ISSN: 0975-1556

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2022; 14(1);162-169
Original Research Article

Study of the Association of Lipid Profile with Chronic Kidney Disease SMS Medical College and Attached Hospital, Jaipur

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Received: 06-11-2021 / Revised: 19-12-2021 / Accepted: 28-12-2021
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Conflict of interest: Nil

Abstract

Background: Chronic kidney disease (CKD) is a pathophysiological process with multiple etiologies resulting in the inexorable attrition of functional nephrons and frequently leading to End Stage Renal Disease (ESRD) necessitating hemodialysis as a mandatory therapeutic measure. Dyslipidemia has been hypothesized to cause kidney damage and to play an important role in the progression of renal failure. Hence, the aim of the present study was to evaluate the pattern of different lipoprotein changes in the CKD patients.

Aims & Objectives: The aim of this study was to evaluate and compare the serum Lipid Profile (TG, Cholesterol, HDL, LDL, VLDL) in CKD patients both hemodialyzed and conservatively treated and comparable control group.

Methods: This study was a cross sectional study in which clinically diagnosed cases of Chronic renal failure from OPD of department of Nephrology, S.M.S. Medical College and Hospital, Jaipur were taken as cases.

Results: 30 cases of chronic renal disease and matched controls between age group of 30-70 years were analyzed in this study. The mean age of cases was 46.63 years and controls were 44.45 years. TG was found to be higher in case group (179.77±69.53) as compared to control group (100.43±35.69). Similarly, Cholesterol was high in case group (182.77±37.07) as compared to control group (159.87±25.66), the mean of LDL-Cholesterol was high in case group (118.52±32.15) as compared to control group (100.60±20.44) and the mean level of VLDL was high in case group (35.94±13.86) as compared to control group (20.05±7.18). However, the mean level of HDL-Cholesterol was found to be low in case group(28.57±5.68) as compared to control group(39.23±4.60). All These values were statistically significant. However, TG and Cholesterol were significantly lower in patients on hemodialysis as compared to patients treated by conservative line.

Conclusion: In this study, we concluded that there is significant dyslipidemia, raised in chronic renal failure patients as compared to healthy controls. We conclude that, the importance of this study lies in the early detection and treatment of lipid abnormalities in CRF, which in turn can decelerate / arrest the progression of the renal failure and predisposition to atherosclerosis.

Keywords: CRF**,** ESRD**,** Cholesterol, HDL, LDL

Introduction

Chronic Kidney Disease(CKD) is becoming a worldwide health problem due to increasing incidence and prevalence, high cost and poor outcomes.[1] According to the Kidney Disease Outcomes Quality Initiative (KDOQI), CKD is defined as kidney damage or a decreased kidney glomerular filtration rate(GFR) of <60mL/min/1.73m^2 for at least 3 months.[2,3]

Table 1: Stages of Kidney failure

STAGE	DESCRIPTION	GFR(mL/min/1.73m^2)
1	Kidney damage with normal or ↑ GFR	≥90
2	Kidney damage with mild ↓ GFR	60-89
3	Moderate ↓ GFR	30-59
4	Severe ↓ GFR	15-29
5	Kidney failure	<15 or dialysis

Globally, CKD is the 12th cause of the death and the 17th cause of disability, respectively.[4] In India, given its population >1 billion, the rising incidence of CKD is likely to cause major problems for both healthcare and the economy in future years. It has been recently estimated that the age-adjusted incidence rate of ESRD in India to be 229 per million population (pmp)[5], and >100,000 new patients enter renal replacement programs annually in India.[6]

Cardiovascular disease is a major cause of morbidity and mortality among patients with chronic kidney disease.[8] More than 50% of patients with CKD die due to cardiovascular complications.[8] CVD and CKD share many risk factors, including obesity, metabolic syndrome, hypertension, diabetes mellitus, dyslipidemia and smoking.[7] The growing recognition that dyslipidemia is a major risk factor for coronary heart disease has prompted interest in the identification and management of abnormalities in plasma lipids and lipoproteins.

There is a lack of evidence when it comes to the prevalence of dyslipidemia in the patients suffering from CKD in North Indian population. An emphasis must also be laid on the derangement of lipid profile in the patients with CKD in North Indian reference population and the severity of CKD.

Hence, the aim of the present study was to evaluate the pattern of different lipoprotein changes, if any, in the CKD patients treated conservatively as well as by haemodialysis and to study the difference of lipid profile between these two groups.

Materials and Methods

This study was a Hospital based comparative observational study in the Department of Biochemistry and Central Lab and Department of Nephrology, S.M.S. Medical College and Hospital, Jaipur. The Study Design was a Cross sectional study done from October 2018 to March 2019.

Diagnosed cases of chronic renal failure between the age of 30-70 years from OPD/IPD of Department of Nephrology of S.M.S. Medical College and Hospital, Jaipur , willing to participate in the study were taken as cases. The presence of CKD was established based on presence of kidney damage and level of kidney function glomerular filtration rate (GFR). Markers of kidney damage included abnormalities in the composition of blood (elevated blood urea and serum creatinine, abnormalities in serum electrolytes, serum total protein and fraction or imaging tests (ultrasonogram). Patients with diabetes mellitus, ischemic heart disease, who have undergone coronary artery bypass graft surgery and with history of alcohol consumption and smoking were excluded from the study. Age matched healthy individuals

(relatives/attendants of patients and/or hospital staff), willing to participate were taken as controls.

Statistical Analyses: Sample size was calculated to be 30 for each group as per previous studies (for Triglycerides). The minimum detectable difference of mean 60.90 & SD 61.82 for 0.05 α-error and 80% power. Quantitative data expressed in the form of Mean ± SD and inference was drawn with the use of appropriate statistical test. Samples were analyzed on fully automated analyzer Beckman Coulter AU-680.

Results

The characteristics of the studied population including age and lipid profile values are shown in Table 2.

Table 2: The characteristics of the studied population including age and lipid profile values

	Group	N	Mean	Std. Deviation	'p' Value*
Age (years)	**Cases**	30	46.63	12.33	0.488
	Controls	30	44.45	10.92	
TG (mg/dl)	**Cases**	30	179.77	69.53	0.000
	Controls	30	100.43	35.69	
Total Cholesterol (mg/dl)	**Cases**	30	182.77	37.07	0.007
	Controls	30	159.87	25.66	
HDL (mg/dl)	**Cases**	30	28.57	5.68	0.000
	Controls	30	39.23	4.60	
LDL (mg/dl)	**Cases**	30	118.52	32.15	0.013
	Controls	30	100.60	20.44	
VLDL (mg/dl)	**Cases**	30	35.94	13.86	0.000
	Controls	30	20.05	7.15	
Urea (mg/dl)	**Cases**	30	104.70	40.57	0.000
	Controls	30	25.17	7.65	
Creatinine (mg/dl)	**Cases**	30	6.363	3.14	0.000
	Controls	30	0.844	0.17	

*Unpaired t-test

Age range of our study is between 30-70 years in both case and control group. We found the non-significant difference between mean age of cases (46.63±12.33) and control group (44.45±10.92). The mean level and standard deviation of urea was found to be higher in case group(104.70±40.57) as compared to control group (25.17±.65) and it was highly significant(P value-0.0000). Similarly, the mean level and standard deviation of creatinine was found to be higher in case group(6.36±3.14) as compared to control group(0.844±0.17) and was highly significant(p value 0.000).

TG was found to be higher in case group (179.77±69.53) as compared to control group (100.43±35.69). Similarly, Cholesterol was high in case group (182.77±37.07) as compared to control group (159.87±25.66), the mean of LDL-Cholesterol was high in case group (118.52±32.15) as compared to control group (100.60±20.44) and the mean level of VLDL was high in case group (35.94±13.86) as compared to control group (20.05±7.18). However, the mean level of HDL-Cholesterol was found to be low in case group (28.57±5.68) as compared to control group(39.23±4.60). (Table 2, Figure 1)

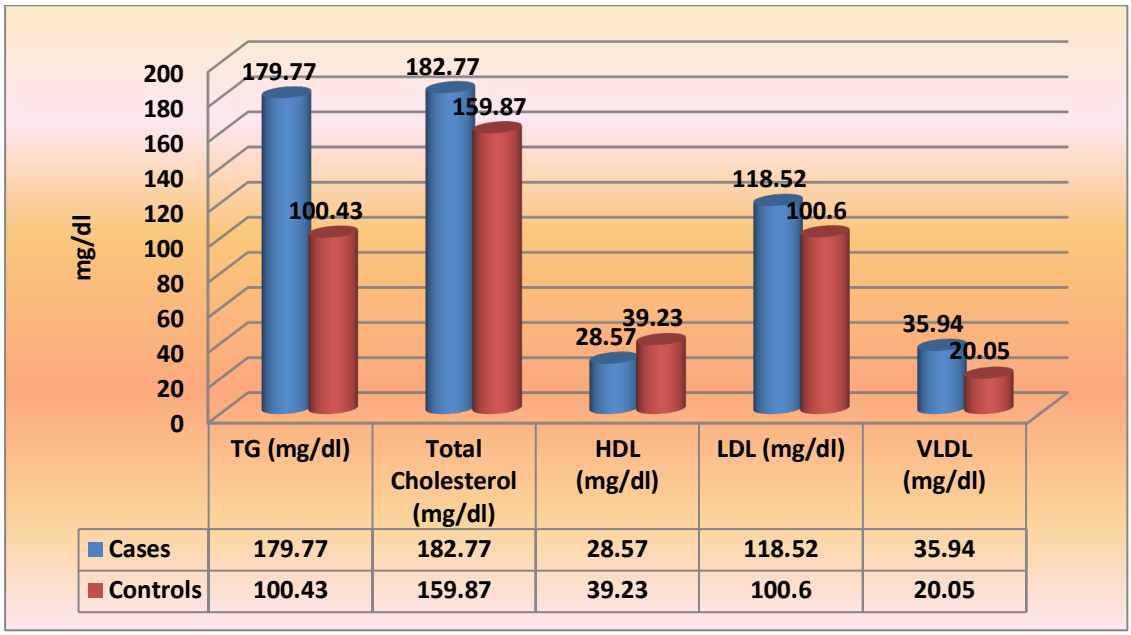

Figure 1: Lipid Profile in Cases and controls

Triglycerides level was low (152.79±56.76) in patients on hemodialysis as compared to patients treated by conservative line (226.36±66.73) and this difference was statistically significant(p value 0.003). Total cholesterol levels were lower in hemodialysis patients (169.58±31.30) as compared to patients on conservative management (205.55±36.36) patients and this was also statistically significant(p value 0.008) (Table 3, Figure 2)

Table 3: Hemodialysis vs conservative treatment

Groups	CKD Patients treated conservatively	CKD Patients treated by hemodialysis	P-Value
TG	226.36±66.73	152.79±56.76	0.003
CHOL	205.55±36.36	169.58±31.30	0.008

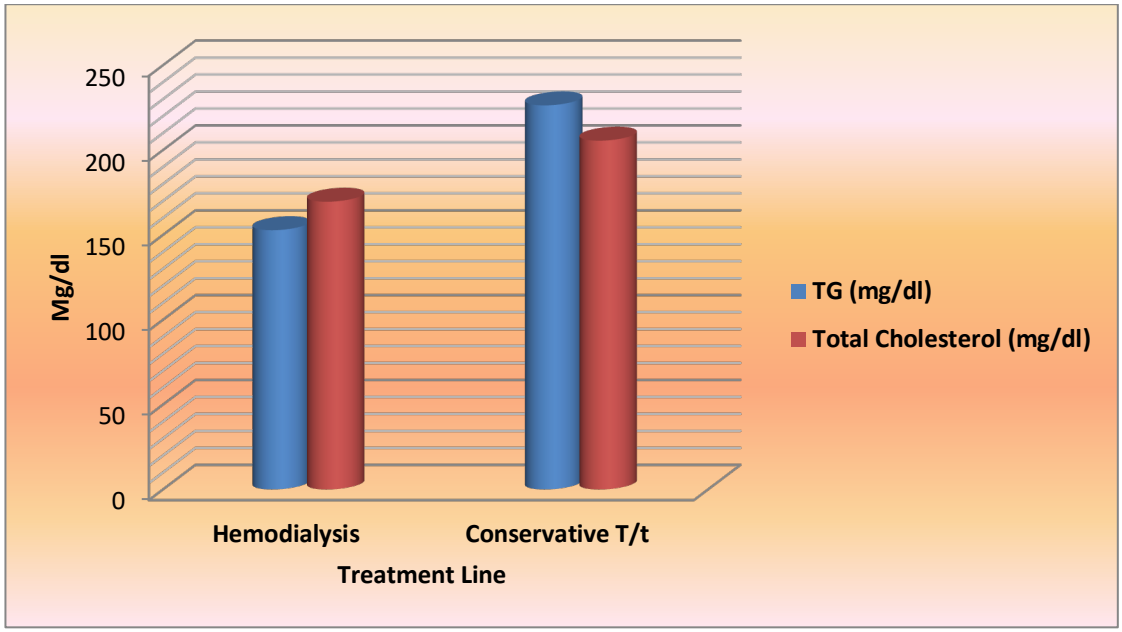

Figure 2: TG, Cholesterol as per treatment line

Discussion

Chronic Kidney Disease is a major health problem due to increasing incidence and prevalence, high cost and poor outcomes. In CKD the most prevalent lipid disorders are hypertriglyceridemia and decreased HDL concentration. LDL levels are usually normal or marginally increased. Also there are reports available regarding accelerated atherosclerosis in chronic renal failure due to altered lipid metabolism.

Age range of our study is between 30-70 years in both case and control group. We found the non-significant difference between mean age of cases (46.63±12.33) and control group (44.45±10.92). Deighan et al, 2000 found that kidney failure was peaked in the age of 50 to 60 years in contrast with other studies in western countries in which peak incidence is older than 75 years.[9]

In table-2 the mean level and standard deviation of TG is shown and found to be higher in case group(179.77±69.53) as compared to control group (100.43±35.69) and it is highly significant (P value-0.0000). In a study by Kasiske BL 40 % of the patients with CKD not due to nephrotic syndrome had triglyceride values more than 200.[10] Hyper triglycerideamia is one of the most common lipid profile abnormalities observed in CKD patients as reported by Attman PO et al[11] and Vazirin ND et al.[12] High plasma triglyceride levels can also be explained by significant increases in plasma levels of apolipoprotein C-III, which is a potent inhibitor of LPL.[13] LPL, which is located in the capillary endothelium, is responsible for triglyceride and phospholipid hydrolysis of VLDL and chylomicrons, leading to their deposition in arterial vessels.[14]

In table-2 the mean level and standard deviation of Cholesterol is shown and found to be higher in case group(182.77±37.07) as compared to control group (159.87±25.66) and it is highly significant (P value-0.007). Similar results were found in the study done by Balode AA et al., who observed significant hypercholesterolemia in CKD patients as compared to the controls.[15] Sumathi ME et al., studied serum total cholesterol, TGL, HDLc, LDLc, and VLDLc in 60 chronic renal failure patients. They observed a significant increase in serum total cholesterol, LDLc, VLDLc and significant decrease in HDLc in the patient group as compared to their controls.[16]

In table-2 the mean level and standard deviation of HDL-Cholesterol is shown and found to be low in case group(28.57±5.68) as compared to control group(39.23±4.60) and it is highly significant (Pvalue-0.0000). This result is in agreement with Mordasini R et al (1977).[17] Attman et al[18] and Deighan et al[19] observed that the HDL values decrease in patients with CKD. Goldberg et al found decrease in HDL concentrations in CKD patients as compared to controls in contrast to Rapoport and Aviram study showed no decrease in HDL concentrations in CKD patients.[20, 21] The significant decrease of HDL-C in CKD can be attributed to

(i) Decreased levels of apolipoproteins AI and AII; the main protein constituents of HDL.[22]

(ii) Diminished activity of LCAT; the enzyme responsible for the esterification of free cholesterol in HDL particles.[23]

(iii) Increased activity of Cholesteryl Ester Transfer Protein (CETP) that facilitates the transfer of cholesterol esters from HDL to triglyceride-rich lipoproteins.[24]

In table 2 the mean level and standard deviation of LDL-Cholesterol is shown and found to be high in case group (118.52±32.15) as compared to control group (100.60±20.44) and it is significant(P value-0.013). Lohano AK et al, 2015 concluded that the levels of LDL are not generally higher in CRF patients.LDL is a heterogeneous molecule consisting of protein, fatty acid, phospholipids and cholesterol. It undergoes oxidative

modifications in CRF. This results in the production of LDL-6 or a small dense LDL, atherogenic molecules. Thus, a fundamental change in LDL is not raising the same, but change the configuration and particle size.[25]

In table 2 the mean level and standard deviation of VLDL is shown and found to be high in case group (35.94±13.86) as compared to control group (20.05±7.18)and it is highly significant(P value-0.000). This result is in agreement with Bagdade et al.[26] Mudunuri Sita Rama Lakshmi et al, 2016 supported that there is significant raise in VLDL levels in chronic kidney disease patients compared to controls ($p<0.0001$).[27] The factors which explain the increase in serum VLDL include, (i) the increased activity of CETP which increases transfer of cholesterol ester to VLDL and promotes more VLDL formation.[28] (ii) Increased apo C-III, which is an LPL inhibitor inhibiting the degradation of VLDL.[29]

Triglycerides level was low (152.79±56.76) in patients on hemodialysis as compared to patients treated by conservative line(226.36±66.73) and this difference was statistically significant(pvalue 0.003). Total cholesterol levels were lower in hemodialysis patients (169.58±31.30) as compared to patients on conservative management (205.55±36.36) patients and this was also statistically significant(pvalue 0.008). Sumathi ME et al., studied serum lipid profile in 30 conservativelytreated and 30 hemodialyzed Chronic Renal Failure (CRF) patients. They found higher total cholesterol, TGL, HDLc, and VLDLc and LDLc in conservatively treated CRF patients as compared with the hemodialyzed patients and the difference was statistically significant except LDLc which was not significant.[16]

Conclusion

The prevalence of dyslipidemia in non-diabetic CKD patients is high enough to pose a health problem in the society and this problem of dyslipidemia increases with the severity of CKD. Along with CKD progression, metabolic abnormalities may progress further, contributing to atherosclerotic changes and adversely affecting renal function.

In this study, we concluded that there is significant dyslipidemia, raised in chronic renal failure patients as compared to healthy controls. These alterations in serum lipid in CKD enhance the risk of atherosclerosis and favours higher incidence of cardiovascular complications. Use of hypolipidemic drugs aimed at lowering triglycerides and consumption of low fat diet may be helpful for impeding the progression of renal disease as well as in lowering the cardiovascular complications observed in CKD patients which will increase the survivability and decrease morbidity and mortality in CKD patients. We conclude that, the importance of this study lies in the early detection and treatment of lipid abnormalities in CRF, which in turn can decelerate / arrest the progression of the renal failure and predisposition to atherosclerosis.

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