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Review

Unrevealing the concept of kidney diseases

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Abstract

Kidney diseases can lead to kidney failure which occurs when a person has less than 15% kidney function kidney diseases may also progressed due to our life styles including food we consume, Insufficient drinking of water, drug interactions and lack of hygiene. There are several types of kidney diseases they maybe progressed into chronic kidney diseases if they left untreated. Usually kidney diseases occur due to damaged glomerulus. In many cases immune complexes damage the glomeruli these are formed when antigen &antibodies combine either within in the kidney or elsewhere in the body and they circulate in the blood which leads to glomerulonephritis. Renal failure is the commonest cause of death in young people with diabetes mellitus. Hypertension can be the cause of renal disease. Bacterial infection of the renal pelvis and calyces causes the pyelonephritis which spreads to upward kidneys. Renal failure may also occur due to severe reduction in the glomerular filtration rate and decreased kidney function.

Keywords: *Glomerulonephritis, Pyelonephritis, Diabetic nephropathy, Renal calculi.*

INTRODUCTION

Normal, healthy kidneys filter about 200 quarts of blood each day, generating about quarts of excess fluid, salts, and waste products that are excreted as urine. Loss of function of these organs, even for a short period of time or due to gradual deterioration, can result in life-threatening complications. Loss of kidney function is an important health challenge whether it occurs suddenly or over a long period of time. Kidney disease's also known as Nephropathies which damage the kidney or it's function. In addition, about 30% of kidney disease cases are monogenic and could potentially be treated using these genetic medicine approaches. Systemic diseases that involve the kidney, such as diabetes mellitus and hypertension, might also be amenable to these treatments. Kidney disease's affect millions worldwide causing significant morbidity & mortality. Kidney disease is the ninth leading cause of death in US.

Anatomy of kidney

Location

The kidneys lie on the posterior abdominal wall, one on each side of vertebral column, behind peritoneum and below the diaphragm. They extend from the level of T12 to L3 and receiving protection from lower rib cage.

Structure

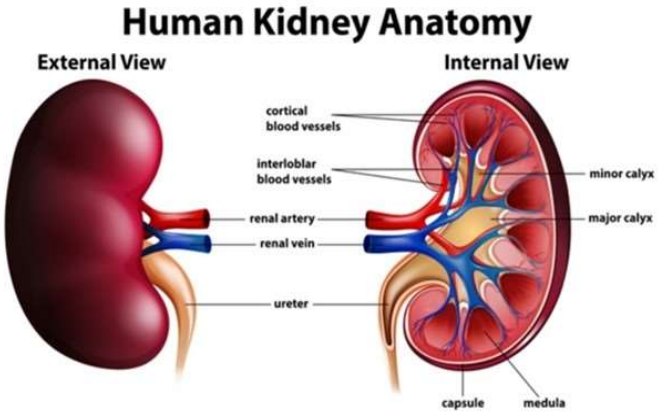

Fig 1: Human Kidney Anatomy

Kidneys are bean shaped organs about 11cm long, 6cm wide, 3cm thick and weigh about 150gm. Kidneys are enclosed by a sheath of fibroelastic renalfascia. Kidneys are made up of two main parts, they are the renal cortex and renal medulla. The renal cortex extends into the medulla, dividing it into triangular shapes called renal pyramids. The tips of the pyramids are called renal papillae, which connect to minor calyces that merge into major calyces. Urine then flows from the major calyces into the renal pelvis and then out of the kidney through the ureter. Left kidney is usually larger than the right kidney.

Capsule: A thin fibrous membrane that covers the kidneys outer surface.
Cortex: A reddish brown layer of tissue present below the capsule and outside the pyramids.
Medulla: The inner most layer consisting of pale conical shaped striations, the renal pyramids.
Hilum: Concave medial boarder of kidney where the renal blood and lymph vessels, ureter and nerves enter.
Renal pelvis: A funnel shaped structure that acts as a receptacle for urine formed by kidney.
Calyces: The number of distal branches of pelvis is called calyces.

Nephron

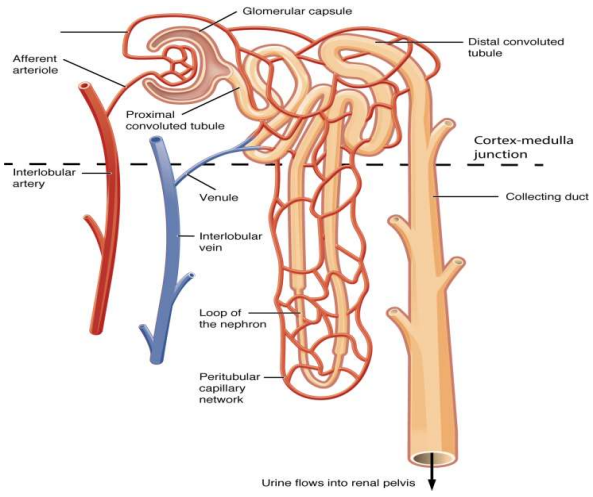

Fig 2: Nephron Structure

The kidney is composed of about one millon functional units called nephrons. It consists of a tubule closed at one end, and other end is opening in to a collecting tubule. The closed end is intended to form a **cupshaped Glomerular capsule bowman'**s a network of arterial capillaries, called glomerulus. Continuing from it, nephron is about 3cm long and consists of the proximal convoluted tubule, loop of henle ,and distal convoluted tube.

Layers
The kidneys are surrounded by three layers of tissue:
Renal fascia: A thin layer of dense connective tissue that attaches the kidney to its surroundings
Adipose capsule: A fatty layer that protects the kidney from injury
Renal capsule: A smooth, transparent sheet of dense connective tissue that gives its shape.

Types of renal diseases
1. Glomerulonephritis
2. Nephrotic syndrome
3. Diabetic nephropathy
4. Hypertension and the kidneys
5. Acute pyelonephritis
6. Reflux nephropathy
7. Renal failure
    a) Acute renal failure
    b) Chronic renal failure
8. Renal calculi

Glomerulonephritis

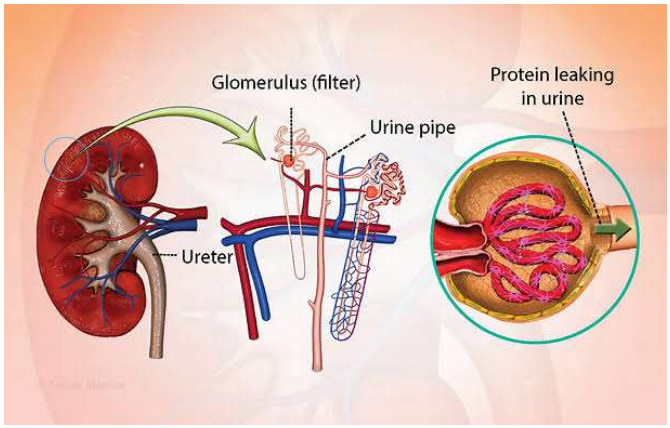

Fig 3: Glomerulonephritis

- This types of GN and inflammatory changes are not always present.term suggests inflammatory conditions of the glomerus but there are several
- In most instances, the diseases becomes progressive without timely intervention, eventualy leading to morbidity.
- One of the targets is the glomerular basement membrane itself or some antigen trapped with in post streptococcal diseases.
- The targets of immune mediated damage vary according to the type of GN for instance, GN associated with staphylococcus shows IgA and C3complement deposits.

Nephrotic syndrome

- This is not a diseases in itself but is an important feature of several kidney diseases the main characters are:1marked proteinuria,2 hypoalbuminaemia,3generalised oedema,4 hyperlipidaemia
- Poststreptococcal glomerual nephrities occurs after sore thorat or skin impetigo by nephrytogenic strains of groups Astreapococcus. The antibodies are produced against nephritogenic antigens of group A streptococcus. The immune complex formed deposits in or are around the glomerular basements

membrane.it activates complement cascade resulting in the recircutement of immune cells like Tcells, plasmacells, and macrophages. The coagulation cascade is also activated . resulting in micro thrombosis.

- RPGL patients have a high prevalence of certain HLA alleles.
- Example:HLA-DR14and HLA-DR4,suggesting a genitic predepostion to auto immunity.

Diabetic nephropathy

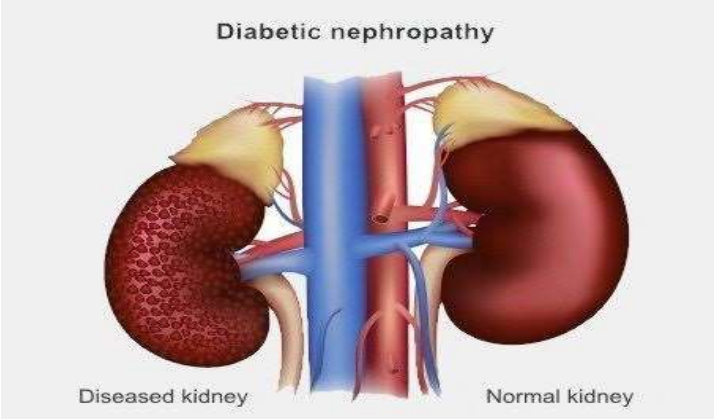

Fig 4: Diabetic Nephropathy

Renal failure is the commonest cause of death in young people with mellitus and is more common if hypertension and severe, long-standing hyperglycaemia are present. Diabetes causes widespread blood vessel damage and the effects vary between individuals. In the Kidney, are known collectiveiy as diabetic nephropathy or diabetic kidney and include: in renal function, and the Diabetic nephropathy (DN) is a clinical syndrome characterized by persistent albuminuria and a progressive decline term infers the presence of a typical pattern of glomerular disease. DN is reported to occur in 20% to 50% of those living with diabetes and is the single commonest cause of end-stage kidney disease (ESKD) in many populations, accounting for 28% of those commencing renal replacement therapy (RRT) in the United Kingdom,1 with corresponding figures of 44% in the United States and 38% in Australia. DN is typically associated with arterial hypertension and increased cardiovascular.

Hypertension and the kidneys

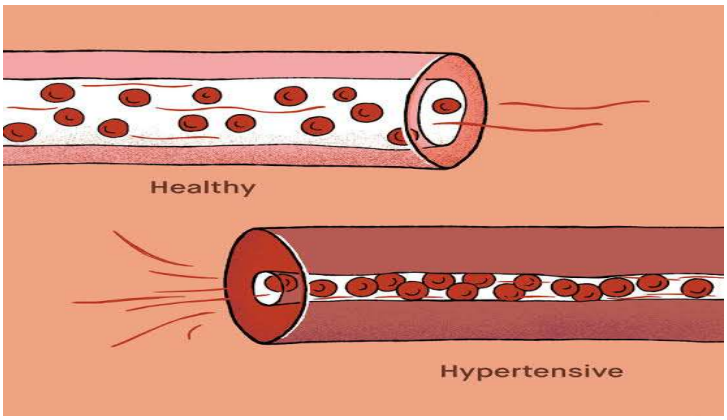

Fig 5: Hypertension And The Kidneys

Hypertension can be the causes or the result of renal disease. Essential and secondary hypertension about affect the kidneys when there is renal blood vessel damage, causing ischaemia. The reduce blood flow stimulates the rennin angiotension aldosterone system rainsing the blood pressure still further.

Types of Hypertension
Essential hypertension
Benign hypertension
This causes gradual and progressive sclerosis and fibrosis of the glomular,leading to renal failure or, more commonly to malignant hypertension.

Malignant hypertension
This causes rapidly developing arteriolosclerosis which spread to the glomular with subsequent distruction of nephrons.

Secondary hypertension
This is caused by long standing kidney diseases and leads to chronic renal ischaemia, further hypertension.

Acute pyelonephritis
- This is acute bacterial infection of the renal pelvis and calyces, spreading to the kidney substance causing formation of small abscesses. The infection may travel up the urinary tract from the perineum or be blood-borne.it is accompanied by fever, malaise and loin pain.
- Acute pyelonephritis can be divided into complicated and uncomplicated types. Complicated pyelonephritis includes pregnant patients, patients with uncontrolled diabetes, kidney transplants, urinary anatomical abnormalities, acute or chronic kidney failure, as well as immunocompromised patients, and those with hospital-acquired bacterial infections.

Types of Infections
Ascending infection
Upward spread of microbes from the bladder is the most common causes of this condition reflux of infected urine into the ureters when the bladder contracts during micturition predisposes to upwards spread of infection to the renal pelves and kidney substance.

Blood-borne infection
- The source of microbes may be form septicaemia or elsewhere in the body. Eg: Respiratory tract infections, Infected wounds or Abscesses
- When the infection spread into the kidney tissue it causes suppuration and destruction of nephrons. The prognosis depends on the amout of healthy kidney, remaining after the infection subsides necrotic tissue is eventually replaced by fibrouos tissue but there may be some hypertrophy of healthy nephrons. There are a number of outcomes, healing, recurrence, especially if there is a structural abnormality of the urinay tract of reflux nephropathy. Pernephric abscess and papillary necrosis are complications, usually if the condition is untreated.

Reflux nephropathy
Previously known as chronic pyelonephritis, this is almost always associated with reflux of urine from the bladder to the ureter enabling microbes to gain access to the kidneys. A congenital abnormality of the angle of insertion of the ureter into the bladder predisposes to reflux of urine,but it is sometimes caused by an obstruction that develops later in the life. Proggressive loss of functioning nephrons leads to chronic renal failure and concurrent hypertension is common. Occasionally it follows repeated of acute pyelonephritis.

RENALFAILURE
Acute renal failure
- There is a sudden and severe reduction in the glomerular filteration rate and kidney function that is usually reversible over days or weeks when treated.
- Acute renal failure is caused by ischemic (50%) or nephrotoxic (35%) injury to the kidney. About 15% of acute renal failure is caused by acute tubular interstitial nephritis.

Chronic renal failure
These occurs when there is irreversible damage to about 75% of nephrons. onset is usually slow and a symptomatic, progression over several days the main causes are glomerular nephritis, diabetes mellitus, reflux nephropathy and hypertension.Renal failure or an estimation glomerular filtration rate (e GFR) of less than 60 ml/min/1.73 m^2, persisting for 3 months or more, irrespective of the cause.

Renal calculi

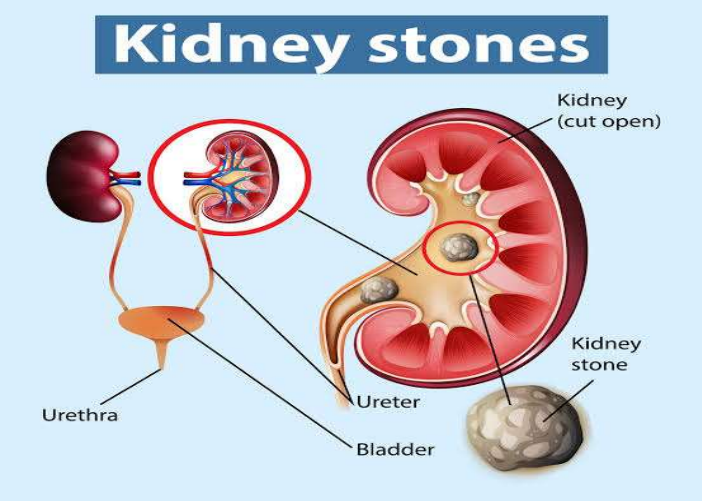

Fig 6: Renal Calculi

Calculi (stones) form in the kidneys and bladder when urinary constituents normally in solution are precipitated. Renal calculi are a common cause of blood in the urine (hematuria) and pain in the abdomen, flank, or groin. They occur in 1 of every 11 people in the United States at some time in their lifetimes, with men affected 2 to 1 over women.

- Dehydration
- PH of urine
- Infection
- Metabolic conditions

Small calculi: These may pass through or become impacted in a ureter and damage the epithelium, leading to haematuria and after healing, fibrosis and stricture.

Large calculi: One large stones may formed, usually over many years filling the renal pelvis and the calyces.

Symptoms

- Muscle cramps
- Feeling sick to your stomach or throwing up
- Feeling less hungry than normal
- Swelling in your hands, legs, feet or ankles
- Urinating (peeing) more or less than normal
- Trouble catching your breath
- Trouble falling or staying asleep
- Itchy skin
- Fatigue
- Hematuria
- Proteinuria
- Electrolyte imbalance
- Decreased urine output
- Polyuria
- Acidosis
- Electrolyte imbalance
- Anaemia
- Hypertension

Risk factors

- Diabetes

- High blood pressure
- Obesity
- Heart disease
- Kidney stones
- Family history
- Inherited kidney disorders
- Previous kidney damage
- Age

Diagnosis

- Serum creatinine &urea test
- Imaging studies (ultra sound)
- Kidney biopsy
- Urine analysis

Treatment

- Life style modifications (Diet, Exercise)
- Medications (ACE inhibitors, diuretics)
- Dialysis
- Kidney transplantation
- Conservative management

Complications

- Cardio vascular diseases
- Anemia
- Bone disease
- Fluid over load

CONCLUSION

In past 5 decades, notable progress has been made in basic, translational & clinical nephrology research. many kidney diseases result in reduced or loss of kidney function are due to affected glomerulus .as we know that kidneys play's an important role in our body, damage's to these kidneys leads to severe complications and increase the risk of other diseases. people are not aware of kidney diseases ,therefore awareness programme's should help to minimize the kidney diseases at early stages. prevention is possible with administration of specific diet choices, life style changes. Treatment may ranges from drug use to minor surgeries, to renal replacement therapies. It is important to include the fruits &vegetables in our diet, and to reduce the intake of animal ptotein and eliminate sugary foods or drinks. promising future approaches to the treatment of kidney diseases include cell or gene therapies, genome transplantation and bioartificial kidneys. This article provides information on the different types of kidney failures, as well as symptoms, causes, treatment options and prevention methods.

REFERENCES

1. Inker LA, Astor BC, Fox CH, Isakova T, Lash JP, Peralta CA, Kurella Tamura M, Feldman HI. KDOQI US commentary on the 2012 KDIGO clinical practice guideline for the evaluation and management of CKD. Am J Kidney Dis. 2014;63(5):713-35.
2. Aeddula NR, Cheungpasitporn W, Thongprayoon C, Pathireddy S. Epicardial Adipose Tissue and Renal Disease. J Clin Med. 2019
3. Coresh J, Astor BC, Greene T, Eknoyan G, Levey AS. Prevalence of chronic kidney disease and decreased kidney function in the adult US population: Third National Health and Nutrition Examination Survey. Am J Kidney Dis. 2003;41(1):1-12.
4. Fishbane S, Agoritsas S, Bellucci A, Halinski C, Shah HH, Sakhiya V, Balsam L. Augmented Nurse Care Management in CKD Stages 4 to 5: A Randomized Trial. Am J Kidney Dis. 2017 ;70(4):498-505.
5. Blakeley, Sara (2010). Renal Failure and Replacement Therapies. Springer Science &Business Media. p. 19. ISBN 9781846289378.
6. KDIGO AKI Work Group. (2012).KDIGO clinical practice guideline for acute kidney injury. Kidney Int. Suppl. 2, 1–138 (2012).

7. Mehta, R. L. etal.(2016) Recognition and management of acute kidney injury in theInternational Society of Nephrology 0by25 Global Snapshot: a multinational cross- sectional study.Lancet 387, 2017–2025 (2016).
8. Stanifer JW, Jing B, Tolan S, etal.(2014). The epidemiology of chronic kidneydisease in sub-Hoy W, Watkins M: Renal disease epidemiology: An underdeveloped discipline. Am J Kidney Dis 12:454-457, Saharan Africa: a systematic review and meta-analysis.Lancet Glob Health. 2014; 2(3):e174−e181.
9. Ruggenenti P, Schieppati A, Remuzzi G: (2001). Progression, remission, regressionof chronic renal diseases. Lancet 2001, 357(9268):1601–8.
10. Lindner A, Sherrard DJ. (1996).Acute renal failure. N. Engl. J. Med. 1996, 24;335(17):1320-1;
11. Pemeger TV, Klag MJ, Whelton PK: Cause of death in patients with end-stage renal disease: Comparison of deathcertificates and Registry reports. Am J Public Health 83: 1735
12. Brancati FL, Whittle JC, Whelton PK. Seidler AJ, Klag MJ: The excess incidence of diabetic end-stage renal disease among African Americans. JAMA 268:3079-3084, 1992
13. Pemeger TV, Klag MJ, Feldman HJ, Whelton PK: Projections of hypertension-related renal disease in middle-aged residents of the United States. JAMA 269: 1272-1277,
14. Sarnak MJ, Levey AS, Schoolwerth AC et al. Kidney disease as a risk factor for development of cardiovascular disease: a statement from the American Heart Association Councils on Kidney in Cardiovascular Disease, High Blood Pressure Research, Clinical Cardiology, and Epidemiology and Prevention. Hypertension 2003; 42: 1050–1065.
15. Yach D, Hawkes C, Gould CL et al. The global burden of chronic diseases: overcoming impediments to prevention and control. JAMA 2004; 291: 2616–2622.
16. Mann JFE, Gerstein HC, Qi-Long Y et al. Development of renal disease in people at high cardiovascular risk: results of the HOPE randomized study.
17. J Am Soc NeFoley RN. Infections and cardiovascular disease in patients with chronickidney disease. Adv Chronic Kidney Dis 2006; 13: 205–208.
18. Jaber BL. Bacterial infections in hemodialysis patients: pathogenesis and prevention. Kidney Int 2005; 67: 2508–2519.phrol 2003; 14: 641–647.
19. Anatomy and physiology in health and illness annewaugh, Allison grant page no; 348.
20. Khalighi MA, A1 Rabadi L, Chalasani M, Smith, kakani S ,Relevo MP,Meehan SM, stephalococcal infection related glomerulo nephritis with cryoglobulinemic features, kidney interrupt 2018.