



Effect Of Renal Dysfunctions In Cardiovascular Health

¹Neelesh Soni, ²Dr. Deepa Muthiya

¹Student, ²Programme Chair & Assistant Professor

¹Department Of Cardiovascular Technology

¹Galgotias University, City, Country

Abstract: Patients with heart failure, arrhythmias, coronary artery disease, and sudden cardiac death are at high risk for cardiovascular disease. The risk of cardiovascular disease is increased in patients with chronic kidney disease (CKD), but the incidence and consequences of cardiovascular disease in this group are already higher than in the population (CKD stages 1-3). The leading cause of death in the high-risk group is cardiovascular disease, not end-stage renal disease (CKD stage 5). Chronic kidney disease (CKD) causes an active, persistent pro-inflammatory state that leads to atherosclerotic lesions, vascular calcification and vascular aging, which is involved in vascular and myocardial remodeling processes, as well as myocardial fibrosis and heart valve calcification. Therefore, CKD is similar to the aging process of the heart.

keywords - Renal dysfunction, Bidirectional relationship, Hypertension, Dyslipidemia, Nontraditional risk factors.

1. INTRODUCTION

The kidneys and cardiovascular system are closely intertwined, with dysfunction in one often precipitating complications in the other. Renal impairment, whether acute or chronic, poses a substantial risk factor for cardiovascular diseases (CVDs), including hypertension, coronary artery disease (CAD), heart failure, and stroke. Conversely, cardiovascular conditions can exacerbate renal dysfunction, creating a complex bidirectional relationship that warrants thorough investigation. This review aims to explore the multifaceted interplay between renal dysfunction and cardiovascular health, elucidating both the mechanisms underpinning this relationship and its clinical implications. By delving into the intricate mechanisms linking renal impairment to cardiovascular disease, including hemodynamic alterations, electrolyte imbalance, inflammation, and oxidative stress, this review seeks to provide a comprehensive understanding of the complex pathways involved.

Furthermore, this review will examine the bidirectional nature of the relationship, wherein not only does renal dysfunction predispose individuals to cardiovascular disease, but cardiovascular pathology can also exacerbate renal impairment, creating a vicious cycle of organ dysfunction.

2. EPIDEMIOLOGY AND PROGNOSIS

Kidney abnormalities found during clinical examination indicate that the kidney is not functioning, which is called kidney damage. Kidney damage or abnormal glomerular filtration rate <60 mL/min/1.73 m² that lasts more than three months and affects health is called chronic kidney disease. When the albumin to creatinine ratio is above 30 mg/g, it is called albuminuria and indicates kidney damage in many kidney diseases. Proteinuria is considered an indicator of risk for kidney or heart disease or both; because a growing body of literature shows a relationship in both kidneys and people without kidneys. Increased levels of proteinuria mean a higher risk of death, independent of CKD. With an estimated global incidence of 13.4%, CKD is considered a global health problem that imposes a significant financial and medical burden on society and health. As the incidence of CKD increases worldwide, more and more people will need a kidney transplant once the disease reaches stage 5. Receiving treatment; These figures need to increase by 50% to 100% by 2030.

3. TRADITIONAL RISK FACTORS OF CARDIO VASCULAR DISEASE IN CKD

Patients with chronic kidney disease (CKD) are at increased risk of cardiovascular disease; this is particularly important in the early stages of CKD due to their important role in atherosclerotic disease. Hypertension, insulin resistance/diabetes, dyslipidemia, and smoking are contributing factors to chronic kidney disease (CKD) and the cardiovascular and cerebrovascular sequelae of atherosclerosis as they affect the renal arteries. In addition, some clinical events are related to the recent association between CKD and abdominal aortic aneurysms.

4.HYPERTENSION AND DYSLIPIDEMIA

Results from the ARIC and CHS (Cardiovascular Health Study) studies indicate that risk factors alone are insufficient to explain the increased cardiovascular risk associated with CKD. However, studies aiming to modify these risk factors have not yet addressed the specific features of CKD. Results of the latest SPRINT study confirm that anti hypertensive therapy is beneficial for patients with chronic kidney disease (CKD); Cholesterol is a specific lipid profile for patients with chronic kidney disease (CKD). According to a recent clinical study, the effect of HDL on the arteries may vary depending on the condition, and as kidney disease progresses, many changes occur in the lipid profile, particularly in HDL and triglyceride-rich lipoproteins, that can lead to atherosclerosis. Children with chronic kidney disease (CKD) may have a negative effect on HDL even if they do not have cardiovascular disease such as diabetes, smoking, high blood pressure, or dyslipidemia. Proinflammatory environment, high oxidative stress, and uremic toxins are some of the variables that alter HDL particle composition in chronic kidney disease (CKD).

5.NONTRADITIONAL RISK FACTORS OF VASCULAR DISEASE IN CKD

The cellular components of blood vessels are called vascular smooth muscle cells. Hemodynamic changes seen in chronic kidney disease (CKD) may cause these cells to become more synthetic than contractile. Cardiovascular calcification is accelerated in patients with chronic kidney disease (CKD) and often occurs even in children with advanced CKD. The histological prevalence of radial vascular calcification is twice as high in patients with CKD than in patients without CKD. In addition to chronic kidney disease (CKD), many other diseases, including diabetes, can also cause arthritis to develop. Additionally, electrolyte abnormalities such as magnesemia are frequently seen in patients with chronic kidney disease (CKD) and are associated with poor patient outcomes. Therefore, electrolyte imbalance may be a target in the treatment of coronary artery calcification. Magnesium, in particular, has recently attracted attention due to its inhibitory effect on vascular calcification. In severe kidney disease, magnesium can prevent the development of vascular calcification by interfering with the formation of hydroxyapatite crystals. Blood magnesium levels are often low in CKD patients.

6.MYOCARDIAL PROBLEMS IN CKD

Pathological myocardial fibrosis, collagen deposition in capillaries and cardiomyocytes, and cardiac hypertrophy of uremic cardiomyopathy are common in patients with chronic kidney disease (CKD). Approximately one-third of CKD patients have left ventricular hypertrophy (LVH), and this rate can range from 70% to 80% in patients with end-stage renal disease. The presence of left ventricular hypertrophy (LVH) is a predictor of survival even in CKD patients in the early stages of the disease. Three major mechanisms are thought to be associated with LVH in CKD: (1) postload-related, (2) preload-related, and (3) nonload-related without affecting loading. Vascular abnormalities, hypothermia, and systolic blood pressure are transplant-related factors that cause primary concentric LVH. In some cases, epidemiological collinearity exists. CKD patients are greatly affected by valve disease. Arterial pressure and valve calcification are associated with early stages 1 to 3 CKD. The failure rate is ten times higher than in patients without CKD. Comorbidities such as diabetes, arterial hypertension, hyperlipidemia, anemia, persistent valve disease, malnutrition, hyperphosphatemia, hyperparathyroidism, and hypercalcemia increase valve disease in patients with chronic kidney disease (CKD).

7.TREATMENT OF VASCULAR DISEASE IN PATIENTS WITH CKD

The degree of CKD appears to influence the effectiveness of lipid-lowering mechanisms in reducing cardiovascular risk in patients. Therefore, the SHARP study, which included 9,438 patients with chronic kidney disease without a history of myocardial infarction or coronary revascularization, compared the effect of ezetimibe with simvastatin 20 mg per day plus simvastatin 20 mg per day. The results of the study showed a significant 17% reduction in cardiovascular death, nonfatal myocardial infarction, non-stroke, or coronary revascularization outcome. Antiplatelet drugs have been shown to reduce cardiovascular risk in patients with coronary heart disease but not chronic kidney disease (CKD); In addition, these drugs reduce the risk of bleeding in CKD patients, leading to better results. The ISCHEMIA-CKD study (International Study of Comparative Health Effectiveness of Drugs and Invasive Approaches – Chronic Kidney Disease) evaluated treatments for people with heart disease and kidney disease (CKD). A large registry study comparing patients with myocardial infarction to patients without CKD found that CKD patients were less likely to receive statin, beta-blocker, and antiplatelet therapy. This shows that CKD patients receive less treatment, which is a factor in their increased mortality.

8.CONCLUSION

Heart disease as a cause of death places patients with chronic kidney disease at significant risk of cardiovascular death. There is hope that in the future, patients with chronic kidney disease will reduce their risk of cardiovascular disease, thanks to the development of many new drugs that are currently in clinical trials or have previously been shown to reduce the risk of heart disease. Given the lack of data on cardiovascular outcomes in high-risk CKD patients, it is justified to ensure that new therapies are evaluated in clinical trials in the CKD population, particularly in advanced CKD patients. This will pave the way for more evidence-based approaches to reducing cardiovascular risk in CKD.

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