Glomerulonephritis

Definition:

- GN refers to a group of **immune-mediated diseases** causing **inflammation and injury** to the glomeruli.
- It can result in **hematuria, proteinuria, decreased kidney function**, and **hypertension**.

Classification:

By Clinical Syndrome	① **Nephritic Syndrome** ② **Nephrotic Syndrome** ③ Rapidly Progressive GN (RPGN) ④ Asymptomatic urinary abnormalities
By Pathology	① **Diffuse:** >50% glomeruli involved ② **Focal:** <50% glomeruli ③ **Global:** entire glomerulus ④ **Segmental:** part of glomerulus ⑤ **Proliferative, Membranous, Crescentic, Sclerosing**
By Etiology	① **Primary** GN (limited to kidney) ② **Secondary** GN (due to systemic disease e.g., SLE, infections, vasculitis)

Etiology & Causes:

Primary GN	Secondary GN
① Minimal Change Disease (MCD) ② Focal Segmental Glomerulosclerosis (FSGS) ③ Membranous Nephropathy (MGN) ④ Membranoproliferative GN (MPGN) ⑤ IgA Nephropathy (Berger's disease)	① Post-streptococcal GN (PSGN) ② SLE-associated GN ③ Goodpasture's syndrome ④ ANCA-associated vasculitis ⑤ Diabetic nephropathy ⑥ Amyloidosis ⑦ Hepatitis B/C ⑧ HIV

Pathophysiology:

- ✧ **Glomerular capillary wall** acts as a filtration barrier (endothelium, GBM, podocytes)
- ✧ Immune complex deposition → complement activation → glomerular injury
- ✧ **Types of injury:**
  1. **Subepithelial** (e.g., MGN)
  2. **Subendothelial** (e.g., MPGN)
  3. **Mesangial** (e.g., IgA)
  4. **Anti-GBM antibodies** (e.g., Goodpasture)
  5. **Pauci-immune** (e.g., ANCA vasculitis)

Clinical Features:

Nephritic Syndrome	① Hematuria (microscopic or gross) ② **RBC casts** in urine ③ Mild to moderate proteinuria (<3.5g/day)	④ **Hypertension** ⑤ Oliguria ⑥ Edema
Nephrotic Syndrome	① **Heavy proteinuria** (>3.5g/day) ② **Hypoalbuminemia** ③ **Generalized edema** ④ **Hyperlipidemia & lipiduria**	
RPGN (Crescentic GN)	① Rapid loss of renal function over days–weeks ② Severe form of nephritic syndrome ③ **Biopsy:** **Crescents** in most glomeruli	

Diagnosis:

Lab Tests	✧ **Urinalysis:** hematuria, proteinuria, RBC casts ✧ **Blood tests:** Creatinine, BUN, electrolytes ✧ **Immune markers:** ANA, Anti-dsDNA, ANCA, anti-GBM, complement levels (C3, C4)
Imaging	✧ Renal ultrasound to rule out obstruction.
Renal Biopsy	✧ Indicated in most GN cases for definitive diagnosis. ✧ Helps guide treatment and prognosis.

Management:

① General Measures:

a) Control BP: **ACEI/ARB** preferred (if not contraindicated)
b) Diuretics for edema
c) Statins if hyperlipidemia
d) Salt and protein restriction

② Immunosuppressive Therapy:

- ➥ Corticosteroids ± other agents (cyclophosphamide, MMF, rituximab)
- ➥ Depends on specific GN type

③ **TREATMENT BY TYPE:**

GN TYPE	FIRST-LINE TREATMENT
MCD	✧ Corticosteroids
FSGS	✧ Steroids ± calcineurin inhibitors
MGN	✧ ACEI/ARB, Immunosuppression if needed
IGA NEPHROPATHY	✧ ACEI/ARB ± steroids (if proteinuria >1g/day)
LUPUS NEPHRITIS	✧ Steroids + immunosuppressives (e.g., MMF)
ANCA VASCULITIS	✧ Steroids + cyclophosphamide/rituximab
GOODPASTURE'S	✧ Steroids + plasmapheresis + cyclophosphamide
PSGN	✧ Supportive (antibiotics if infection present)

COMPLICATIONS:

① Acute or chronic kidney failure
② Hypertension
③ Recurrence after transplant (e.g., FSGS)
④ Thromboembolic events (esp. in nephrotic)
⑤ Infections (due to loss of Ig/immune suppression)

PROGNOSIS:

✧ Depends on cause, severity, response to therapy
- **Better prognosis:** MCD, PSGN
- **Poorer prognosis:** FSGS, RPGN, late-diagnosed lupus