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M.A. Home Science

Semester-IV CC-5 (Therapeutic Nutrition)

Unit-III Kidney diseases

Introduction

Kidneys paired vital organs which serve as a complex filter. They filter waste and extra fluid without losing the vital constituents. The basic units of the kidneys are microscopically thin structures called nephrons, which filter the blood and remove wastes in form of urine. Together with the bladder, two ureters, one urethra and the kidneys make the urinary system.

Kidneys are dark red beans like structure. They are about 10 to 13 cm long and 5 to 7.5 cm wide as the size of computer mouse. They are situated below the middle of the back, beneath the liver on the right and the spleen on the left. The primary structure in the filtering system is the glomerulus, a network of extremely thin blood vessels called capillaries. The glomerulus is contained in a cup like structure called Bowman's capsule, from which extends the renal tubules. This tube twists and turns until it drains into a collecting tubules that carries urine to the bladder.

Functions of the Kidneys

Primary function of the kidneys is to remove the poisonous wastes from the blood. These wastes are nitrogen containing compounds urea and uric acid, which results from the breakdown of proteins and nucleic acids .Apart from cleaning the blood, the kidneys perform several other functions. These are:

- Filtration: The end products of protein metabolism (urea, creatinine, uric acid) are removed.

- Regulate the water content in the blood.
- Regulate sodium and potassium content in the blood.
- Control blood pressure.
- Convert vitamin D to an active form that keep the bone healthy.
- Adjust the body's acid-base balance and prevent acidosis and ketosis
- Help to make red blood cells.

Causes of kidney disease

Factors that may increase the risks of kidney diseases are:

1. Diabete
2. High blood pressure-
3. Smoking
4. Obesity
5. Family history of kidney disease
6. Abnormal kidney structure
7. Cardiovascular disease
8. Certain medicines
9. Infections
10. Injury
11. Age and occupation
12. Environmental exposure to lead, mercury, or toxic chemicals
13. Climate and geographic location

Symptoms of kidney disease

- Itchy skin
- Muscle cramps
- Nausea and vomiting
- Loss of appetite
- Swelling in feet and ankles
- Puffiness around eyes
- Trouble sleeping
- Insufficient production of urine
- Urine is smoky and foamy
- Sometimes blood in urine
- Fatigue
- High blood pressure
- Electro imbalance

Diseases of the Kidneys

Diseases of the kidney range from mild infection to life threatening kidney failure. The most common diseases are:-

I. Nephritis

1. Pyelonephritis
2. Glomerulonephritis

II. Nephrosis (Degenerative Bright's disease)

III. Nephrosclerosis

IV. Uremia

V. Renal failure

1. Chronic renal failure
2. Acute renal failure

VI. Stones in kidney and urinary tract

I. Nephritis

General term for inflammatory diseases of kidney. Although many types of nephritis exist, the most common form is glomerulonephritis. Patients with acute nephritis generally recovers. A small percentage of cases result in chronic nephritis, which tends to be a progressive disease that gradually destroys the kidneys. Common nephritis are:

1. **Pyelonephritis** –The most common form of kidney disease is an inflammation of the kidney, called pyelonephritis. This inflammation is caused by a bacterial infection that starts in bladder and reaches to the kidney. Symptoms includes fever, chills and back pain.
2. **Glomerulonephritis**- Inflammation of the glomeruli. This occurs when the body's immune system is impaired. Symptoms includes blood in the urine and presence of protein in the urine.

Diet Modification: The diet must be planned to suit the patient's kidney capacity.

Normal intake of protein is planned when kidneys are able to excrete wastes. The protein losses must be covered by appropriate increase of proteins of high biological value. Protein in the diet should be reduced to 30-40 g or less in sever condition. Energy intake through carbohydrate and fat should be encouraged to prevent tissue breakdown.

If there is edema, sodium intake must be restricted. Due to poor reabsorption of the nutrients, loss of iron can lead to anemia. Hence iron supplements are needed.

II. Nephrosis

Any degenerative disease of the kidney tubules that damages the kidneys is called nephrosis. The damaged filtering system leads to an imbalance of proteins in urine. Swelling around face, eye, feet, ankles and in abdomen area is the most common symptom.

Diet modification: A healthy diet for nephrotic patient is low salt, low fat and low cholesterol. Nutrients must meet the requirements of the body.

Restricted protein, high carbohydrate, restricted salt and fluids are recommended. Vitamin supplements especially vitamin C must be provided. **Sodium** level needs to be kept at about 500 mg to prevent edema. Dietary fat and cholesterol may be limited to control hyperlipidaemia.

III. Nephrosclerosis

Nephrosclerosis is the hardening of the kidney due to the development of fibrosis which is usually caused by disease of the renal arteries that supply blood to the kidneys. It is associated with hypertension and diabetes. It can lead to kidney failure. Symptoms include **impaired vision, blood in urine. Loss of weight** and accumulation of urea in the blood.

Diet modification: low sodium, low fat, low cholesterol diet is recommended. Emphasis should be given on lean meats, dried beans, fresh vegetables and fruits, potatoes etc.

IV. Uremia

Uremia is the symptoms marked by elevated concentrations of urea in the blood and associated with fluid, electrolyte and hormone imbalances and metabolic abnormalities. Another symptoms are extreme tiredness, cramping in the legs, loss of appetite, headache, nausea and vomiting.

Diet modification: A very low protein diet is recommended to reduce waste build up in the blood. Protein should be given .5 to 0.75 grams/kg body weight. Low protein increases the rate of glucose metabolism and energy production rate.

V. Renal failure

A condition in which the kidneys lose the ability to remove waste and extra fluids. These are the following types:

1. **Chronic Renal failure** – It is a condition involving a decrease in kidneys' ability to filter waste and fluid from the blood. The condition develops over a long period of time. Chronic kidney failure is the gradual loss of kidney function. In this stage, dangerous levels of fluid, electrolytes and wastes can accumulate in the body.
2. **Acute Renal failure** – A condition in which the kidneys suddenly stop filtering waste from the blood. It may be fatal. It is very serious and requires immediate medical treatment. Symptoms include decreased urinary output, swelling due to fluid retention, nausea, fatigue and shortness of breath.

Diet Modification: The diet planning depends upon the stage of the disease, levels of urea in the blood, electrolytes and the nutritional status.

Energy: Adequate calorie is needed to prevent tissue breakdown. 1900 – 2200 Cal /day is recommended.

Protein: Protein intake can be reduced to 0.5 – 7.5g/kg body weight. Reduced protein is necessary to reduce the work load of kidneys.

Minerals: Potassium and sodium intakes should be restricted to avoid hyperkalaemia, oedema and hypertension. Phosphorus is also restricted to 600-1000 mg/day to prevent acidosis

Sodium: Average sodium intake should be 2-3g/day. Controlling sodium intake will help avoid cramping and blood pressure.

Fluid: Fluid is restricted when urine output is low. The total fluid intake is equal to the volume of urine output plus about 500 ml for insensible losses.

VI. Stones in kidney and urinary tract

These stones are resulted due to continuous deposition of fine chemical crystals in any part with gradual increase in size. Such stone formed in kidney is known as **renal calculus (plural calculi)**. It may be formed in ureter **ureteric calculi** whether in bladder is called **vesicular calculus**. Severe back pain in the ribs can be due to calculus and if associated with fever, it is indicative of infection of the kidney. Severe pain in abdomen, arising in flanks that appears moving down to lower abdomen is due to ureteric calculus. Symptoms can show pain in lower stomach area, blood in urine, cloudy and smoky dark urine, discomfort during urination and starting a stream takes longer time.

Stones are divided into two parts according to their formation-

1. **Primary stone** – Formed by metabolic errors. e.g. calcium, uric acid, oxalate.
2. **Secondary stones** – Formed due to infection. e.g. formation of magnesium, ammonium and phosphate.

Diet modification: Diet is planned on the basis of the predominant component of the stone. A very liberal fluid intake of 2500 to 3000ml per day is recommended to avoid formation of concentrated urine from which salts get precipitated out as stones. The intake of calcium phosphates should be reduced to prevent stone formation. Increase potassium and reduce intake of meat.

Dialysis

Dialysis is used in acute and chronic renal failure for a short or long periods. It does not correct metabolic problems and there is need for modification of diet. Renal dialysis is a method to filter out the toxic products from blood by passing it through an artificial filter machine that works like a kidney. The procedure is carried out in a patient who has developed a condition of chronic renal failure. The kidneys become non functional due to infection and other diseases, which damages their tissues resulting into a condition termed as nephrotic syndrome.

Kidney Transplant

When both kidneys of a patient fail, kidney transplant provides a functioning kidney, which permits the patients to lead a normal life

Foods avoided in renal diseases

- The following foods should be avoided during renal diseases:

- Dark coloured soda
- Canned foods
- Whole wheat bread
- Brown rice
- Bananas, Oranges
- Dairy foods
- Spinach, Cabbage, Cauliflower, Peas, Cucumber ,Potatoes etc

Safety measures for the healthy kidneys

Following points can help to lower the risks of kidneys problems:

- aControl diabetes
- Control high blood pressure.
- Don't smoke and use tobacco
- Keep a healthy weight.
- Control cholesterol.
- Live a healthy life
- Eat healthy meals.
- Exercise regularly for 30 minutes a day.
- Take medicines as prescribed by doctor
- Eat low salt and low fat diet
- Avoid too much alcohol
- Have regular check –ups

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