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# Dyslipidemia in Patients with Renal Failure: A Review Literature

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**ABSTRACT:** Renal failure is a serious condition, with the loss of kidney function being irreversible and frequently managed by dialysis or kidney transplant. Hyperlipidemia is a prevalent condition among CKD patients, particularly affecting those with associated comorbidities such as T2DM. This literature review presents an integration of current research findings on the relationship between hyperlipidemia and renal failure with particular attention to cardiovascular complications and patterns of dyslipidemia in this population. The accurate comprehension of these interrelations is the key to advancing clinical outcomes in terms of developing efficient strategies of control. This literature review synthesizes current research findings about dyslipidemia in patients with renal failure, identifies the knowledge gaps, and recommends directions for further research.

## INTRODUCTION

End-stage kidney disease (ESKD) is a life-threatening condition resulting from the complete irreversible loss of renal function and is chronically managed with dialysis or kidney transplantation. ESKD patients commonly present with dyslipidemia, contributing majorly to the cardiovascular risk factor profile that is heightened within this population. The current review sought to consolidate available evidence on lipid profile alterations in ESKD and their importance in reality of health outcomes. It also highlights areas little known and thus which could be avenues for further research (Kang et al., 2014).

Dyslipidemia is common and complex in CKD patients progressing to ESKD. The lipid profile gradually changes as CKD progresses. Non-dialysis-dependent CKD patients usually present low high-density lipoprotein (HDL), normal or low total cholesterol (TC), and decreased low density lipoprotein (LDL), whereas triglycerides (TG), apoB, and lipoprotein(a)) are increased in general (Mikolasevic et al., 2017). In this way, the condition has an opposite effect on the atherogenic lipid profile causes an increase in TC, LDL and triglycerides in the patients with nephrotic syndrome (Mikolasevic et al., 2017).

In hemodialysis (HD) patients, the lipid profile mimics that of non-dialysis-dependent CKD patients, whereas PD patients commonly express an even more altered and atherogenic lipid profile (Mikolasevic et al., 2017). In addition to that, renal transplant recipients normally have high TC, LDL, very lo density lipoprotein (VLDL), and triglycerides along with markedly low HDL values which further verifies the persistent dyslipidemia even post transplantation (Mikolasevic et al., 2017).

It is in this light that the current literature review was conceptualized, synthesizing prevailing research findings on dyslipidemia in renal failure patientst, identifying proved knowledge gaps, and suggesting future research directions with confidence and conviction.

## CARDIOVASCULAR RISKS ASSOCIATED WITH HYPERLIPIDEMIA IN CKD

According to the research, the patients with CKD have highly increased risks for MACE, HF, and ACM, with hyperlipidemia acting as relevant comorbidity (Arnold et al., 2018). This finding that CKD patients have higher risks of all cardiovascular outcomes compared to individuals without CKD supports other outcomes. The interaction between hyperlipidemia and CKD increases the risks for cardiovascular events; thus, lipid profiles need strict monitoring.

Chronic kidney disease and cardiovascular disease have a long-known long-established mutual relationship. Damman et al. (2014) in a meta-analysis suggest that progressively deteriorating renal function in patients with heart failure is ‘added’ to cardiovascular risk in view of worse outcomes. The finding emphasizes the need for monitoring cholesterol levels among others as part of holistic care regime meted out to renal failure patients at probable risk of cardiovascular episodes. The recent work by Hallan et al. (2012) also expounds on the age-related associations between kidney measures and mortality and ESRD. Indeed, their findings, that impaired kidney function enhances the ‘union’ of years with increased risks for adverse outcomes, can further make a case for closer management of cholesterol levels in this demographic.

## DYSLIPIDEMIA PATTERNS IN CKD

Dyslipidemia is common in patients with CKD because of altered lipid metabolism. The changes in lipid profile at different stages of renal dysfunction portray the evolving nature of dyslipidemia in this population (source). Advanced CKD patients present marked dyslipidemia evident by the significant rise in serum triglycerides and lowering of GFR (Udell et al., 2014). This strongly suggests that as renal function decreases, the increasing intensity of lipid abnormalities further adds to the cardiovascular burden.

A study on patients with Bardet-Biedl Syndrome showed over 60% of them to have hyperlipidemia, bringing forth an even higher risk of cardiovascular disease in certain specific populations (Ferro et al., 2018). This underscores that genetic, and metabolic factors play a major role in the development of dyslipidemia in CKD patients and, therefore, tailored approaches may be needed for different subgroups.

Several mechanisms are responsible for dyslipidemia in ESKD. Defective oxidation of fatty acids in the renal tubular epithelial cells has been identified in the development of fibrosis and fat-dependent cell death in the kidney and may represent a key pathway to dyslipidemia in CKD patients. Second, imbalanced lipid metabolism worsens fluid overload, also including the effect of gut-microbiota-derived uremic toxins such as trimethylamine N-oxide on increasing cardiovascular risk among ESKD patients.

Epigenetic regulation, especially in relation to microRNA21, has been a prospective area in the pathogenesis of non-alcoholic fatty liver disease and CKD independently striking lipoprotein metabolism and hepatokine secretion (Ferro et al., 2018). Besides, levels of triglycerides positive and, correspondingly, negative of HDL and LDL levels reflect significant relationship between renal dysfunction and adverse lipid profiles (Musso et al., 2016). The inhumanity of it all.

Dyslipidemia is not merely a biochemical abnormality. It has a direct impact on clinical outcomes for ESKD patients. In moderate to advanced CKD (stages 3-5), specific patterns of dyslipidemia were independently associated with rapid renal progression to the need for renal replacement therapy (Merscher-Gomez et al., 2013). Besides, free fatty acids, glycerolipids, and glycerophospholipids accumulation in CKD patients is directly related to increased serum triglycerides and decreased estimated glomerular filtration rate. The decline in eGFR was found to be strongly associated with increasing serum triglyceride concentration in CKD patients due to free fatty acids, glycerolipids, and glycerophospholipids accumulation (Ahmadmehrabi & Tang, 2018).

## CLINICAL IMPLICATIONS AND MANAGEMENT STRATEGIES

Because dyslipidemia is prevalent among CKD patients, a special lipid management strategy is required. The special alterations that take place in the lipid profiles while kidney function deteriorates further also need the attention of the clinician. It has been suggested that CKD patients, especially those with comorbidities like T2DM, be screened for dyslipidemia by regular lipid profiles monitoring to control CVD risk factors (Bendz et al., 2010).

Although much has been done to understand the association of hyperlipidemia with CKD, challenges remain with the gap of knowledge on ideal dyslipidemia management among this population. For example, the efficacy of specific lipid-lowering therapies in reducing cardiovascular events in patients with CKD is not well documented. More studies are needed to develop recommendations for lipid management that take into account the peculiarities of renal function and concomitant diseases..

## CHOLESTEROL AND RENAL FUNCTION

Such concerns turn around the levels of cholesterol in renal failure patients, centrally linked to the risk of cardiovascular diseases. This is that the chronic kidney disease affects lipid metabolism known to bring about varieties in cholesterol levels; as a result, it leads to an increased risk of cardiovascular events. In this context, Baigent et al. (2011) performed a randomized controlled trial to assess the efficacy in lowering LDL cholesterol of simvastatin plus ezetimibe among patients having chronic kidney disease and showed a substantial decrease in LDL levels and a corresponding lesser frequency of cardiovascular events. It offers very profound ways through which targeting cholesterol management could be better directed in patients with renal failure. Haynes et al. (2014) also argued that lowering LDL cholesterol could retard kidney disease's progressive nature because by lowering it, decline in renal function is slowed down. This further underscore the need for the management of cholesterol among such patients.

In contrast, Kanbay et al. (2014) worked out the monocyte count to HDL cholesterol ratio and its relationship to cardiovascular events among chronic kidney disease patients. The higher ratio value found to be associated with added cardiovascular risk supports the view that in renal failure not only absolute monocyte and HDL counts should be considered but also their balance with other lipid fractions.

## MECHANISMS AND METABOLIC CONSIDERATIONS

The pathophysiology of renal disease is multifaceted. Mulay et al. (2014) discussed molecular mechanisms of kidney inflammation and injury related to crystal deposition which may also implicate cholesterol in the pathophysiology of renal disease. An indication from this study can be considered as a causal effect of cholesterol in the inflammatory processes during the course of renal impairment. In another development, Chung et al. (2018) investigated how defective peroxisome proliferator-activated receptor alpha (PPARα) and fatty acid oxidation pathways induce renal fibrosis during aging. Their results may further explain why

dysregulated lipid metabolism allows the progression of renal disease, through highlighting definite biochemical pathways that would likely have contributed to the altered cholesterol levels noted in renal failure patients.

## CONCLUSION

The pathogenesis of the lipid spectrum in end-stage renal disease is not fully understood; however, it is possible to describe it based on available theories. This review could suggest different mechanisms associated with lipid disturbances. These potential mechanisms describe how interventions could also be directed to correct these lipid abnormalities. Gaps in knowledge identified previously are addressed extensively by future research endeavors in the ESKD population. Cholesterol management of patients with renal impairment remains demanding and is dynamically developing. The current research highlights that optimal cholesterol management may have a positive impact on the outcomes of this population. Nevertheless, some gaps in knowledge remain to be explored in comparison with long-term interventions and various fractions of lipids as well as cognitive implications about dyslipidemia in renal patients. These gaps would improve clinical practice related to care strategies for managing cholesterol levels in patients with renal impairment.

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