Renal Failure And Its Types

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ABSTRACT

Renal Failure means that there's damage to your kidneys and they aren't working as well as they should. Your kidneys are like a filter in your body — filtering out wastes, toxins, and extra water from your blood. They also help with other functions like bone and red blood cell health. When your kidneys begin to lose their function, they can't filter waste, which means the waste builds up in your blood.

INTRODUCTION

Chronic kidney disease (CKD) is characterized by a decline in kidney function, indicated by a glomerular filtration rate (GFR) of less than 60 mL/min per 1.73 m^2 or evidence of kidney damage lasting for at least 3 months **[Kidney Health Australia,2023].** This condition poses a significant risk for end-stage renal disease (ESRD), cardiovascular diseases, and premature death [**Levin A et al 2017**]. Over the years, the global burden of CKD has shown a substantial increase, resulting in more than 500,000 deaths since 1990 **[Bikbov B et al, 2017].**

Worldwide, an estimated 200 million people have chronic kidney disease (CKD). In the United States, African Americans (AAs) have a four-fold excess risk of CKD compared to non-Hispanic white people and gloHill NR, Fatoba ST, Oke JL, Hirst JA, O'Callaghan CA, Lasserson DS, Hobbs FD. Global Prevalence of Chronic Kidney Disease - A Systematic Review and Meta-Analysis. PLoS One. 2016 Jul 6;11(7):e0158765. doi: 10.1371/journal.pone.0158765. PMID: 27383068; PMCID:

PMC4934905.bally, people in the low-to-middle income countries of Asia and Sub-Saharan Africa have the highest rates of CKD. Annually, more than 500,000 individuals develop end-stage renal disease (or CKD stage 5) in Sub-Saharan Africa alone and the vast majority of these patients suffer premature mortality. The health care costs and economic burden of CKD are huge and not sustainable even in advanced Western countries. A recent discovery on the role of Apolipoprotein 1 (APOL1) G1 and G2 renal risk variants in AAs has a huge potential to unravel the etiology of CKD in both AA and other black populations. **(Ojo A. et al 2014)**

Chronic kidney disease (CKD) is a global health burden with a high economic cost to health systems and is an independent risk factor for cardiovascular disease (CVD). All stages of CKD are associated with increased risks of cardiovascular morbidity, premature mortality, and/or decreased quality of life. CKD is usually asymptomatic until later stages and accurate prevalence data are lacking. **(Hill NR, et al 2016)**

Chronic kidney disease (CKD) includes a variety of conditions that impact your kidneys' ability to filter waste and fluid out of your blood. Each type of kidney disease affects the kidneys and the

body in different ways. The diagnosis, treatment, and management of kidney disease can vary greatly depending on the specific condition.

TYPES OF RENAL FAILURE

1. **aHUS (atypical hemolytic uremic syndrome):** Atypical hemolytic uremic syndrome (aHUS) is a rare type of renal failure characterized by the formation of blood clots in small blood vessels, leading to kidney damage and failure. It is often caused by genetic mutations or autoimmune disorders **(Noris & Remuzzi, 2015).**
2. **Alport syndrome1:**Alport syndrome is a rare genetic disorder characterized by progressive kidney disease, hearing loss, and eye abnormalities. It is caused by mutations in the COL4A3, COL4A4, or COL4A5 genes, leading to defects in the type IV collagen protein. This results in damage to the kidneys, ears, and eyes, ultimately leading to renal failure **(Savige et al., 2016).**
3. **Amyloidosis:** Amyloidosis is a rare condition characterized by the deposition of abnormal proteins, called amyloid, in various organs, including the kidneys. This can lead to kidney damage and failure, as the amyloid deposits disrupt normal kidney function. Amyloidosis can be primary (AL amyloidosis) or secondary (AA amyloidosis), and treatment options vary depending on the underlying cause **(Palladini et al., 2017).**
4. **APOL1-Mediated Kidney Disease:**APOL1-mediated kidney disease is a type of renal failure caused by genetic variants in the APOL1 gene. These variants are associated with an increased risk of kidney disease, particularly in individuals of African ancestry. APOL1-mediated kidney disease can lead to non-diabetic kidney disease, focal segmental glomerulosclerosis (FSGS), and end-stage renal disease (ESRD) **(Kopp et al., 2018).**
5. **Cardiovascular-kidney-metabolic (CKM) syndrome:** Cardiovascular-kidney-metabolic (CKM) syndrome kidney disease is a type of renal failure characterized by the interplay between cardiovascular disease, kidney disease, and metabolic disorders. CKM syndrome is associated with increased risk of kidney disease progression, cardiovascular events, and mortality. Early detection and management of CKM syndrome are crucial to prevent kidney disease progression **(Thomas et al., 2019).**
6. **Complement 3 glomerulopathy (C3G):** Complement 3 glomerulopathy (C3G) is a rare type of renal failure characterized by the abnormal activation of the complement system, leading to damage to the glomeruli. C3G can present with hematuria, proteinuria, and kidney failure. Genetic mutations and autoantibodies are common underlying causes of C3G, and treatment typically involves immunosuppression and complement inhibition **(Bomback et al., 2021).**
7. **Congenital Abnormalities of the Kidneys and Urinary Tract (CAKUT):** Congenital Abnormalities of the Kidneys and Urinary Tract (CAKUT) are a group of disorders that affect the development of the kidneys and urinary tract. CAKUT can lead to renal failure due to obstructive uropathy, reflux nephropathy, or renal dysplasia. Early diagnosis and management are crucial to prevent long-term kidney damage and renal failure **(Hwang et al., 2022).**

8. **Cystinosis:** Cystinosis is a rare genetic disorder characterized by cystine accumulation within cells, damaging the kidneys, eyes, and other organs. Renal failure is a common cystinosis complication resulting from cystine crystal deposition in the kidneys. Early diagnosis and treatment with cystine-depleting therapy can slow disease progression and delay renal failure **(Levtchenko et al., 2023).**
9. **Focal segmental glomerulosclerosis (FSGS):**Focal segmental glomerulosclerosis (FSGS) is a type of kidney disease characterized by scarring of the glomeruli, leading to renal failure. FSGS is a common cause of nephrotic syndrome and can be primary or secondary to other conditions. Treatment options include immunosuppressive therapy and supportive care to manage symptoms and slow disease progression **(D'Agati et al., 2016).**
10. **Glomerulonephritis (Glomerular Disease) :**Glomerulonephritis (GN) is a type of kidney disease characterized by inflammation of the glomeruli, leading to renal failure. GN can be acute or chronic, and can result from various causes, including autoimmune disorders, infections, and vasculitis. Treatment options include immunosuppressive therapy, corticosteroids, and supportive care to manage symptoms and slow disease progression **(Floege et al., 2015).**
11. **Goodpasture syndrome :** Goodpasture syndrome is a rare autoimmune disorder characterized by the presence of anti-glomerular basement membrane (anti-GBM) antibodies, leading to renal failure and pulmonary hemorrhage. The antibodies attack the basement membrane of the glomeruli and lung alveoli, causing inflammation and damage. Treatment involves plasmapheresis, immunosuppression, and supportive care **(Levy et al., 2015).**
12. **Granulomatosis with polyangiitis (GPA):** Granulomatosis with polyangiitis (GPA) is a rare autoimmune disorder characterized by inflammation of small blood vessels, including those in the kidneys. Renal involvement can lead to rapidly progressive glomerulonephritis, causing renal failure. Treatment involves immunosuppression with corticosteroids and rituximab, and supportive care to manage symptoms and prevent complications **(Stone et al., 2014).**
13. **Hemolytic uremic syndrome (HUS) :**Granulomatosis with polyangiitis (GPA) is a type of vasculitis that can cause renal failure. It is characterized by inflammation of small blood vessels, including those in the kidneys, leading to glomerulonephritis and renal damage. Treatment involves immunosuppression with corticosteroids and cyclophosphamide, and supportive care to manage symptoms and prevent complications **(Hellmich et al., 2013).**
14. **Henoch-Schönlein purpura (HSP) :** Henoch-Schönlein purpura (HSP) is a rare autoimmune disorder characterized by inflammation of small blood vessels, leading to renal failure in some cases. HSP nephritis can cause hematuria, proteinuria, and kidney damage. Treatment involves corticosteroids, immunosuppressants, and supportive care to manage symptoms and prevent complications **(Pillebout et al., 2011).**

15. **Interstitial nephritis:** Interstitial nephritis is a type of kidney disease characterized by inflammation of the interstitial tissue surrounding the renal tubules. This can lead to renal failure due to tubular damage and fibrosis. Causes include medications, infections, and autoimmune disorders. Treatment involves removing the underlying cause and supportive care to manage symptoms and slow disease progression **(Rossert, 2013).**
16. **Lupus nephritis:** Lupus nephritis is a type of kidney disease that occurs in patients with systemic lupus erythematosus (SLE). It is characterized by inflammation of the glomeruli and renal vasculature, leading to renal failure. Treatment involves immunosuppression with corticosteroids, cyclophosphamide, and mycophenolate mofetil to manage symptoms and slow disease progression **(Hahn et al., 2012).**
17. **Minimal change disease:** Minimal change disease (MCD) is a type of kidney disease characterized by the loss of foot processes of podocytes, leading to massive proteinuria. Despite the lack of significant histological changes, MCD can progress to renal failure if left untreated. Treatment with corticosteroids is highly effective, and most patients achieve complete remission **(Korbet, 2011).**
18. **Polycystic Kidney Disease:** Polycystic Kidney Disease (PKD) is a genetic disorder characterized by the growth of numerous fluid-filled cysts in the kidneys, leading to renal failure. The cysts can cause damage to the surrounding kidney tissue, impairing kidney function. Treatment involves managing symptoms, controlling blood pressure, and slowing disease progression with tolvaptan **(Cornec-Le Gall et al., 2023).**

CONCLUSION

Renal failure, also known as kidney failure, is a complex and multifaceted condition characterized by the kidneys' inability to filter waste and excess fluids from the blood. Various underlying causes, including diabetes, hypertension, glomerulonephritis, and polycystic kidney disease, can lead to renal failure. If left untreated, renal failure can progress to end-stage renal disease, requiring dialysis or kidney transplantation. Early diagnosis and treatment are crucial to slow disease progression and improve patient outcomes.

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