INTRODUCTION TO KIDNEY DISEASE

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Introduction

Kidneys are bean shaped structure located on either side of back bone, just above the level of waist (photo). Normally a person has two kidneys, however 1 in 5000 has only one kidney, and if this kidney is working well than person can survive on it for lifelong, it means that only one kidney is sufficient for life. Each kidney has about 1 million of filtering units called nephron and they perform many important functions in body like:

- Removal of waste products like urea, creatinine and many others,
- BP control, as kidney is responsible for salt excretion and production of hormone renin which is important for BP control.
- Fluid control as kidney removes extra fluids and in patients with kidney disease this fluid is accumulated in body leading to swelling,
- Formation of blood through production of hormone erythropoietin and
- Keeping our bone healthy, through synthesis of active form of vitamin D.

Types of Kidney Diseases

A). Acute kidney injury (AKI) - if kidneys stop working in a period of hours to days then it is called acute kidney injury. The most common causes are-

- Sudden loss of fluids/blood from body as in severe dehydration, diarrhea, and excessive bleeding
- Poisoning
- Severe infection or heart failure which might lead to shock (low blood pressure) reducing the blood flow to kidney leading to low urine formation.

Once kidney develops AKI secondary to one of these causes than it usually takes 2-4 weeks for kidney function to recover, which occurs in most of the patients but not in all. Patient might need dialysis till kidney is recovered in such cases.

B). Chronic kidney disease (CKD) - Chronic kidney disease is defined as the gradual loss of kidney function over time usually more than 3 months. World-wide about 10-15% of population is estimated to have CKD of various grades; it means it is now becoming a very common disease. However most of these people have initial stages of CKD and only about 0.5-1% patients have advanced stages of CKD. When the function of kidney is <10% than it is called CKD stage 5 or kidney failure and in this stage a person usually requires either dialysis or kidney transplantation to sustain his/her life. Chronic kidney disease is 12th most common cause of death and 17th in disability worldwide.

The common causes of CKD are:

- Diabetes mellitus (DM) - 30-40%
- Hypertension (HTN) - 15-20%
- Glomerulonephritis – protein leakage from kidneys
- Interstitial nephritis- due to various toxins, drugs, infections, kidney stones, urinary problems like prostate enlargements, etc.
- ADPKD- a condition where many cysts (water bags) are formed in kidneys due to genetic defects which usually runs in families.
- Autoimmune diseases like SLE

The most common causes of CKD are diabetes mellitus and hypertension. As DM and HTN are increasing in population so are kidney diseases. Additionally some other factors like smoking, obesity, older age and family history of kidney diseases increase the risk of development of CKD.
Symptoms/Signs of Chronic Kidney Disease

In the early stages of CKD, there may not be any symptoms in many patients and the disease can go unnoticed and progress to end-stage renal disease requiring dialysis or transplant. The problem is often discovered when blood or urine tests done for some other reasons especially in patients with diabetes or hypertension. The common symptoms are

- Edema - swelling of the feet, ankles, or legs
- Abnormalities in urine like- excessive frothing (protein in urine), blood in urine (haematuria), excessive urine frequency in night, decrease in urine output etc.
- Poor blood pressure control despite drugs for high BP
- Anemia
- Bone abnormalities especially in children like knock knee, rickets etc.
- Growth retardation in children
- Frequent low blood sugars in patient with long standing diabetes despite same doses may be sign of kidney disease

In advanced stages of CKD patient develops –

- Decreased appetite, nausea, vomiting, weight loss due to poor intake, itching, dryness of skin, altered taste
- Breathlessness, altered mental state, seizures and coma if not treated

Early Detection of CKD

It is possible to detect kidney disease in early stages by 2 simple tests

1. Urine for albumin/protein- which can be done by simple dipstick or urine examination in a lab. Urine albumin excretion of >30 mg/day or urine protein > 200 mg/day is high and such person should see a nephrologist.

2. Serum creatinine –to estimate kidney function is another test done through blood; however creatinine is only increased when kidney function is less than 50%. The normal range of serum creatinine is 0.6- 1.3 mg/dl, which can vary according to laboratory.

It is recommended that patients with high risk of kidney disease like diabetes, hypertension and family history of kidney disease should undergo these tests yearly.

Other Tests for Kidney Disease

Ultrasound of kidneys - detects size of kidneys, if there is any cysts, stone, obstruction in kidneys etc. In patients with CKD kidneys are usually small due to long standing disease and it denotes the irreversibility of disease, however in patients with diabetes kidneys may remain normal in size despite loss of function and in hereditary cystic kidney disease (ADPKD), kidneys are enlarged as they fail.

Kidney biopsy - in a kidney biopsy, a small piece of kidney tissue is taken via a needle and examined under a microscope. The biopsy helps to diagnose cause of kidney disease, which is helpful in correct treatment of kidney disease. However kidney biopsy is only useful if kidney size is normal and kidney disease is of short duration.

Other tests - like CT scan, antinuclear antibody (ANA), antineutrophilic cytoplasmic antibodies (ANCA), complement levels, etc. may be required in some patients.
Management of Chronic Kidney Disease

The management of CKD is best done with the assistance of a nephrologist, a doctor who specializes in kidney diseases. Early referral to a nephrologist decreases the chance of developing complications associated with CKD.

**Hypertension** — High blood pressure, is present in more than 80 percent of people with CKD. BP should be maintained at < 130/80 in all patients with CKD, and it has been found to be most important factor to slow/retard the progression of kidney disease.

**Anemia (low Hb)** — can occur in CKD due to many factors, however mostly due to deficiency of hormone secreted by kidneys. Other causes are- iron deficiency, infections, decreased life span of blood cells etc. To correct anemia, patient often needs iron and other nutritional supplementation and synthetic erythropoietin hormone in many patients.

**Dietary changes** — Changes in diet is recommended to control or prevent some of the complications of CKD; most important is salt restriction to help control the blood pressure and low protein diet to slow the progression of CKD.

**Management of Chronic Kidney Disease**

- Medications for high triglyceride and cholesterol levels,
- Stopping smoking help to slow the progression of kidney disease,
- Weight reduction if obese
- Tight blood sugar control in people with diabetes. HbA1C around 7%
- Medications to reduce phosphorus levels, vitamin D supplementation and specific drugs for kidney diseases as required.
- Vaccination – in CKD vaccination for hepatitis B, pneumonia and influenza are recommended.

**Drugs to be Avoided in Patients with Kidney Diseases**

- Some painkillers called nonsteroidal anti-inflammatory drugs (NSAIDs) – e.g. brufen, combiflame, voveron, nimesulide, etc. because these drugs can deduce the blood flow to kidneys and precipitate kidney damage.
- Safe painkillers for kidneys are – paracetomol, tramoldol and opioids after consultation with your doctor
- Some antibiotics like aminoglycosides e.g. amikacin, gentamicin etc. and polymixin group. However sometimes in serious infections, these drugs need to be given even in kidney failure to save patient’s life.
- Some herbal medicines are known to cause/increase kidney damage like Chinese herbal medicines and Ayurvedic drugs with heavy metals. Unfortunately we are not aware of all the side effects of ayurvedic drugs so it a advise to avoid all herbal medicines in patients with CKD.

### Kidney Function Remaining

<table>
<thead>
<tr>
<th>Stage 1 &amp; 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 3</th>
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<tbody>
<tr>
<td>&gt; 90% &gt; 90 - 60%</td>
<td>60 - 30%</td>
<td>30 - 15%</td>
<td>&lt;15%</td>
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**Decreased Kidney Function**

- No symptoms observed
- Urea and creatinine are normal

**Kidney Insufficiency**

- More symptoms occurred
- Rising creatinine level, excess urea, anemia

**End-Stage Renal Disease**

- Renal function severely impaired
- Elevated urea and creatinine