Original Article

A study of lipid variations occurring patients in different stages of Chronic Kidney Disease

Gopalakrishnan. T[1], Sivakumar. J[2]

[1]Assistant Professor, Department of Biochemistry, Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research, Melmaruvathur-603319, Tamil Nadu, India.

[2]Associate Professor, Department of Biochemistry, Dhanalakshmi Srinivasan Medical College, Perambalur, Tamil Nadu, India.

Abstract

Aim and Background: In this study investigated that the alteration in different lipoprotein fractions in chronic kidney disease patients. Chronic kidney disease is a syndrome, which results from progressive and irreversible destruction of nephrons regardless of the etiology, where the kidney is no longer able to maintain the biochemical homeostasis. The syndrome is complex and the biochemical changes and clinical signs are variable and mostly non-specific. Materials and Methods: This is a cross sectional study. Study conducted on patients attending the departments of General Medicine and biochemistry, Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research. 100 chronic kidney patients were taken this study. All the patients divided into five groups each group consist of 20 patients. Results: The mean age for the total number of patients was 57.28 yrs. Among 100 CKD patients 77 were on conservative treatment and 23 were on maintenance hemodialysis. Among the 100 CKD patients in the study group stage wise distribution was done. Majority of patients being in stage 5 followed by stage 3. Conclusion: In the present study we conclude that the lipid abnormalities in chronic renal failure accelerates the progression of the renal failure and predisposes to atherosclerosis it is worthwhile detecting and treating hyperlipidemia in chronic renal failure patients.

Keywords: Chronic Kidney Disease, hemodialysis, Lipid Profile.

1. INTRODUCTION

Chronic kidney disease is an irreversible deterioration of renal function, which results from diminished effective functioning of renal tissue. Ensuing impairment of excretory, metabolic and endocrine functions of the kidney leads to the development of clinical syndrome of uremia. The severity of the consequences of CKD has however undergone profound changes since the advent of dialysis.

Cardiovascular disease is a major cause of morbidity and mortality among patients with chronic kidney disease. More than 50 percent of patients with CKD die due to cardiovascular complications [1]. 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.

An association between lipids and kidney disease was first noted by Virchow [2] who described fatty degeneration of renal epithelium in Bright's disease in 1860. In chronic kidney disease the most prevalent lipid disorders are hypertriglyceridemia and decreased HDL Concentration. LDL levels are usually normal or marginally increased [3]. Also there are reports available regarding accelerated atherosclerosis in chronic renal failure due to altered lipid metabolism.

Address for correspondence: T. Gopalakrishnan
Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research, Melmaruvathur, Tamil Nadu, India.
Email: gopalkrishmd@gmail.com

Access this article online

Quick Response Code:

Website: www.pnrjournal.com

DOI: 10.47750/pnr.2023.14.01.001

How to cite this article: Gopalakrishnan. T, Sivakumar. J, A study of lipid variations occurring patients in different stages of Chronic Kidney Disease, J PHARM NEGATIVE RESULTS 2023;14(1): 1-5.

2. Materials and Methods

This is a cross sectional hospital based study. In this study was conducted on patients attending the department of General Medicine and Biochemistry, Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research, Tamil Nadu, India . sample size of the study was 100 CKD patients. During the period of the study was July 2021 to June 2022. Patients presenting to the hospital and diagnosed with CKD were included in the study after obtaining informed consent until hundred cases were collected. The history of onset, progression, duration of various symptoms was noted. Laboratory investigations like basic blood profile, blood urea, serum creatinine, serum cholesterol, serum triglyceride, serum LDL, serum HDL and ultrasound abdomen were done. Data was collected and noted in a pre-designed proforma. All the patients were selected based on the inclusion and exclusion criteria.

Clinical criteria for chronic renal failure

The features of uremia include fatigue, lethargy, somnolence headache, muscular irritabilities, muscle cramps, asterixis, myoclonus, seizures, and coma. Cardiovascular and pulmonary disturbances in the form of congestive cardiac failure, pulmonary edema, pericarditis and arrhythmias. Hematologic disturbances in the form of anemia, bleeding diathesis. Gastrointestinal disturbances in the form of anorexia, nausea and vomiting, gastroenteritis, peptic ulcer, gastrointestinal bleeding. Features of hyperparathyroidism in the form of osteomalacia, bone pains, fractures and osteomalacic myopathy and gait disturbance.

Clinical evidence of pallor, edema, Hypertension, pleuritis, pericarditis, CCF, pulmonary edema, hypertensive retinopathy changes were noted. Urine output below 500 ml was considered as oliguria18 and more than 3000 ml was considered as polyuria [4].

Urine Findings

Proteinuria was considered as present when the heat test showed a definite cloud which did not get-dissolved on addition of glacial acetic acid. Urine pus cells more than 2-3 per HPF was considered abnormal.

Biochemical Findings

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).

Ultrasonogram

Bilateral shrunken Kidneys59 (<8.5cm) with loss of corticomedullary differentiation was taken as indicative of chronic renal failure.

Other investigations

Hb%, serum electrolytes, serum calcium, and phosphorus, ECG, chest X-ray, complete blood counts, was done. Study of lipid profile by enzymatic method by using autoanalyser was done.

Statistical Analysis

Comparison of the parameters was done using one way ANOVA (SPSS version 22). Student's t test was used to calculate the significance between means and the same represented by graphs.

3. Results

This study was conducted on one hundred patients with chronic kidney disease over a period of one year. The data from each patient was obtained on a proforma and analyzed. The results are as follows. Among the 100 patients included in this study 67% were male and 33% were females. Table.1

Table.1. Sex wise Distribution

Sex	Percent
Female	33.0
Male	67.0
Total	100.0

Age distribution among CKD patients

Table.2. indicates that the study sample included majority 33 percent of the patients in the age group of 51 -60 years followed by 28 percent in the age group of 61-70 years.

Table.2 Age distribution among CKD patients

Age		20-30	31-40	41-50	51-60	61-70	71-80	81-90
CKD stage	Stage 1	0	2	1	1	0	0	0
	Stage 2	1	1	2	4	2	1	0
	Stage 3	0	2	5	8	8	1	0
	Stage 4	0	2	4	4	7	2	1
	Stage 5	0	2	6	16	11	3	3

Distribution of CKD Patients

Table 3. Shows that Among the 100 CKD patients in the study group stage wise distribution is as detailed below. Majority of patients being in stage 5 followed by stage 3.

Table.3. Stage wise Distribution of CKD patients	
CKD Stage	**Percent**
Stage 1	4.0
Stage 2	11.0
Stage 3	24.0
Stage 4	20.0
Stage 5	41.0
Total	100.0

Comparison of Lipid Fraction According to CKD Staging

The mean values of each fraction of fasting lipid profile was calculated and compared with values in each stage of CKD. The results are as depicted in table 4. Serum Triglyceride and VLDL values in CKD patients in each stage increased as stage progressed. The mean averaged 161.7 ± 79.19 and 31.73 ± 15.74 respectively. This difference was statistically highly significant. (P <0.001). Total cholesterol, LDL and HDL values in CKD patients in each stage increased as stage progressed. The mean averaged 187.42 ± 63.35, 124.71 ± 57.83 and 30.75 ± 11.63 respectively. However this difference was not statistically significant. (P > 0.223), (P >0.711) and (P >0.326) respectively.

Table 4: Comparison of Lipid Fraction According to CKD Staging

		N	Mean	Std. Deviation	Sig.
S. Chol mg/dl	Stage 1	4	169.25	10.81	0.223
	Stage 2	11	170.52	42.31	
	Stage 3	24	183.63	47.22	
	Stage 4	20	179.59	65.76	
	Stage 5	41	199.78	76.37	
	Total	100	187.42	63.35	
S. Trig mg/dl	stage 1	4	107.75	10.27	<0.001
	stage 2	11	134.18	76.66	
	stage 3	24	151.86	70.35	
	stage 4	20	162.59	82.96	

	stage 5	41	179.68	83.90	
	Total	100	161.7	79.19	
S.LDL mg/dl	Stage 1	4	119.7	17.69	0.711
	Stage 2	11	111.03	39.59	
	Stage 3	24	119.97	42.51	
	Stage 4	20	118.40	58.80	
	Stage 5	41	134.72	70.65	
	Total	100	124.71	57.83	
S.HDL mg/dl	Stage 1	4	28	11.77	0.326
	Stage 2	11	35.27	8.49	
	Stage 3	24	33.29	12.29	
	Stage 4	20	29.1	9.63	
	Stage 5	41	29.12	12.69	
	Total	100	30.75	11.63	
S.VLDL mg/dl	Stage 1	4	21.45	1.98	<0.001
	Stage 2	11	24.89	6.88	
	Stage 3	24	31.11	16.27	
	Stage 4	20	29.70	16.13	
	Stage 5	41	35.93	16.78	
	Total	100	31.73	15.74	

4. Discussion

This study is a cross sectional descriptive study which included hundred patients of chronic kidney disease who were treated as outpatients or inpatients. The cases were collected over a period of one and a half years. The patients included those who were managed conservatively and with hemodialysis. The results of the study show that there are significant alterations in the lipid profiles of these CKD patients.

Triglycerides

In this study triglyceride value in CKD patients were found to be high; a rising trend was observed as the stage of CKD progressed and it was statistically highly significant (P values <0.001). Attman P.O, Alaupovic P [5] stated that hypertriglyceridemia is the most common plasma lipid abnormality in patients of chronic renal failure. The cause for hypertriglyceridemia in chronic renal failure patients has not been clearly delineated. Available data derived from kinetic studies have demonstrated that reduced catabolism of triglycerides is the predominant defect due to deficiency of lipoprotein lipase or hepatic triglyceride lipase or both.

HDL Cholesterol

There was marginal decrease in HDL cholesterol seen in patients as CKD stage progressed but was statistically insignificant (P>0.326).

P.O.Attman et al [5] found decrease in plasma HDL cholesterol concentration in patients with CRF. It was also reported that decreased HDL was associated with decrease in both the fractional catabolic rate and the total synthetic rate of ApoA1/HDL. The slow fractional catabolic rate of Apo A1 in patients with chronic renal failure could be a primary event resulting from a decrease in synthesis or secretion of Apo A1.

Total Cholesterol

There was increase of serum total cholesterol in patients as CKD stage progressed but this was not statistically significant (P > 0.223). P.O. Attman et al [5] in their study showed no significant change in levels of total cholesterol.

Thomas Quasctining et al [6] reported combined hyperlipidemia (elevated total cholesterol and triglycerides in their study).

VLDL

There is significant raise in VLDL levels in patients as CKD stage progressed (P<0.001). Gerald Appel et al [7] also showed increase in very low density lipoproteins (VLDL).

LDL

There was increase of serum LDL in patients as CKD stage progressed but this was not statistically significant (P >0.711).In uremia LDL lipoproteins are qualitatively altered.

The results of comparative study of lipid profile in chronic renal failure patients on conservative management and hemodialysis. Total cholesterol levels were marginally decreased in patients on hemodialysis as compared to patients treated by conservative line but this difference was statistically not significant (P>0.944). HDL levels were decreased in patients on hemodialysis compared to conservatively treated patients but this was also statistically not significant. (P>0.317). VLDL in hemodialysis group was modestly increased compared to conservative group but this was also statistically not significant (P>0.073). LDL values were lower in patient treated with hemodialysis as compared to patients treated conservatively however this difference was statistically not significant. (P>0.735). There was notable increase in triglycerides in patients treated with hemodialysis compared to patients on conservative treatment but this was statistically not significant (P>0.117).

5. Conclusion

In the present study we conclude that the lipid abnormalities in chronic renal failure accelerates the progression of the renal failure and predisposes to atherosclerosis it is worthwhile detecting and treating hyperlipidemia in chronic renal failure patients.

References

1. King W MA, Edward L Greene, Leopold Raij. Cardiovascular risk factors in chronic renal failure and hemodialysis populations. Am J kidney Dis.1992; 6:505-513.
2. Majumdar A, Wheeler DC. Lipid abnormalities in renal disease. J R Soc Med. 2000; 93:178-82.
3. Lidner A, Charra B, Sherrard D. Accelerated atherosclerosis in prolonged maintainance hemodialysis. N Engl J Med.1974; 290:697-701.
4. Karl Skorecki, Jacob Green, Barry M Brenner. Chronic renal failure, In: Harrison's principles of internal medicine 16th edn. Mc Graw Hill 2005. 1653-1663.
5. P.O Attman, Alaupovic P, M. Tavella , C Knignt , Gibson C. Abnormal lipid and apolipoprotein composition of major lipoprotein density classes in patients with chronic renal failure. Nephrol dial transplant. 1996; 11:63-69.
6. Thomas Quaschning, Vera Krane, Thomas Metzger, Christoph Wanner. Abnormalities in uremic Lipoprotein Metabolism and it's impact on cardiovascular disease. Am J kidney dis. 2001; 38:S14-S19.
7. Gerald appel, Jordan J Cohen, John T Harrington, Cheryl J Zusman. Lipid abnormalities in renal disease. Kidney int. 1991; 39:169-183.