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Corresponding Author
N. Raghavaram,
Department of General medicine, Alluri Sita Ramaraju Academy of Medical Sciences, Andhra Pradesh, India
nraghavaram202@gmail.com

Author Designation
[1,3]Junior Resident
[2]Associate professor
[4]Assistant Professor
[5]Professor and HOD

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A Analytical Study on the Variations of Lipid Profile in Chronic Kidney Disease

[1]R. Praveen Kumar, [2]N. Raghavaram, [3]G. Raghavendra Rao, [4]Yenduri Ramakrishna and [5]R. Siddeswari

[1-5]Department of General Medicine, Alluri Sitarama Raju Academy of Medical Sciences, Eluru, India

[4]Department of General Medicine, Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, India

Abstract
Chronic kidney disease (CKD) is intricately linked to dyslipidemia, characterized by elevated triglycerides and decreased HDL concentration, while LDL levels typically remain relatively normal. This dyslipidemia profile poses a significant risk factor for coronary heart disease, highlighting the importance of managing lipid abnormalities in CKD patients. Recognizing distinct lipid patterns across different renal disorders is crucial for effective intervention and management strategies. The present study is a analytical observational study conducted in the Department of General Medicine at a tertiary care hospital asrams eluru. The duration of the study was six months, from January 2023, to June 2023.The study compared lipid profiles between chronic kidney disease (CKD) patients undergoing conservative treatment and hemodialysis. While total cholesterol (TC) levels did not significantly differ between the two groups, triglyceride (TG) levels were notably higher in the hemodialysis group. HDL cholesterol (HDLc), LDL cholesterol (LDL), VLDL cholesterol (VLDL) and the HDL/Total Cholesterol ratio showed no significant differences between treatment groups. These findings suggest that while treatment type may not significantly impact TC, LDL, VLDL, HDLc, or patients undergoing hemodialysis. Chronic kidney disease (CKD) patients exhibit elevated triglycerides and VLDL, alongside reduced HDL levels and HDL/TC ratio, heightening cardiovascular risk. HDL reduction and HDL/TC ratio serve as predictive indicators for coronary artery disease in CKD patients. Managing hyperlipidemia in CKD is crucial, as it accelerates renal failure progression and predisposes to atherosclerosis.

INTRODUCTION

Chronic kidney disease (CKD) encompasses a range of complex physiological processes that result in abnormal kidney function, often characterized by a gradual deterioration in glomerular filtration rate (GFR)[1]. The risk of exacerbating CKD is intimately tied to two key factors: the GFR and the extent of albuminuria, which is the presence of excess albumin (a protein) in the urine. Chronic kidney disease represents an inexorable deterioration of renal function characterized by the gradual diminishment in the efficacious operation of renal tissue[2]. This inexorable decline inevitably culminates in the compromising of excretory, metabolic and endocrine functionalities within the kidney, eventually giving rise to the complex clinical syndrome known as uremia[3].Of profound concern within this paradigm is the pivotal role played by cardiovascular disease, a preeminent source of both morbidity and mortality among individuals grappling with chronic kidney disease. An overwhelming majority of patients succumb to the intricate complications stemming from the cardiovascular system, underscoring its ominous significance[4]. Lipoproteins are intricate molecular complexes formed by the amalgamation of proteins with lipids, which inherently possess hydrophobic properties. In the realm of chronic kidney disease, the prevailing lipid disorders manifest most prominently as hypertriglyceridemia, coupled with a discernible reduction in high-density lipoprotein (HDL) concentration[5]. These lipid irregularities are characterized by a state of moderate hypertriglyceridemia alongside the maintenance of normal total cholesterol levels. It is against this backdrop that the heightened awareness of dyslipidemia's cardinal importance as a primary risk factor for coronary heart disease has galvanized the medical community's dedication to pinpointing and effectively managing aberrations in plasma lipids and lipoproteins[6]. In contrast, low-density lipoprotein (LDL) levels tend to maintain a relatively normal profile or exhibit only marginal increases. The nexus between renal disease and hyperlipidemia has been recognized for over a century, although it is only in recent times that we have elucidated the distinct patterns discernible across various renal disorders.

MATERIALS AND METHODS

The present study is a analytical observational study conducted in the Department of General Medicine at a tertiary care hospital asrams eluru. The duration of the study was six months, from January 2023-June-2023. The study was conducted after obtaining approval from the Institutional Ethics Committee. A total of 60 patients in 30 patients of non diabetic chronic kidney disease, 15 non-dialysed patient, 15 hemodialysis patients and compared to 30 healthy subjects where compared. The patients fulfilling the inclusion criteria were subjected to detailed clinical history, systemic examination and blood investigations.

Inclusion Criteria: Patients of chronic renal failure. Diagnostic criteria for chronic renal failure1. Clinical signs and symptoms of uremia2. The presence of Chronic Kidney disease was established based on presence of kidney damage and level of kidney function (GFR). Markers of kidney damage included abnormalities in the composition of blood (elevated blood urea, serum creatinine) or urine or abnormalities in imaging tests (ultrasonogram).3. Ultrasonographic evidence of bilateral shrunken kidney/ loss of corticomedullary differentiation.

Exclusion Criteria: One Patients with diabetes mellitus2. Patients with Ischemic heart disease3. Patients who have undergone coronary artery by pass graft surgery4. Patients on lipid lowering drugs 5. Patients with history of alcohol consumption and smoking 6. Patients with thyroid and liver disease Data was tabulated and analyzed using Descriptive and inferential statistical analysis was done in a statistical package of social sciences (SPSS) version trail version 26.0. Data was presented in the form of frequencies and percentages, categorical data was analysed by using Chi square test. P=0.05 was considered statistically significant. Microsoft Excel 2021 software was used to analysed.

RESULTS AND DISCUSSIONS

- 30 patients of chronic kidney disease and 30 normal subjects (controls) were taken for present study
- Age and sex distribution among CKD patients

In the study, 30 patients of CKD were included, out of which 21 patients (70%) were male and 9 patients (30%) were females. The mean age for the total number of patients was 42.7.The mean age for male patients was 45.3.The mean age for female patients was 36.6.Male to female ratio in the study group was 2:3:1

In the study examined various lipid profiles in patients with chronic kidney disease (CKD) who underwent different treatments. Here are the key findings: Total Cholesterol (TC): The mean total cholesterol level in patients receiving conservative treatment was 192.53±50.17 mg/dL, while in patients undergoing hemodialysis, it was 180.38±32.66 mg/dL. Importantly, this difference was found to be statistically non-significant ($P > 0.05$). This suggests that the type of treatment (conservative vs. hemodialysis) did not significantly affect total cholesterol levels in

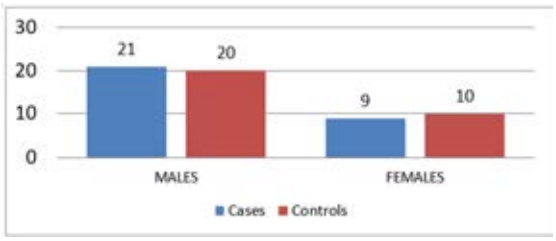

Fig.1: Sex distribution in cases and controls

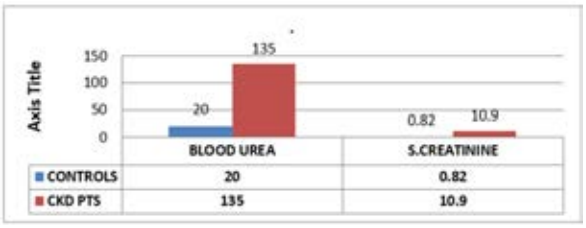

Fig. 2: Biochemical data in controls and CKD patients

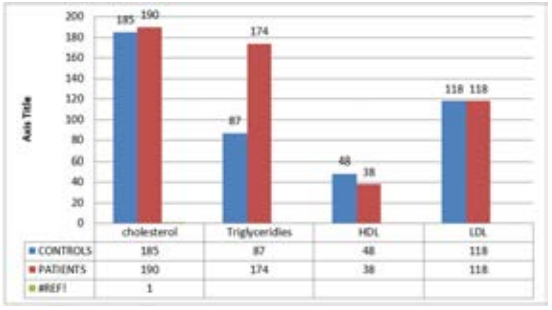

Fig. 3: Biochemical (lipid profile) data in controls and CKD patients

these patients. Triglycerides (TG): The study observed a statistically significant difference in mean triglyceride levels between patients on conservative treatment (155.18±47 mg/dL) and those undergoing hemodialysis (199.01±70 mg/dL) (P<0.05). This indicates that triglyceride levels were higher in the hemodialysis group compared to the conservative treatment group. HDL Cholesterol (HDLc): Mean HDL cholesterol levels in the conservative treatment group and the hemodialysis group were 36.1±5.76 mg/dL and 35.7±5.20 mg/dL, respectively. The difference between these groups was statistically not significant, suggesting that the type of treatment did not impact HDL cholesterol levels significantly. LDL Cholesterol (LDL): The mean LDL cholesterol levels in CKD patients on conservative treatment were 125.38±44.3 mg/dL, while in the hemodialysis group, they were 104.87±25.10 mg/dL. Similar to total cholesterol, this difference was statistically not significant, indicating that the type of treatment did not have a significant effect on LDL cholesterol levels. VLDL Cholesterol (VLDL): Mean VLDL cholesterol values in the conservative treatment and hemodialysis groups were 31.27±9.53 mg/dL and 39.82±14 mg/dL, respectively. Like other lipid parameters, this difference was also statistically non-significant, suggesting that VLDL cholesterol levels were not significantly affected by the treatment modality. HDL/Total Cholesterol Ratio (HDL/TC): The study found that the difference in mean values of HDL/TC between the conservative treatment group and the hemodialysis group was statistically not significant. This indicates that the ratio of HDL cholesterol to total cholesterol was similar between the two treatment groups.

Mean total cholesterol in patients on conservative and for patients on Hemodialysis was statistically not significant (P>0.05). TG-Mean triglycerides in patents of CKD on conservative treatment and Hemodialysis group was statistically significant (P<0.05).

HDLc: Mean HDL value in conservative treatment group was statistically not significant.

LDL: Mean LDL value in CKD patients on conservative group and Hemodialysis group was statistically not significant. VLDL: Mean VLDL values for conservative and Hemodialysis group was statistically not significant. HDL/TC: The difference in mean values of HDL/TC in both conservative treatment and Hemodiailysis group was also statistically not significant

The study investigated the lipid profiles of patients with chronic renal failure (CKD) undergoing different treatments, particularly focusing on conservative treatment and hemodialysis. The findings shed light on the impact of these treatments on various lipid parameters, including total cholesterol (TC), triglycerides (TG), HDL cholesterol (HDLc), LDL cholesterol (LDL), VLDL cholesterol (VLDL), and the HDL/Total Cholesterol ratio (HDL/TC). Firstly, regarding total cholesterol levels, the study found no statistically significant difference between patients receiving conservative treatment and those undergoing hemodialysis. This suggests that the type of treatment did not substantially influence total cholesterol levels in CKD patients. Secondly, the study observed a notable disparity in triglyceride levels between the two treatment groups. Patients undergoing hemodialysis exhibited significantly higher triglyceride levels compared to those receiving conservative treatment. This implies that hemodialysis may exacerbate dyslipidemia by elevating triglyceride levels in CKD patients. On the other hand, HDL cholesterol levels did not significantly differ between the conservative treatment group and the hemodialysis group. This suggests that neither treatment modality had a pronounced effect on HDL cholesterol levels in CKD

Table 1: Biochemical data in controls and CKD patients

Sr. No	Groups	Blood Urea	Serum Creatinine
01	Controls	15.7±5.3	0.82±0.33
02	Patients	135.23±41.64	135.23±41.64
03	t-value	14.235	10.681
04	significance	<0.001	<0.001

Table 2: Cholesterol Levels in controls and CKD patients

Sr. No	Groups	Controls	Patients	t-Value	Significance
01	Total cholesterol	185.2±24.51	187±43.5	0.1838	Ns>0.05
02	Triglycerides	97±17	174±60.7	6.14	<0.001 H.S
03	HDLc	48.8±10.3	36±5.1	5.990	<0.001 H.S
04	LDLc	116.8±26.78	116.4±38.3	0.034	N-S
05	VLDLc	19.3±3.49	34.88±12.14	6.194	<0.001 H.S
06	HDL/TC	0.28±0.07	0.2002±0.0478	5.003	<0.001 H.S

Table 3: Cholesterol Levels in controls and CKD patients

S. No	Groups	Conservative management	Dialysis	t-value	p-value
01	Total cholesterol	192.529±50.17	180.385±32.66	0.759	N.S
02	Triglycerides	155.176±47	199.01±70	2.052	Sig P<0.05
03	HDLc	36.1±5.76	35.7±5.20	0.196	N.S
04	LDLc	125.38±44.3	104.87±25.10	1.492	N.S
0	VLDLc	31.27±9.525	39.82±14	1.991	N .s
06	HDL/TC	0.20±0.055	0.202±0.0405	0.1130	N.S

patients. Similarly, LDL cholesterol levels did not show a significant discrepancy between patients on conservative treatment and those undergoing hemodialysis. This implies that the type of treatment did not exert a significant influence on LDL cholesterol levels in CKD patients. Moreover, the study found no statistically significant difference in VLDL cholesterol levels between the conservative treatment group and the hemodialysis group. This suggests that both treatment modalities had a comparable impact on VLDL cholesterol levels in CKD patients. Lastly, the study analyzed the HDL/Total Cholesterol ratio and found no significant difference between the two treatment groups. This implies that the Tatio of HDL cholesterol to total cholesterol remained relatively consistent across both conservative treatment and hemodialysis in CKD patients. In summary, while some variations in lipid profiles were observed between CKD patients receiving conservative treatment and those undergoing hemodialysis, many of these differences were not statistically significant. However, triglyceride levels emerged as a notable exception, being significantly higher in the hemodialysis group. These findings underscore the importance of monitoring lipid profiles, particularly triglyceride levels, in CKD patients undergoing hemodialysis and highlight the need for targeted interventions to manage dyslipidemia in this population.

CONCLUSION

This study deals with the alterations observed in various lipoprotein fractions among patients suffering from chronic kidney disease. Additionally, it investigated disparities in the lipid profiles between chronic kidney disease patients undergoing conservative treatment and those undergoing hemodialysis. Here are the findings: Chronic kidney disease patients exhibited a noteworthy increase in triglyceride and very-low-density lipoprotein (VLDL) concentrations. The level of high-density lipoprotein cholesterol (HDL-C) was significantly lower in chronic kidney patients (CKD) patients compared to the control group. Total cholesterol and low-density lipoprotein (LDL) levels did not exhibit significant elevation in CKD patients when compared to the control group.

The HDL/total cholesterol (TC) ratio was significantly reduced in CKD patients. In the comparison between chronic kidney disease (CKD) patients undergoing hemodialysis and those on conservative treatment, a significant increase in triglyceride levels was observed. However, total cholesterol and LDL levels did not show significant differences between hemodialysis patients and those on conservative treatment. The notable increase in triglyceride and VLDL levels, coupled with the reduction in HDL and the HDL/TC ratio in chronic kidney disease patients, underlies the heightened risk of cardiovascular abnormalities in CKD patients. The significant reduction in HDL levels and the HDL/TC ratio are crucial predictive indicators for the risk of developing coronary artery disease across all groups of chronic kidney disease patients. This may constitute a major contributing factor to the accelerated atherogenesis observed in these patients. In conclusion, since lipid abnormalities in chronic kidney disease accelerate the progression of renal failure and predispose individuals to atherosclerosis, it is prudent to detect and treat hyperlipidemia in chronic kidney disease patients.

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