigned for switching
- Most accepted criteria for switching are led by National Kidney Foundation in KDOQI guidelines



# Indications of Renal Replacement Therapy



- Severe metabolic acidosis
- Hyperkalemia
- Pericarditis
- Encephalopathy
- Intractable volume overload
- Failure to thrive and malnutrition
- Peripheral neuropathy
- Intractable gastrointestinal symptoms
- In asymptomatic patients, a GFR of 5-9 mL/min/1.73 m<sup>2</sup>, irrespective of the cause of the CKD or the presence or absence of other comorbidities

# Renal replacement therapy



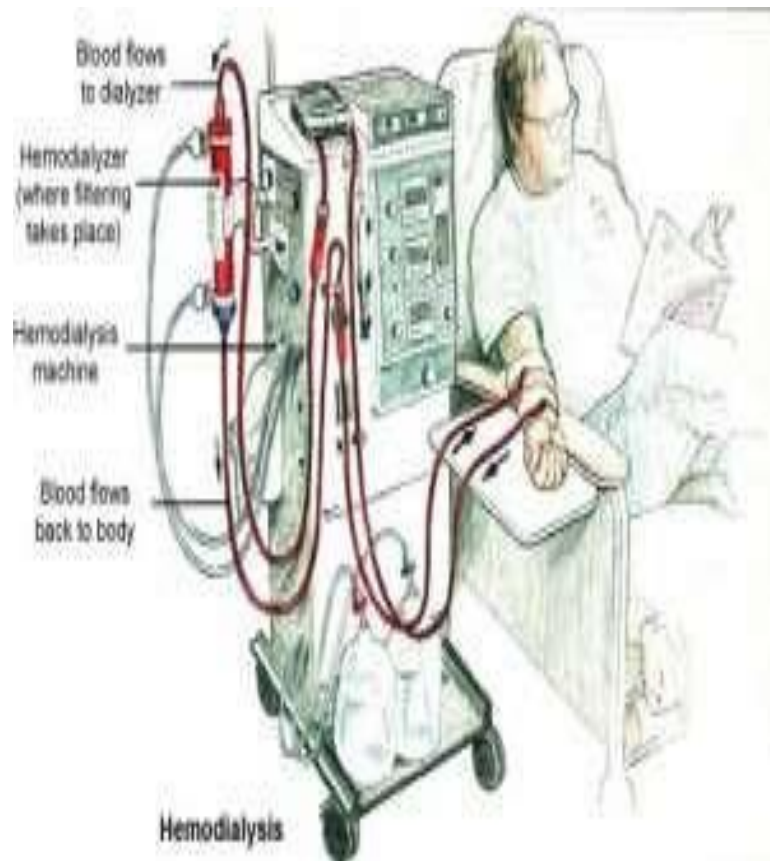
- **Dialysis**

- 1) haemodialysis
- 2) peritoneal dialysis

- **Kidney transplantation**

- 1) living donor
- 2) deceased donor

# Haemodialysis



# Haemodialysis



- Most common therapeutic modality for ESRD
- Based on principles of solute diffusion across a semipermeable membrane.
- three essential components are the dialyzer, dialysate, and the blood delivery system.
- Dialysis access can be done through fistula, graft or catheter.
- Nowadays, “fistula first” initiative is promoted

# Complications of haemodialysis



## 1. Hypotension

- most common
- Managed with discontinuing ultrafiltration, administration of isotonic or hypertonic saline and salt poor albumin

## 2. High output cardiac failure in fistula

## 3. Muscle cramps

## 4. Anaphylactoid reactions

# Peritoneal dialysis



- Dextrose containing solution is infused into peritoneal cavity and allowed to dwell for set period of time
- Toxic materials are removed through convective and diffusive clearance
- Of two types,
  1. Continuous ambulatory (CAPD)
  2. Continuous cyclic (CCPD)
- Patients on peritoneal dialysis do well when they retain residual kidney function
- Done mainly in developing countries d/to lower expense

# Complications of peritoneal dialysis



- Peritonitis – intraperitoneal or oral antibiotics
- Catheter associated non peritonitis infections (tunnel infections)
- Weight gain
- Residual uremia
- Hypoproteinemia
- Hyperglycemia

# Renal Transplantation



- Transplantation is the treatment of choice in advanced CKD
- Can be done from deceased donor or living donor
- Living donor kidneys have better survival than deceased donor kidneys
- Though donor number has increased, demand exceeds supply
- Careful selection of recipient and donor necessary



# PREVENTION



- Identify persons at risk of CKD at early stage and treat aggressively
- Appropriate detection and treatment of various glomerulonephritis
- Control of diabetes and hypertension
- Cautious use of nephrotoxic drugs
- Early detection of polycystic kidney disease and treatment

# SUMMARY



- CKD is emerging as major public health problem
- Early identification and treatment of complications is of utmost important
- Though renal transplant is therapy of choice in ESRD patients, it is not widely available
- Prevention is the best modality of therapy

THANK YOU

