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Question

Discuss the diseases of the renal system

Kidney disease, or **renal disease**, also known as **nephropathy**, is damage to or disease of a kidney. Nephritis is an inflammatory kidney disease and has several types according to the location of the inflammation. Inflammation can be diagnosed by blood tests. Nephrosis is non-inflammatory kidney disease. Nephritis and nephrosis can give rise to nephritic syndrome and nephrotic syndrome respectively. Kidney disease usually causes a loss of kidney function to some degree and can result in kidney failure, the complete loss of kidney function. Kidney failure is known as the end-stage of kidney disease, where dialysis or a kidney transplant is the only treatment option.

Causes of Diseases of the Kidney and Urinary System

Kidney disease leading to ESRD has many causes. The prevalence varies by country, region, ethnicity, gender, and age.

Genetic Diseases

Knowledge of inherited kidney disease has changed radically with advances in molecular biology and gene-sequencing technology. The characterization of inherited kidney diseases has improved, and novel mutations leading to selective renal defects have been described. Inherited kidney diseases are rare, with the exception of autosomal dominant polycystic kidney disease, the fourth most common cause of ESRD in developed countries. This disease has a prevalence of 1 in 1,000 people and affects approximately 10 million people worldwide. Autosomal recessive polycystic kidney disease is less frequent, with an incidence of 1 in 40,000, but is an important hereditary disease of childhood. Many other inherited diseases can lead to ESRD, but together they account for only a small percentage of all people with ESRD.

Glomerulonephritis

Glomerulonephritides are a group of kidney diseases that affect the glomeruli. They fall into two major categories: *glomerulonephritis* refers to an inflammation of the glomeruli and can be primary or secondary, and *glomerulosclerosis* refers to scarring of the glomeruli. Even though glomerulonephritis and glomerulosclerosis have different causes, both can lead to ESRD. Glomerulonephritis ranks second after diabetes as the foremost cause of ESRD in Europe.

Infections, Stones, and Obstructive Uropathy

Infections of the urinary tract are a common health problem worldwide and can be categorized as either uncomplicated or complicated. Uncomplicated infections include bladder infections such as cystitis, seen almost exclusively in young women. Among sexually active women, the incidence of cystitis is 0.5 episodes per person annually, and recurrence develops in 27 to 44 percent of cases. Acute, uncomplicated pyelonephritis, involving the kidney, is less frequent in women than is cystitis. Males are less susceptible to acute, uncomplicated infections of the bladder or the kidney, with an incidence of five to eight episodes per 10,000 men annually. Even though uncomplicated urinary tract infections are considered benign, they have significant medical and financial implications estimated at approximately US\$1.6 billion per year.

As for complicated urinary tract infections, hospitalization results in almost 1 million such infections per year in the United States. Bladder catheterization is the most important cause.

Kidney stones can have different clinical presentations, ranging from asymptomatic to large obstructing calculi in the upper urinary tract that can severely impair renal function and lead to ESRD. Although specific causes of kidney stones should be treated appropriately, general treatment includes increased fluid intake, limited daily salt intake, moderate animal protein intake, and medical treatment with alkali and thiazides.

Benign Prostatic Hypertrophy

Benign prostatic hypertrophy is a major cause of lower urinary tract symptoms and leads to obstructive renal failure and ESRD. By age 80, 80 percent of men have benign prostatic hypertrophy. The World Health Organization quotes a mortality rate of 0.5 to 1.5 per 100,000. The actual incidence of benign prostatic hypertrophy is difficult to assess because of the lack of epidemiological data. In the developed world, the incidence varies between 0.24 and 10.90 per 1,000 annually from age 50 to 80, and the probability of prostate surgery for benign prostatic hypertrophy ranges from 1.4 to 6.0 percent.

Acute Renal Failure

Acute renal failure refers to a sudden and usually temporary loss of kidney function that may be so severe that RRT is needed until kidney function recovers. Even though acute renal failure can

be a reversible condition, it carries a high mortality rate. Acute renal failure is a prominent feature of major earthquakes, where many suffer from crush syndrome accompanied by severe dehydration and rapid release of muscle cell contents, including potassium. Kidney function shuts down unless body fluid and blood pressure are rapidly corrected and frequent hemodialysis is available.

Diabetes

Diabetes is one of the most common noncommunicable diseases. Diabetes may account for one-third of all ESRD cases.

Family-based studies and segregation analyses suggest that inherited factors play a major role in people's susceptibility to diabetic renal complications. When specific markers of risk are found, high-risk individuals can be identified early and monitored for the development of proteinuria and kidney dysfunction. The earliest sign of diabetic nephropathy is the appearance of small amounts of protein in the urine (*proteinuria*). As proteinuria increases and blood pressure rises, kidney function declines. The complete loss of kidney function occurs at different rates among type 2 diabetes patients, but it eventually occurs in 30 percent of proteinuria cases. The latter have a 10-fold increased risk of dying from associated coronary artery disease, which may obviate the progression of diabetic nephropathy to ESRD. As therapies and interventions for coronary artery disease improve, patients with type 2 diabetes may survive long enough to develop kidney failure.

Hypertension

Hypertension and kidney disease are closely related. Most primary renal diseases eventually produce hypertension. Before the development of effective antihypertensive agents, 40 percent of hypertensive patients developed kidney damage and 18 percent developed renal insufficiency over time. Elevated serum creatinine develops in 10 to 20 percent of hypertensive patients, with African Americans and Africans at particularly high risk. In 2 to 5 percent of hypertensive patients, progression toward ESRD will occur in 10 to 15 years. Despite the relatively low rate of progression, hypertension remains the most common cause of ESRD after diabetes in the United States, is the foremost cause of death in all developed countries, and is a likely primary cause in

developing countries given its high global prevalence rate. Native Americans and Hispanic Americans are disproportionately affected relative to Caucasian Americans.

Risk Factors for Kidney Disease

The identification of risk factors can prevent or limit disease through lifestyle modifications or specific therapeutic interventions. For example, familial predisposition for a disease, which is not amenable to modification, can be used to identify high-risk populations for future monitoring.

Low socioeconomic status and limited access to health care are strong risk factors for kidney failure but account for only part of the excess of ESRD among African Americans. whereas racial and social factors account for most ESRD incidence. Factors associated with the progression of CKD include the following:

- unmodifiable variables
 - old age
 - gender
 - genetics
 - ethnicity
- risk factors susceptible to social and educational interventions
 - low birth weight
 - smoking
 - alcohol abuse
 - illicit drug abuse
 - analgesic abuse and exposure to toxic substance such as lead
 - sedentary lifestyle
- risk factors susceptible to pharmacological interventions
 - hypertension

- dyslipidemia
- poor glycemic control in diabetic patients
- proteinuria
- biological markers
 - hemoglobin
 - insulin-resistant syndrome
 - proteinuria
 - Serum creatinine.

Prevention of Kidney Failure

Prevention of acute and chronic kidney disease should be a global priority. During the past decade, an array of clinical trials has been directed at assessing the benefits of interventional therapy, particularly the success of ACE inhibitors. Such trials can play an important role in increasing knowledge and improving the implementation of prevention of kidney disease in developing countries. Training epidemiologists and physicians to execute screening strategies and clinical trials in their own settings is urgently needed. The cooperation of global funding agencies and training centers; the consistent availability of effective, inexpensive pharmaceuticals; and the assessment of the efficacy and side effects of multiple drug therapy must be coordinated. The priority is to make low-cost drugs available, using as a model the recent process that allowed universal access to inexpensive antiretrovirals for HIV infection.