

**A Study to Find the Correlation between Serum Lipids and Diabetes in Chronic Kidney Disease Individuals**Srikanth Dubbaka<sup>1</sup>, Kaliparambil Sugathan Roshni<sup>2</sup>, Veeranna Addanki<sup>3</sup>, Kunam Nikitha<sup>4</sup><sup>1</sup>Assistant Professor, Department of General Medicine, ESIC Medical College, Hyderabad.<sup>2</sup>Assistant Professor, Department of General Medicine, Visakha Institute of Medical Sciences, Vishakapatnam.<sup>3</sup>Assistant Professor, Department of General Medicine, ESIC Medical College, Hyderabad.<sup>4</sup>Assistant Professor, Department of General Medicine, GSL Medical College, Rajahmundry

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Corresponding Author: Dr Kunam Nikitha

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**Abstract**

**Introduction:** Chronic kidney disease (CKD) complicates lipid metabolism and diabetes mellitus (DM), contributing to dyslipidemia and increased cardiovascular risk. This study aims to explore the association between serum lipid levels and diabetes in CKD patients, informing tailored management strategies for mitigating cardiovascular complications in this challenging patient population.

**Methods:** A prospective study conducted at NRI Medical College, Andhra Pradesh, spanning 18 months, aimed to investigate the association between serum lipid levels and diabetes in CKD patients. Ethical approval was obtained, and informed consent was obtained from participants. Physical examinations and detailed clinical histories were conducted. Blood samples were collected after an overnight fast, processed for lipid estimation, and analyzed using SPSS version 17.0. Statistical analysis included the student t-test, with significance set at  $p < 0.05$ .

**Results:** Statistical analysis revealed higher total cholesterol (TC), triglyceride (TG), very low density lipoprotein levels, and lower low density lipoprotein levels in DM individuals compared to non-DM counterparts. HDL levels were slightly lower in DM patients. These findings indicate an association between DM and altered lipid profiles, with dyslipidemia more pronounced in diabetic individuals, suggesting potential cardiovascular risk.

**Conclusion:** This study highlights the complex interaction between dyslipidemia, DM, and CKD. Elevated TG levels were observed in both DM and CKD, while DM individuals displayed higher TC and TG levels. Comprehensive lipid management strategies are crucial in mitigating cardiovascular complications in these populations.

**Keywords:** Dyslipidemia, Diabetes Mellitus, Chronic Kidney Disease, Triglycerides, Cardiovascular Complications.

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**Introduction**

Chronic kidney disease (CKD) presents a complex interplay with both lipid metabolism and diabetes mellitus, creating a challenging clinical scenario. [1] Serum lipids, including cholesterol (CL) and triglycerides (TG), are crucial components of lipid metabolism and are intricately linked to the pathophysiology of both CKD and DM.

In CKD patients, dyslipidemia is a common occurrence, characterized by elevated levels of TG and decreased levels of high-density lipoprotein (HDL). [2] These lipid abnormalities are attributed to various factors such as decreased renal clearance of TG rich lipoproteins, insulin resistance, and inflammation. Additionally, impaired renal function can

lead to dysregulation of lipid metabolism enzymes, further exacerbating dyslipidemia.

The presence of DM in CKD patients significantly exacerbates these lipid abnormalities. [3] Diabetes is associated with insulin resistance, which contributes to dyslipidemia by increasing hepatic synthesis of triglycerides and reducing lipoprotein lipase activity. Moreover, the combination of CKD and diabetes accelerates the progression of atherosclerosis, predisposing patients to cardiovascular events, the leading cause of mortality in this population. [4]

Management of dyslipidemia in CKD patients with diabetes requires a multifaceted approach. Lifestyle modifications including dietary interventions and

regular physical activity are fundamental. Pharmacological interventions, such as statins and fibrates, are commonly used to target lipid abnormalities, although their efficacy and safety in CKD patients warrant careful consideration due to altered drug metabolism and potential adverse effects. The aim of this study is to investigate the association between serum lipid levels and diabetes in CKD patients, elucidating the interplay of dyslipidemia, renal function, and diabetic status to better understand cardiovascular risk and guide tailored management strategies in this complex patient population.

### Methods

A prospective study was carried out at the Department of General Medicine, NRI Medical College in Chinakakani, Andhra Pradesh, spanning 18 months from July 2015 to Jan 2018. Approval for the study protocol was obtained from the Institutional Ethics Committee, and written informed consent was obtained from all participants. The study included individuals of both genders diagnosed with uremia, with serum creatinine levels exceeding 1.5 mg/dL. Exclusion criteria comprised individuals with dyslipidemia attributed to alcohol consumption, AIDS, hypothyroidism, liver disorders, and those who were non-cooperative. The research aimed to investigate the association between serum lipid levels and diabetes in chronic kidney disease patients, providing insights into cardiovascular risk factors and informing tailored management strategies for this complex patient population.

Following participant recruitment, a comprehensive explanation of the research objectives was provided, ensuring clarity and addressing any queries. Subsequently, a thorough physical examination was conducted, documenting all relevant findings in the study proforma. Detailed clinical histories were obtained and meticulously recorded. Participants were instructed to fast overnight or for a minimum of 12 hours prior to the procedure. With strict adherence

to sterile precautions, blood samples (3 to 5 ml) were collected via venipuncture. [5] The collected blood was then processed to separate serum, which served as the specimen for lipid estimation. The lipid levels were quantified using an autoanalyzer technique, ensuring accuracy and consistency in the measurements. [6] This meticulous approach in sample collection and analysis aimed to minimize variability and ensure reliable data for investigating the association between serum lipid levels and DM in CKD patients. In this research various lipids such as TC, TGs, HDL, low density lipoproteins (LDL) and very low density lipoproteins (VLDL) were measured.

**Statistical Analysis:** SPSS version 17.0 was used for the data analysis. Continuous variables were expressed as the mean  $\pm$  SD, while categorical variables were presented as percentages. Lipid values and ratios were compared using the student t test. A two-tailed 'P' value of  $< 0.05$  was deemed significant.

### Results

Statistical analysis revealed that individuals with DM had slightly higher TC levels (203.94 mg/dL) compared to non-DM individuals (194.32 mg/dL). Similarly, TG levels were elevated in the DM group (191.31 mg/dL) compared to the non-DM group (158.10 mg/dL). HDL levels were marginally higher in non-DM individuals (37.70 mg/dL) compared to DM individuals (38.15 mg/dL). VLDL levels were higher in the DM group (30.10 mg/dL) compared to the non-DM group (25.64 mg/dL). LDL levels showed a slight decrease in the DM group (118.15 mg/dL) compared to the non-DM group (132.32 mg/dL). These findings suggest a potential association between DM and altered lipid profiles, with dyslipidemia being more pronounced in diabetic individuals. Further analyses such as correlation coefficients and significance tests could provide additional insights into the relationships between these lipid parameters in DM and non-DM individuals (Table 1).

**Table 1: Correlation between lipids in DM and non DM individuals.**

S. No.	Lipid	DM	Non DM	Statistical analysis
1	TC	203.94 $\pm$ 39.54	194.32 $\pm$ 47.06	Significant; P <0.05
2	TG	191.31 $\pm$ 59.15	158.10 $\pm$ 64.93	
3	HDL	38.15 $\pm$ 12.31	37.70 $\pm$ 11.43	
4	VLDL	30.10 $\pm$ 15.15	25.64 $\pm$ 15.44	
5	LDL	118.15 $\pm$ 22.15	132.32 $\pm$ 37.16	Not significant

### Discussion

Diabetic kidney disease (DKD) stands as a significant microvascular complication in approximately 20% of individuals diagnosed with type 2 diabetes (T2D). [7] It is characterized by progressive renal dysfunction, often leading to end-stage renal disease (ESRD) and necessitating renal replacement therapy. DKD arises due to prolonged exposure to hyperglycemia, hypertension,

dyslipidemia, and genetic predisposition. Pathologically, it involves glomerular hypertrophy, basement membrane thickening, and eventual fibrosis. Clinical manifestations include albuminuria, declining glomerular filtration rate (GFR), and hypertension. [8] Early detection and intensive management of risk factors are crucial in mitigating the progression of DKD and reducing associated morbidity and mortality in T2D patients.

In this study, among the DM individuals TC was 203.94 and in non DM patients it was 194.32; statistically there was significant difference (Table 1). Dyslipidemia in patients with T2D commonly presents as elevated TG and LDL levels, coupled with reduced HDL levels. [9] Elevated TG levels result from increased hepatic synthesis and decreased clearance of triglyceride-rich lipoproteins, compounded by insulin resistance. Concurrently, decreased HDL levels stem from impaired reverse CL transport and alterations in lipoprotein metabolism. These lipid abnormalities contribute significantly to the heightened cardiovascular risk observed in T2D patients, emphasizing the importance of comprehensive lipid management strategies to mitigate cardiovascular complications in this population. [10]

In CKD patients, TG levels tend to rise, particularly in advanced stages of the condition. This elevation is attributed to various factors including impaired renal clearance of TG rich lipoproteins, insulin resistance, and altered lipid metabolism. As kidney function declines, there is a decrease in the activity of lipoprotein lipase, which plays a key role in triglyceride metabolism. [11] Additionally, CKD often accompanies other metabolic disturbances such as diabetes and dyslipidemia, further exacerbating triglyceride elevation. Elevated TG levels in CKD are associated with increased cardiovascular risk, emphasizing the importance of monitoring and managing lipid abnormalities in CKD patients to mitigate cardiovascular complications. It was also reported that elevated TG is the common abnormality among the CKD patients. [12] Under similar ground, in this research, TG levels were elevated in the DM group (191.31 mg/dL) compared to the non-DM group (158.10 mg/dL).

HDL exhibit significant heterogeneity in their composition, size, and shape, reflecting their diverse functional roles in lipid metabolism. In CKD, dyslipidemia often manifests as reduced concentrations of HDL. [13] This decline in HDL levels is multifactorial, stemming from impaired renal clearance, altered lipid metabolism, and inflammation associated with CKD. Reduced HDL concentrations in CKD contribute to increased cardiovascular risk, as HDL plays a crucial role in reverse CL transport and possesses anti-inflammatory and antioxidant properties. Consequently, addressing HDL deficits is essential in managing dyslipidemia and reducing cardiovascular morbidity and mortality in CKD patients. [14] Whereas in this research, there was a low HDL concentration in CKD with non DM and elevated in DM individuals (Table 1). As it was clear in the literature that insulin is the key chemical in the lipid metabolism. [15]

In Saini M et al. [16] study, one of the commonest finding was modest raise in LDL and VLDL.

Whereas in this research VLDL levels were higher in the DM group (30.10 mg/dL) compared to the non-DM group (25.64 mg/dL). LDL levels showed a slight decrease in the DM group (118.15 mg/dL) compared to the non-DM group (132.32 mg/dL). One limitation of the study was lack of consideration for potential confounding factors such as medication use, dietary habits, and comorbidities, which could influence lipid profiles independently of diabetes and CKD status.

In conclusion, this study underscores the intricate interplay between dyslipidemia, DM, and CKD. Elevated TG levels were observed in both DM and CKD, exacerbating cardiovascular risk. While DM individuals exhibited higher TC and TG levels, CKD patients showed decreased HDL concentrations. These findings emphasize the importance of comprehensive lipid management strategies in both DM and CKD populations to mitigate cardiovascular complications. Furthermore, the study highlights the need for tailored interventions addressing the specific lipid abnormalities observed in these patient groups, aiming to reduce morbidity and mortality associated with cardiovascular disease.

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