International Journal of Medicine
pISSN 1468-3814 | eISSN 2667-7008
https://theinternationalmedicine.com/

Original Researcher Article *DOI: 10.61336/im/26-2-12*

A Cross-Sectional Observational Study of Lipid Profile in Chronic Kidney Disease Patients Presenting to a Tertiary Care Centre in the Garhwal Region of Uttarakhand

Geetanshu Kapoor[1], Dilwer[2], Yogesh Kumar[3], Ranjeet Yadav[4]

[1]*Junior Resident, Internal Medicine, VCSGGMC&RI, Srikot, Srinagar, Uttrakhand. Email : geetanshukapoor00@gmail.com*

[2]*Ex-Assistant Professor, General Medicine, VCSGGMC&RI, Srikot, Srinagar, Uttrakhand, Email: drdilwernagar401@gmail.com*

[3]*Assistant Professor,General Medicine, SGRRIM&HS, Dehradun.Email: ykyogesh18@gmail.com*

[4]*Senior Resident,General Medicine, VCSGGMC&RI, Srikot, Srinagar, Uttrakhand, Email: ranjeetsingh.yadav75@gmail.com*

Correspondence:
Dr. Ranjeet Yadav
Senior Resident, General Medicine, VCSGGMC&RI, Srikot, Srinagar, Uttrakhand.
Email:
ranjeetsingh.yadav75@gmail.com

Received: **January 28, 2026**
Revised: **February 10, 2026**
Accepted: **February 25, 2026**
Published: **March18, 2026**

Abstract

Background **:**Chronic kidney disease (CKD) is associated with multiple metabolic disturbances, among which dyslipidemia plays a significant role in increasing cardiovascular morbidity and mortality. Alterations in lipid metabolism are commonly observed in CKD patients and contribute to accelerated atherosclerosis and vascular complications. The present study was conducted to evaluate the pattern of lipid profile abnormalities among patients with chronic kidney disease presenting to a tertiary care center in the Garhwal region of Uttarakhand. ***Methods:*** This hospital-based cross-sectional observational study included 115 patients diagnosed with chronic kidney disease. Demographic and clinical details were recorded after obtaining informed consent. Fasting blood samples were collected for estimation of serum creatinine, blood urea, and lipid profile parameters including total cholesterol, triglycerides, HDL, LDL, and VLDL. Estimated glomerular filtration rate (eGFR) was calculated to determine CKD stages. Data were analyzed using descriptive statistical. Methods. **Results:** The mean age of the study population was 53.73 ± 12.96 years, with a male predominance (58.26%). Hypertension was the most common comorbidity (82.61%). The majority of patients were classified as Stage 5 CKD. The mean total cholesterol, triglycerides, HDL, LDL, and VLDL levels were 163.33 ± 28.85 mg/dL, 155.89 ± 20.96 mg/dL, 37.31 ± 6.97 mg/dL, 94.94 ± 30.71 mg/dL, and 31.17 ± 4.19 mg/dL respectively. ***Conclusion*****:** CKD patients exhibit characteristic dyslipidemia marked by elevated triglycerides and VLDL levels with reduced HDL concentrations. Routine assessment and early management of lipid abnormalities may help reduce cardiovascular risk in patients with chronic kidney disease.

Keywords: Chronic kidney disease, dyslipidemia, lipid profile, triglycerides, cardiovascular risk.

INTRODUCTION

Chronic kidney disease (CKD) has emerged as a major global public health problem due to its increasing prevalence and its strong association with cardiovascular morbidity and mortality. It is characterized by a progressive and irreversible decline in renal function that may ultimately lead to end-stage renal disease if not appropriately managed. The global burden of CKD has increased substantially in recent decades, largely driven by the rising prevalence of hypertension, diabetes mellitus, obesity, and aging populations (1). Patients with CKD are at significantly higher risk of developing cardiovascular disease, which remains the leading cause of mortality in this population (2).

Among the various metabolic disturbances associated with CKD, abnormalities in lipid metabolism play a crucial role in the development of cardiovascular complications. Dyslipidemia is frequently observed in patients with impaired renal function and contributes to accelerated atherosclerosis. The pattern of dyslipidemia in CKD differs from that seen in the general population and is typically characterized by elevated triglycerides, increased very-low-density lipoprotein (VLDL) levels, and reduced high-density lipoprotein (HDL) concentrations, while total cholesterol and low-density lipoprotein (LDL) levels may remain normal or only mildly elevated (3).

The pathophysiology of dyslipidemia in CKD is complex and multifactorial. Reduced activity of lipoprotein lipase and hepatic lipase leads to impaired clearance of triglyceride-rich lipoproteins and accumulation of VLDL particles in circulation (4). In addition, oxidative stress and chronic inflammation commonly observed in CKD promote structural modifications in lipoproteins, including the formation of small dense LDL particles with increased atherogenic potential (5).

These lipid abnormalities significantly contribute to endothelial dysfunction, vascular injury, and accelerated atherosclerosis in CKD patients (6). Given the increased cardiovascular risk associated with these metabolic disturbances, evaluation of lipid profile alterations in CKD patients is of considerable clinical importance. Therefore, the present study was undertaken to evaluate the lipid profile among patients with chronic kidney disease presenting to a tertiary care centre in the Garhwal region of Uttarakhand.

METHODOLOGY

This hospital-based cross-sectional observational study was conducted in the Department of Medicine at a tertiary care centre in the Garhwal region of Uttarakhand. The study included 115 patients diagnosed with chronic kidney disease (CKD) who attended the outpatient department or were admitted to the hospital during the study period. CKD was defined and classified according to the Kidney Disease Improving Global Outcomes (KDIGO) guidelines, based on estimated glomerular filtration rate (eGFR). Patients aged 18 years and above with confirmed CKD were included in the study, while patients with acute kidney injury, nephrotic syndrome, chronic liver disease, or those receiving lipid-lowering therapy were excluded.

After obtaining informed consent, detailed clinical history and demographic information including age, gender, and associated comorbidities such as hypertension were recorded. Venous blood samples were collected from all participants after an overnight fasting period. Laboratory investigations included serum creatinine, blood urea, and lipid profile parameters, namely total cholesterol, triglycerides, high-density lipoprotein (HDL), low-density lipoprotein (LDL), and very low-density lipoprotein (VLDL). The estimated glomerular filtration rate (eGFR) was calculated to determine the stage of CKD.

The collected data were compiled and analyzed using appropriate statistical methods. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequency and percentage distributions. The lipid profile parameters and renal function indices were evaluated to determine the pattern of dyslipidemia among patients with chronic kidney disease.

RESULTS

Table 1: Demographic and Clinical Characteristics of CKD Patients (n = 115)

Variable	Category	Number (n)	Percentage (%)
Age Group (years)	25–40	19	16.52
	41–55	45	39.13
	56–70	39	33.91
	>70	12	10.43
Gender	Male	67	58.26
	Female	48	41.74
Comorbidity	Hypertension	95	82.61
	Rheumatoid Arthritis	1	0.87
	None	20	17.39

Table 1 presents the demographic and clinical characteristics of the study population. A total of 115 patients with chronic kidney disease (CKD) were included in the study. The mean age of the participants was 53.73 ± 12.96 years. The largest proportion of patients belonged to the 41–55 years age group (39.13%), followed by the 56–70 years group (33.91%), while 16.52% were aged between 25–40 years and 10.43% were above 70 years. Regarding gender distribution, 67 patients (58.26%) were male and 48 patients (41.74%) were female. Among the comorbid conditions, hypertension was the most common, observed in 95 patients (82.61%), while 20 patients (17.39%) had no associated comorbidity and one patient (0.87%) had rheumatoid arthritis.

Table 2: Distribution of CKD Grade and Renal Function Parameters

Parameter	Number (n)
CKD Grade	
Grade 3b	9 (7.83%)
Grade 4	15 (13.04%)
Grade 5	91 (79.13%)
Renal Function Parameters (Mean ± SD)	
Serum Creatinine (mg/dL)	6.92 ± 2.31
Blood Urea (mg/dL)	80.92 ± 21.83
eGFR (mL/min/1.73 m²)	10.38 ± 8.31

Table 2 shows the distribution of CKD grades along with renal function parameters of the study participants. The majority of patients were classified as Grade 5 CKD (79.13%), followed by Grade 4 (13.04%) and Grade 3b (7.83%), indicating that most patients presented with advanced stages of renal disease. The overall mean serum creatinine level was 6.92 ± 2.31 mg/dL, while the mean blood urea level was 80.92 ± 21.83 mg/dL. The mean estimated glomerular filtration rate (eGFR) was 10.38 ± 8.31 mL/min/1.73 m², reflecting significantly reduced renal function in the majority of patients.

Table 3: Lipid Profile and Atherogenic Indices in CKD Patients

Parameter	Mean ± SD
Total Cholesterol (mg/dL)	163.33 ± 28.85
Triglycerides (mg/dL)	155.89 ± 20.96
VLDL (mg/dL)	31.17 ± 4.19
HDL (mg/dL)	37.31 ± 6.97
LDL (mg/dL)	94.94 ± 30.71
Total Cholesterol / HDL Ratio	4.58 ± 1.41
LDL / HDL Ratio	2.70 ± 1.22

Table 3 summarizes the overall lipid profile and atherogenic indices among CKD patients. The mean total cholesterol level was 163.33 ± 28.85 mg/dL, while the mean serum triglyceride level was 155.89 ± 20.96 mg/dL. The mean VLDL level was 31.17 ± 4.19 mg/dL, whereas the mean HDL level was relatively low at 37.31 ± 6.97 mg/dL. The mean LDL concentration was 94.94 ± 30.71 mg/dL. In addition, the mean total cholesterol to HDL ratio was 4.58 ± 1.41, and the LDL to HDL ratio was 2.70 ± 1.22, indicating an increased atherogenic lipid profile among patients with chronic kidney disease.

DISCUSSION

Chronic kidney disease is frequently associated with disturbances in lipid metabolism that significantly increase the risk of cardiovascular complications. The present study evaluated lipid profile alterations among CKD patients presenting to a tertiary care centre and demonstrated a characteristic pattern of dyslipidemia marked by elevated triglycerides, increased VLDL levels, and reduced HDL concentrations. These findings are consistent with the typical lipid abnormalities described in CKD patients (3,6).

In the present study, the mean age of the study population was 53.73 ± 12.96 years, with the majority of patients belonging to the middle-aged group. Increasing age has been recognized as an important risk factor for CKD due to progressive nephron loss and cumulative exposure to metabolic and vascular risk factors over time (7). Similar age distributions have been reported in previous hospital-based studies of CKD patients.

The study also demonstrated a male predominance, with males accounting for a higher proportion of CKD cases compared to females. Several epidemiological studies have reported a higher prevalence of CKD among males, which may be attributed to lifestyle factors, occupational exposures, and differences in healthcare utilization (8).

Hypertension was identified as the most common comorbidity in the present study. Persistent elevation of blood pressure contributes to progressive renal damage through mechanisms such as glomerular sclerosis, vascular injury, and increased intraglomerular pressure. At the same time, impaired renal function leads to disturbances in sodium and water balance, further exacerbating hypertension (9). This bidirectional relationship highlights the critical role of blood pressure control in the management of CKD.

Hypertriglyceridemia observed in the present study represents the most consistent lipid abnormality associated with CKD. Impaired activity of lipoprotein lipase results in decreased catabolism of triglyceride-rich lipoproteins, leading to accumulation of circulating triglycerides and VLDL particles (4,10). These alterations contribute to the development of an atherogenic lipid profile and increased cardiovascular risk.

Another important finding in the present study was the reduction in HDL levels. HDL plays a protective role in cardiovascular health through reverse cholesterol transport and antioxidant functions. Reduced HDL concentrations in CKD may result from impaired synthesis of apolipoprotein A-I and altered HDL metabolism (11). The reduction of cardioprotective HDL particles further increases the susceptibility of CKD patients to atherosclerotic cardiovascular disease.

Although LDL levels in the present study were within near-normal limits, CKD is known to cause qualitative modifications in LDL particles, including oxidative modification and formation of small dense LDL particles, which possess increased atherogenic potential (5). These altered LDL particles can penetrate the vascular endothelium more readily and contribute to the development of atherosclerotic plaques.

Overall, the findings of the present study demonstrate that CKD is associated with a characteristic pattern of dyslipidemia characterized by elevated triglycerides, increased VLDL levels, and reduced HDL concentrations. These lipid abnormalities significantly contribute to increased cardiovascular risk in CKD patients and emphasize the importance of early detection and appropriate management of dyslipidemia as part of comprehensive CKD care.

CONCLUSION

The present study demonstrated that patients with chronic kidney disease exhibit significant alterations in lipid metabolism, characterized predominantly by elevated triglycerides, increased VLDL levels, and reduced HDL concentrations, while total cholesterol and LDL levels remained within near-normal ranges in most cases. These findings indicate the presence of a characteristic pattern of dyslipidemia associated with chronic kidney disease, which contributes to an increased risk of cardiovascular complications. The majority of patients in this study presented in advanced stages of CKD, reflecting delayed diagnosis and highlighting the importance of early screening and timely management of renal disease. The high prevalence of hypertension as a comorbidity further emphasizes its critical role in the development and progression of chronic kidney disease. Overall, the results of this study underscore the importance of routine evaluation of lipid profiles in patients with CKD for early identification of dyslipidemia and cardiovascular risk. Early detection and appropriate management of lipid abnormalities may help reduce cardiovascular morbidity and improve clinical outcomes in patients with chronic kidney disease.

REFERENCES

1. Kidney Disease Improving Global Outcomes. KDIGO 2012 clinical practice guideline for the evaluation and management of chronic kidney disease. *Kidney Int Suppl.* 2013;3(1):1–150.
2. National Kidney Foundation. K/DOQI clinical practice guidelines for chronic kidney disease: evaluation, classification, and stratification. *Am J Kidney Dis.* 2002;39(2 Suppl 1):S1–266.
3. Nosratola D. Vaziri. Dyslipidemia of chronic renal failure: the nature, mechanisms, and potential consequences. *Am J Physiol Renal Physiol.* 2006;290(2):F262–F272.
4. Giuseppe Attman, Per Alaupovic. Lipid abnormalities in chronic renal insufficiency. *Kidney Int Suppl.* 1991;31:S16–S23.
5. Christie M. Ballantyne, Antonio M. Gotto Jr.. Dyslipidemia and cardiovascular disease: pathophysiology and management. *Circulation.* 2005;111(4):499–511.
6. Josef Coresh, Brad C. Astor, Tom Greene, et al. Prevalence of chronic kidney disease and decreased kidney function in the adult US population. *JAMA.* 2007;298(17):2038–2047.
7. Kai-Uwe Eckardt, Jürgen Coresh, Omri S. Devuyst, et al. Evolving importance of kidney disease: from subspecialty to global health burden. *Lancet.* 2013;382(9887):158–169.
8. Marcello Tonelli, Paul Muntner, Alan S. Go, et al. Risk of coronary events in people with chronic kidney disease compared with those with diabetes. *Lancet.* 2012;380(9844):807–814.
9. Barry M. Brenner, Floyd C. Rector. *The Kidney.* 8th ed. Philadelphia: Saunders Elsevier; 2008.
10. Giuseppe Attman, Bengt Samuelsson. Dyslipidemia of kidney disease. *Curr Opin Lipidol.* 2009;20(4):293–299.
11. N. D. Vaziri. HDL abnormalities in nephrotic syndrome and chronic kidney disease. *Nat Rev Nephrol.* 2016;12(1):37–47.