

CHRONIC RENAL FAILURE(CRF)
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CRF

DEFINITION:-it is a complex constellation of clinical ,metabolic and biochemical disturbances that result from chronic reduction of renal function, of which the essential feature is decrease in Glomerular filtration rate(GFR) .

Incidence – 18/million of pediatric population

Normal GFR in children varies according to the age,

Children up to 3 yrs of age, range of GFR will be between 65- 75ml/min/1.73m²

Above 3 yrs of age,range between 75-120ml/min/1.73m²

CRF

Depending on GFR value, CRF is classified into: -

Mild CRF (GFR range 50-75ml/min/1.73m²)

Moderate CRF (GFR range 25-50ml/min/1.73m²)

Sever CRF (GFR range 10-25 ml/min/1.73m²)

End stag renal failure (ESRF) GFR < 10ml/min/1.73m²

Symptoms appear when GFR < 20ml/min/1.73m²

CRF

AETIOLOGY:-

1. Glomerular disease(40%of cases)e.g RPGN
2. Anatomic abnormalities(20% of cases)like Bilateral renal hypoplasia/dysplasia
- 3.Hereditary disease(15%ofcases)like Alport Syndrom and polycstic kidney diseas(ARPKD)
- 4.Chronic pyelonephritis&Reflux nephropathy (15%of cases)
- 5.Others (hemolytic uremic syndrom,D.M,...etc) (10%of cases)

CRF

CRF due to **anatomic abnormalities** usually
Present in children <5 years of age.

CRF due to **glomerular&hereditary diseases**
Usually present in children >5 years of age.

Some diseases(**Autosomal Dominant Polycystic
Kidney**)present late in adulthood.

CRF

PATHOGENESIS: exact mechanism of progressive functional deterioration is not clear, but factors that play important role include:-

1) ongoing immunogenic injury, through the deposition of immune complexes on glomeruli which lead to chronic inflammation & scarring

CRF

2) Hyprfiltration injury, through increase in blood flow & toxic effect of protein passage through capillary wall which result in glomerular scaring.

3) Proteinuria may accelerate the development of renal failure.

CRF

4)Hyperphosphatemia,through loading of the Calcium-phosphate in renal interstitium and blood vessels.

5)uncontrolled hypertension will lead to arteriolar nephrosclerosis&glomerular scaring

6)Hyperlipidemia,common in CRF is another risk factor.

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CLINICAL FEATURES:

- Manifestations of the underlying disease, like *glomerulonephritis* are evident before the development of CRF.

The onset is usually insidious(gradual).

Presenting complains are nonspecific, like headache lethargy,anorexia,vomiting,polyuria,polydypsia,fatigue and growth failure.

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Examination may be unrevealing, but most of the patients will appear pale, brown pale (sallow) colour, weak and may be hypertensive

Signs of growth retardation and rickets may be seen in long standing & untreated patients.

kidneys may be palpable in some cases (ARPKD)

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LABORATORY INVESTIGATIONS:-

1) Elevation of BUN (Blood urea), serum creatinin and uric acid.

2) Reduction in GFR, proved by the calculation of creatinin clearnce through 24hrs urine collection

$GFR = U * V / P * 1.73 / \text{surface area of patient}$

GFR can also be calculated by Schwartz formula
(Height*0.55/serum creatinin)

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3)Hyperphosphatemia and hypocalcemia,raised Alkaline phosphatase¶thyroid hormon(PTH)

4)Hyperkalemia and metabolic acidosis.

5)CBC(low Hb,normocytic,normochromc anemia platelets may be low with defective function).

6)Serum lipids(cholesterol&triglycerides)are high.

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RADIOLOGICAL INVESTIGATIONS:-

1)Ultrasound(USS)abdomen may show small size kidneys(renal hypoplasia)or large kidneys(PCKD).

2)Chest x-ray may show cardiomegaly,dilatation Of aorta and left ventricular hypertrophy.

Pulmonary edema may be seen in late stages.

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3) Bones(wrist&knee)X-rays may show evidence of rickets and secondary hyperparathyroidism (osteopenia,demineralization&loss of bone cortex)

X-ray hand show subperiosteal erosions of the edges of distal phalangs of index&middle fingers

4)Echocardiogram,may show left ventricular hypertrophy identify cardiac dysfunction.



9. **Distal phalangeal resorption.** Note resorption of terminal phalanges in advanced primary hyperparathyroidism.

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TREATMENT:-

1-Close monitoring for:-

*Growth parameters(Height&Weight).

*Blood pressure.

*Laboratory status which include measurement of Hb,K,Ca,Po₄,alk.Phosphatase,s.PTH,blood gases, measurement of GFR(Creatinine clearance),and bone X-ray studies(detect early osteodystrophy)

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2)Diet:-

Child need protein for growth(2.5gms/Kg/day) in form of high biological value proteins(eggs, fish, meat)that are metabolized to usable amino-acids rather than to nitrogenous waste products.

Carbohyrates&fats to provide adequate calorie Intake.

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Cow milk contains high phosphate concentration

So, some restriction is advised in addition to give Phosphate binders(oral calcium carbonate) or to use formula with low phosphate content.

Water soluble vitamins should be supplied and fat soluble vitamins are not required.

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3) Water and electrolyte management:-

Water restriction is not recommended except in end stage renal disease.

Sodium intake should be restricted in patient with hypertension, edema or heart failure

Sodium intake is needed in patients with polyuria
(anatomic or obstructive causes).

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Hyperkalemia is seen in advanced cases(causes?)

Treatment of hyperkalemia include:-

- *Reduce dietary potassium intake

- *Oral alkalinizing agent(sodium bicarbonate)

- *Kayexalate powder(oral calcium/sodium resin)

- *Dialysis

4)Treatment of acidosis, by giving oral sodium citrate or sodium bicarbonate .

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5) Treatment of anemia:- Anemia is primarily result of inadequate erythropoietin production.

Recombinant human erythropoietin therapy is given & Hb level of at least 11 gm% is recommended.

Iron supplementation is needed & if Hb level fall below 6 gm% slow packed cell transfusion is required.

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6) Treatment of hypertension

*combination of salt restriction, diuretics(loop diuretics),and angiotensin converting enzyme Inhibitors(ACEI)are used in proteinuric renal disease .ARB agents may be used.

*Calcium channel blocker(amlodipin),B-blocker (atenolol)and vasodilators(hydralazin)may be used in some patients.

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7) Treatment of renal osteodystrophy

- * Phosphate binders (Ca carbonate, sevelamer)
- * Active Vitamin D (Calcitriol)
- * Surgery

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8) Treatment of convulsion, by treating the cause

Which include:-

- *Hypertension

- *Electrolytes disturbances like hyponatremia hypocalcemia&hypomagnesemia.

- *CNS complications

Diazepam(0.1-0.3mg/kg i.v slowly) may be given.

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9) Treatment of ESRF

By giving renal replacement therapy:-

- * Hemodialysis
- * Peritoneal Dialysis
- * Kidney Transplantation