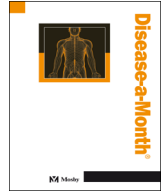




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Cardiovascular disease and chronic kidney disease



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Epidemiology

Cardiovascular disease (CVD) is the number one cause of death in the United States among men, women, and nearly all ethnic groups. It accounts for over 600,000 deaths annually.¹ Chronic kidney disease (CKD) has been recognized for decades to be associated with increased risk of mortality from CVD, even being recognized by some as a coronary heart disease risk equivalent. CKD patients are more likely to die from CVD during their lifetime than progress to end-stage renal disease (ESRD).² CVD becomes more prevalent in patients as glomerular filtration rate (GFR) declines, reaching an apex once on dialysis. However, studies have shown that patients with a preserved GFR and only microalbuminuria are still at higher risk of mortality from CVD than is the general population.³ The risk of CVD in CKD patients is independent of other shared risk factors, including hypertension, diabetes, and obesity. Though progress is being made in treatment and risk management, CVD remains the leading cause of death in CKD patients.

Etiology

Evidence of disease to the cardiovascular system is wide ranging in CKD patients. The 4 broad categories of affliction are vascular disease, cardiomyopathy, valvular dysfunction, and arrhythmia

Vascular disease

Vascular disease is evident in most CKD patients and manifested by atherosclerosis and arteriosclerosis. Atherosclerosis is progressively occlusive damage secondary to lipid-laden plaques forming along the vessel walls. Arteriosclerosis is diffuse arterial vasculature remodeling and eventual loss of vessel elasticity. The sequelae of this systemic damage can be devastating and includes such manifestations as myocardial infarction, peripheral vascular disease, and cerebrovascular accidents.

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Coronary artery disease

Multiple studies have demonstrated that CKD is associated with not only higher incidence of myocardial infarction but also a worse prognosis than that of the general population. A 2012 observational study of more than 1,000,000 subjects showed that patients with CKD and no diabetes had higher rates of myocardial infarction (6.9 per 1000 person years) when compared with those who had diabetes and no evidence of CKD (5.4 per 1000 person years).⁴ Patients with a GFR < 45 and proteinuria had a rate of myocardial infarction nearly twice that of those with diabetes (12.4 versus 6.6 per 1000 person years).⁴ The mortality risk over the first year after a myocardial infarction in ESRD patients is 2 times greater than that of the general population.² Even mild or moderate kidney disease is associated with worse outcomes after acute coronary syndromes. Studies have demonstrated a poorer prognosis in CKD patients undergoing coronary artery bypass grafting or percutaneous coronary intervention, and creatinine clearance is often used in risk-stratifying scores to predict mortality prior to intervention.

Peripheral vascular disease

Peripheral vascular disease (PVD) is a common finding in CKD, occurring in nearly 20% of patients. Symptomatic or clinically significant peripheral arterial disease is more common in CKD patients even after adjusting for factors such as diabetes and old age.⁵ The National Health and Nutrition Examination Survey demonstrated a relationship between lower GFR and albuminuria with a lower ankle–brachial index (ABI) measurement. Findings showed a ABI < 0.9 in 3.6% of patients with a GFR > 60 and no albuminuria, compared with 25% of patient with a GFR < 60 and albuminuria (Fig. 1).⁶ CKD patients with PVD have been associated with higher mortality rates and have more complications than the general population has after surgical or percutaneous revascularization.^{5,6}

Cerebrovascular disease

CKD has been shown to be an independent risk factor for cerebrovascular disease even in the absence of traditional cardiovascular risk factors.⁷ Cerebrovascular accidents (CVA), both ischemic and hemorrhagic, occur more frequently in CKD patients⁸ and account for a significant burden of impairment and mortality. Cognitive impairment is common in CKD, increasing by 10% with each 10 ml/min/1.73 m decrease in the GFR after 60 according to the REGARDS study.⁹ In stage 5 CKD the relative risk of stroke was estimated to be 5–10 times greater than in the age-matched general population.¹⁰

Cardiomyopathy

CKD is associated with significant cardiac disease, often resulting in increased rates of left ventricular hypertrophy and both systolic and diastolic heart failure.

Percentage of patients w/ ABI < 0.9	(-) Albuminuria	(+) Albuminuria
GFR > 60	3.6%	9.7%
GFR < 60	14.8%	25.3%

Fig. 1. Percentage of PVD with worsening CKD.

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