

Prevalence and Risk Factors of Chronic Kidney Disease

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Annotation: Chronic kidney disease (CKD) is characterized by kidney damage lasting three months or more under the influence of various etiological factors, and its dysfunction as a result of replacement of its normal anatomical structures with fibrosis. Chronic Kidney Disease (CKD) is a progressive condition in which the kidneys gradually lose their ability to function effectively over time. CKD can lead to kidney failure, making it a serious health issue that often requires lifelong management and involves a progressive loss of kidney function, often leading to the need for renal replacement therapy, such as dialysis or transplantation. The 2012 KDIGO CKD classification considers the underlying cause and categorizes CKD into 6 stages of progression and 3 stages of proteinuria based on glomerular filtration rate and levels of albuminuria. Although the causes of CKD vary, certain disease processes exhibit similar patterns.

Keywords: GFR (glomerular filtration rate), albuminuria, creatinine, dialysis, transplantation.

Chronic kidney disease (CKD) is characterized by the presence of kidney damage or an estimated glomerular filtration rate (eGFR) of less than 60 mL/min/1.73 m², persisting for 3 months or more, irrespective of the cause.

The 2012 Kidney Disease Improving Global Outcomes (KDIGO) CKD classification recommends specifying the cause of CKD and classifies the condition into 6 categories based on GFR (G1 to G5, with G3 split into 3a and 3b). In addition, it also includes staging based on 3 levels of albuminuria (A1, A2, and A3), with each stage of CKD subcategorized according to the urinary

albumin-creatinine ratio (ACR; mg/g or mg/mmol) in an early morning "spot" urine sample.

The 6 CKD categories, known as stages 1 through 5, are described below (stage 3 is separated into 3a and 3b):

- G1: GFR 90 mL/min/1.73 m² and above with evidence of kidney disease, such as hematuria or proteinuria
- G2: GFR 60 to 89 mL/min/1.73 m²
- G3a: GFR 45 to 59 mL/min/1.73 m²
- G3b: GFR 30 to 44 mL/min/1.73 m²
- G4: GFR 15 to 29 mL/min/1.73 m²
- G5: GFR less than 15 mL/min/1.73 m² or treatment by dialysis

The 3 levels of albuminuria include an ACR:

- A1: ACR less than 30 mg/g (<3.4 mg/mmol)
- A2: ACR 30 to 299 mg/g (3.4-34 mg/mmol)
- A3: ACR greater than 300 mg/g (>34 mg/mmol)

Epidemiology:

The true incidence and prevalence of CKD are challenging to determine due to the asymptomatic nature of early to moderate stages. The prevalence of CKD in the general population is estimated to be around 10% to 14%. Specifically, albuminuria and an eGFR less than 60 mL/min/1.73 m² have prevalences of about 7% and 4%, respectively.

Worldwide, CKD accounted for 2,968,600 (1%) of disability-adjusted life-years and 2,546,700 (1%-3%) life-years lost in 2012. The Kidney Disease Outcomes Quality Initiative (KDOQI) recommends that for diagnosing chronicity and CKD, patients should be tested on 3 separate occasions over a 3-month period, with at least 2 of the 3 results being positive. The global prevalence is 13.4% in stages 1-5 and 10.6% in stages 3-5. The true prevalence of SBK may be higher than the reported values, as it is often diagnosed incidentally. SBK is an insidious condition that can progress to the last stage of the disease and cause serious complications without any obvious symptoms. By 2030, the prevalence of SBK among adults will increase to 16.7%. In addition, WHO data shows that 1.2 million people died of SBS in 2017, a 41.5% increase from 1990 to 2017. Chronic kidney disease (CKD) is recognized as the third fastest growing cause of death among non-communicable diseases (NCDs), according to WHO analysis in 2024. This makes it second only to leading non-communicable diseases (NCDs) such as cardiovascular disease and cancer in terms of death rates. According to estimates of recent years, about 10-15% of the population of Uzbekistan have chronic kidney diseases. The importance of the increase in SBK is explained by its inextricable connection with other diseases, such as diabetes and hypertension, which contribute to its prevalence and mortality. In addition, limited access to early diagnosis services and advanced treatment methods such as dialysis or kidney transplantation are not sufficiently developed in all regions of Uzbekistan.

Etiology:

The causes of CKD vary globally, with the most common primary diseases leading to CKD and, ultimately, end-stage renal disease (ESRD) being:

- Type 2 diabetes (30%-50%)
- Type 1 diabetes (3.9%)
- Hypertension (27.2%)
- Primary glomerulonephritis (8.2%)

- Chronic tubulointerstitial nephritis (3.6%)
- Hereditary or cystic diseases (3.1%)
- Secondary glomerulonephritis or vasculitis (2.1%)
- Plasma cell dyscrasias or neoplasm (2.1%)
- Sickle cell nephropathy, which accounts for less than 1% of ESRD patients in the United States.

CKD may result from disease processes in any of the 3 categories, including prerenal (decreased renal perfusion pressure), intrinsic renal (pathology of the vessels, glomeruli, or tubules- interstitium), or postrenal (obstructive).

Prerenal Disease

Chronic prerenal disease occurs in patients with chronic heart failure or cirrhosis, where persistently decreased renal perfusion increases the risk of intrinsic kidney injury, such as acute tubular necrosis. Over time, this can lead to a progressive loss of renal function.

Intrinsic Renal Disease

Intrinsic renal vascular disease: The most common chronic renal vascular disease is nephrosclerosis, which causes ongoing damage to blood vessels, glomeruli, and the tubulointerstitium. Other renal vascular diseases include renal artery stenosis due to atherosclerosis or fibromuscular dysplasia, which, over months or years, can lead to ischemic nephropathy. This condition is characterized by glomerulosclerosis and tubulointerstitial.

Intrinsic glomerular disease (nephritic or nephrotic): A nephritic pattern is indicated by abnormal urine microscopy showing red blood cell (RBC) casts, dysmorphic red cells, and occasionally white blood cells (WBCs), along with a variable degree of proteinuria. The most common causes are post-infectious glomerulonephritis, infective endocarditis, IgA nephropathy, lupus nephritis, Goodpasture syndrome, and vasculitis.

A nephrotic pattern is associated with proteinuria, usually in the nephrotic range (>3.5 g/24 h), and an inactive urine microscopic analysis with few cells or casts. Common causes include minimal change disease, focal segmental glomerulosclerosis, membranous glomerulonephritis, diabetic nephropathy, and amyloidosis.

Intrinsic tubular and interstitial disease: The most common chronic tubulointerstitial disease is polycystic kidney disease (PKD). Other etiologies include nephrocalcinosis (often due to hypercalcemia and hypercalciuria), sarcoidosis, Sjögren syndrome, and reflux nephropathy in children and young adults.

There is increasing recognition of a relatively high prevalence of CKD of unknown cause among agricultural workers from Central America and parts of Southeast Asia, known as MesoAmerican nephropathy or chronic interstitial nephritis in agricultural communities.

Postrenal (Obstructive Nephropathy)

Chronic obstruction may result from prostatic disease, nephrolithiasis, or an abdominal/pelvic tumor exerting a mass effect on the ureter(s). Congenital abnormalities causing obstruction at the ureteropelvic or ureterovesical junctions are also common. Rare causes of chronic ureteral obstruction include retroperitoneal fibrosis or neurogenic bladder.

Risk Factors for Progression of Chronic Kidney Disease:

Chronic kidney disease (CKD) risk factors include a combination of medical conditions, lifestyle factors, and genetic predispositions. Here are the primary risk factors:

1. Diabetes: The leading cause of CKD, as high blood sugar can damage kidney blood vessels over time.
2. High Blood Pressure (Hypertension): Damages kidney vessels, impairing their ability to filter waste from the blood.
3. Heart Disease: Cardiovascular conditions increase the likelihood of kidney problems due to reduced blood flow.
4. Obesity: Increases the risk of diabetes and high blood pressure, which are linked to CKD.
5. Age: CKD is more common in people over 60.
6. Family History: A family history of kidney disease can increase risk.
7. Ethnicity: African American, Hispanic, Native American, and Asian American populations have higher rates of CKD.
8. Frequent Use of Certain Medications: Prolonged use of NSAIDs (e.g., ibuprofen) and certain antibiotics can harm kidney function.
9. Smoking: Contributes to high blood pressure and atherosclerosis, which can damage the kidneys.
10. Chronic Infections and Autoimmune Disorders: Conditions like lupus can cause long-term inflammation and kidney damage.

Other factors, such as poor diet, high-sodium intake, and limited physical activity, can also contribute indirectly by increasing the risk of diabetes and high blood pressure.

Conclusion:

Chronic Kidney Disease (CKD) is a long-term condition where the kidneys gradually lose function over time.

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