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A Comparative Study of Variations of Lipid Profile in Patients of Chronic Kidney Disease and the Controls Coming to Pravara Rural Hospital, Loni

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Abstract: ***Background and Objective: Chronic kidney disease patients were found to have varied lipid profiles depending on the co - morbid conditions and also the treatment given. The lipid profiles of these patients in the western and the Indian subcontinent are widely varied in different studies. This study was undertaken to compare the lipid profile in CKD patients and healthy individuals in Pravara Rural Hospital, Loni, Ahmednagar. Method: This study was a comparative study which had been done over a period of two years in 40 patients with CKD (STAGE V - undergoing hemodialysis) vs.40 as control group which were AGE and SEX matched. The lipid profile was studied on these patients. Results: The mean value of serum triglycerides, total cholesterol and LDL was significantly higher than control group. HDL, VLDL was significantly lower than control group. The mean value of serum triglycerides, total cholesterol and LDL was highest in patients whose serum urea was >140mg/dL. The mean value of serum triglycerides, total cholesterol was higher in patients whose serum creatinine was >8 mg/dL. Conclusion: Significant amount of change in lipid profile was found in patients of CKD; hence it is worth while detecting and treating hyperlipidemia in chronic renal failure patients early on.***

Keywords: Chronic Kidney Disease, Hemodialysis, Lipid Profile

1. Introduction

Chronic kidney disease encompasses a spectrum of pathophysiological process associated with abnormal kidney function and a progressive decline in the glomerular filtration rate. The dispiriting term end stage renal disease represents a stage of CKD where the accumulation of toxins, fluids, and electrolytes normally excreted by the kidneys leads to death unless the toxins are removed by renal replacement therapy, using dialysis or kidney transplantation. Chronic renal failure (CRF) is an irreversible deteriorationofrenal function that results from diminished effective functioning of renal tissue. Impairment of excretory, metabolic and endocrine functions of the kidney leads to the development of clinical syndrome of uremia.

Cardiovascular disease is a leading cause of morbidity and mortality among patients with chronic renal failure. [1, 2] Dyslipidemia is a major risk factor for coronary heart disease and mainly serves in the identification and management of abnormalities in plasma lipids and lipoproteins.

In chronic renal failure, the most significant lipid disorders are hypertriglyceridemia and decreased HDL Concentration. LDL levers are eithernormal or marginally increased. There are reports available regarding accelerated atherosclerosis in chronic renal failure secondary to altered lipid metabolism. In recent years, the levels of high - density lipoproteins have gained significance in view of increasing reports that are available incriminating decreased HDL levels as one of risk factors. [3, 4]

The present study was conducted to compare variations in lipid pattern in patients of chronic kidney disease and patients of similar age group, to analyse lipid alterations that can occur in Chronic Kidney Disease patients and also to study the correlation between renal function and lipid abnormalities in Chronic Kidney disease.

2. Materials and Methods

Ethics Committee Approval:
The study was conducted after the ethics committee approval from the Institutional Ethics Committee of Pravara Institute of Medical Sciences, Loni after submitting the synopsis mentioning the proposed study details and protocols.

Research Design: Cross - Sectional Study.

Duration of Study: September 2018 to September 2020 (2years).

Study Setting: Present study was conducted in Pravara Rural Hospital, Loni, a tertiary care teaching hospital situated in the rural area of Ahmednagar District

Sample Size: A total of 80 patients were included with 40 as CASES of Chronic Kidney Disease and 40 as CONTROLS which were AGE and SEX matched.

Size n = [DEFF*Np (1 - p)]/ [(d^2 / $Z^2_{1-\alpha/2}$* (N - 1) +p* (1 - p)]

For Chronic Kidney Disease Patients

Inclusion Criteria

- Patients above 12 years of age admitted in Pravara Rural Hospital, Loni
- Either gender.
- Patient or patients relatives willing to give consent
- Established Chronic Kidney Disease on blood parameters and radiological evidence

Exclusion Criteria

- Patients with Acute kidney injury, nephrotic Syndrome, genetic disorders
- HIV and HBsAg positive patients.

For non chronic kidney disease patients:

Inclusion Criteria:

- Patients above 12 years of age admitted in pravara rural hospital, loni.
- Either gender
- Patients or patients relatives willing to give consent

Exclusion Criteria:

- Established renal failure on blood parameters and radiological evidence
- Hiv/hbsag positive patients

Diagnostic criteria for chronic renal failure

1) Clinical signs and symptoms of uremia
2) 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.

Method

All the selected patients were subjected to detailed history and complete physical examination and data collected was noted in a pre - designed proforma.

The control group was formed by 40 healthy persons, which was age and sex matched to the study group.

Clinical criteria for chronic renal failure:

- The clinical signs and symptoms are not much absolute and are non - specific, and can occur only in the later stage and are not dependable.
- The feature of uremia includes fatigue, lethargy, headache, muscular irritabilities, cramps, coma.
- Cardiovascular and pulmonary disturbances can be in thethe form of congestive cardiac failure, pulmonary edema, pericarditis and arrhythmias.
- Haematological disturbances are in the form of anemia and bleeding diathesis. Gastrointestinal disturbances are in the form of anorexia, nausea, vomiting,
- gastroenteritis, peptic ulcer and gastrointestinal bleeding.
- Features of Hyperparathyroidism are mostly in the form of osteomalacia, bone pains, fractures and osteomalacic myopathy.
- Clinical evidence of pallor, edema, Hypertension, pericarditis, CCF, pulmonary edema, hypertensive retinopathy changes was mostly noted.

Stages of chronic kidney disease

Stage	Description	GFR ml/min /1.73m2
1	Kidney damage with normal or high GFR	GFR > 90
2	Kidney damage with mild loss of kidney function or	60 - 89
3	Moderate ↓ GFR	30 - 59
4	Severe ↓ GFR	15 - 29
5	Kidney failure	<15 (or dialysis)

The CKD - EPI Creatinine Equation

The CKD - EPI creatinine equation is based on the same four variables as the MDRD Study equation, but uses a 2 - slope "spline" to model the relationship between estimated GFR and serum creatinine, and a different relationship for age, sex and race. The equation was reported to perform better and with less bias than the MDRD Study equation, especially in patients with higher GFR.

$GFR = 141 \times \min(scr/k, 1)^{\alpha} \times \max(scr/k, 1)^{-1.209} \times 0.993^{Age} \times 1.018$ (if female) X 1.159 (if black)

Urine Findings:

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

Biochemical Findings:

The presence of Chronic Kidney disease was established on the basis of presence of kidney damage and the level of kidney function (GFR). Markers of kidney damage included abnormalities in composition of blood (elevated blood urea, serum creatinine) or abnormalities in urine or abnormalities in the imaging tests (ultrasonogram).

Ultrasonogram:

Bilateral shrunken Kidneys [5] (<8.5cm) with loss of corticomedullary differentiation was taken as indicative of chronic renal failure.

Blood sampling and preparation of serum

Blood samples were drawn from the patients after a minimum of 12 hours of fasting. The vene puncture was done in cubital fossa. About 12 ml of blood was drawn using perfectly sterile syringe. About 10ml of blood was transfused to the dried glass vials. Serum was separated within 2 hours after collection which prevents artefactal change in concentration of HDL. After the clot retraction occurred, the serum was transferred out into to a centrifuge tube and centrifuged at 5000 rpm for 10 minutes. The supernatant clear serum was then pipetted out with the help of dry piston pipettes with disposable tips and then stored in dry thin walled vials at 4°C. The samples were analysed on the same day.

Lipid classification according to NCEP program III

Risk factor	
LDL –C (mg/dl)	**GOAL**
< 100	Optimal
100 - 129	Near or above optimal
130 - 159	Borderline high

160 - 189	High
> 190	Very high
Total cholesterol (mg/dl)	
< 200	Desirable
200 - 239	Borderline high
> 240	High
HDL – C (mg/dl)	
< 40	Low
< 60	High
Triglycerides (mg/dl)	
< 150	Normal
150 - 199	Border line high
200 - 499	High
>500	Very high

Apart from mentioned biochemical assays, the other investigations set out in the proforma were carried out as required.

3. Observations and Results

Present study was conducted at PRAVARA RURAL HOSPITAL, LONI from the year September 2018 to September 2020 with 40 patients as cases of chronic kidney disease and 40 as controls getting admitted which are age and sex matched.

In the present study, 40 patients of chronic kidney disease and 40 as controls were taken. The maximum numbers of patients were in the age group of 61 - 70 years (6^{th} decade) (30%). The mean age in patients of CKD was 57.78 ± 17.25 years. In our study there were 26 males (65%) and 14 females (35%). The male to female ratio was 1.85: 1.

17 out of 40 patients were hypertensive (42.5%), 7 out of 40 patients were cases of Type 2 DM (17.5%), 40% of the patients did not have neither hypertension or type 2 diabetes mellitus, 97.5% of patients of the control group did not have either hypertension or type 2 diabetes mellitus and comparison of the past history among cases and controls showed statistically significant difference.

In the study, 85% of the patients of the CKD had oliguria, 75% of the patients of CKD had facial puffiness and 67.5% of the cases had breathlessness.

According to sign, Oedema was found in 42.5% of the patients of CKD, 32.5% patients of CKD had pallor, 15% of the patients showed signs of hypertension, 10% of the patients did not show any signs, 82.5% of the controls did not show any signs but 10% had pallor, 5% showed signs of hypertension and 2.5% had ascites.

The mean value of serum triglycerides (202.36), total cholesterol (181.13) and LDL (114.44) was significantly higher than control group. HDL (30.42) and VLDL (33.77) was significantly lower than control group.

Hb was found lower in case group (8.75 g/dL) as compared to control group (11.31 g/dL) which was found to be statistically significant. (P= 0.001)

The mean value of serum urea (126.159 mg/dL), serum creatinine (8.007 mg/dL) and serum potassium (5.76 mmol/L) was significantly higher as compared to the controls. The mean value of serum sodium was significantly higher in the controls (135.84 mEq/L) when compared to the mean value of cases.

The mean value of serum triglycerides, total cholesterol and LDL was highest in patients whose serum urea was > 140. The mean value of serum triglycerides, total cholesterol and LDL was higher in patients whose serum creatinine was in between >8.

According to fundus evolution, hypertensive retinopathy was seen in 37.5 %of the cases of CKD, diabetic retinopathy was seen in 10% of CKD patients, 2 out of 40 patients of CKD showed changes of both Diabetic and Hypertensive retinopathy (Mixed Retinopathy) and 47.5% of the cases showed no changes in the fundus whereas no patient in the control group showed any changes in the fundus.

The mean value of both, right and left kidney in cases had lower mean value (7.702±0.68 and 7.78±0.59 cms, respectively) when compared to the control group (10.91±0.71 and 10.54±0.88 cms, respectively).

4. Discussion

A total of 80 patients were included in the study out of which forty patients were of chronic kidney disease and forty were AGE and SEX matched controls. The patients included were ≥ 12years of age. The cases OF CKD patients were undergoing hemodialysis (STAGE V).

In present study of total 80 patients, there were 40 cases of CKD with 40 patients as controls. Among them there were 52 males (65%) and 28 females (35%). The male to female ratio was 1.85: 1. Similar to our study, in a study conducted by Chaudhari T (2017) [6] et al, out of 50 patients there were 32 (64%) males and 18 (36%) females and male to female ratio was 1.77: 1.

In our study the maximum number of patients belonged to the age group of 61 - 70 years. The mean age in our study was 57 years. The youngest patient was of 19 years while the oldest patient was of 86 years. Similar to our study in a study conducted by Chaudhari T (2017) [8]et al, the maximum number of patients belonged to the age group of 61 - 70 years. The mean age was 57.8 yrs. Contrary to our study, in a study conducted by Raju SSK (2013) [7] et althe maximum number of patients were in the age group of 51 - 60 with mean age being 45.24yearrs.

Association of type 2 Diabetes Mellitus and Hypertension with Chronic Kidney Disease

In present study, 42.5% of patients were of hypertension and 17.5% were of type 2 diabetes mellitus. Similar to our study, in a study conducted by Modi GK and Jha V (2006) [8] 53% of patients had hypertension. Similarly in a study conducted by Vinay Sakhuja V and Sud K (2003) [9] 24% of patients had type 2 diabetes mellitus. Contrary to our findings, in a study conducted by Chaudhari T (2017) [8] et al, 20% of the patients had hypertension whereas 32% of the patients had type 2 diabetes mellitus.

Signs and Symptoms in Chronic Kidney Disease

In present study, 85% of the patients had oliguria, 75% of the patients had facial puffiness, 67.5% of patients had breathlessness while 42.5% had oedema and 15% showed signs of hypertension. Pallor was present in 32.5% of patients. Similar to our study, 76% of patients had oliguria in a study conducted by Chaudhari T (2017) [8]et al. Contrary to our study, in a study conducted by Sharma M (2019) [10] et al.58 60% of patients had oliguria.

Association of lipid profile in patients of CKD

STUDIES	Triglycerides (mg/dL)	Total Cholesterol (mg/dL)	HDL (mg/dL)	LDL (mg/dL)	VLDL (mg/dL)
PRESENT STUDY	202.36	181.13	30.42	114.4	33.77
Raju SSK (2013) [9]et al	195.4	173.71	29.97	104.6	39.08
Maheshwari N (2010) [11] et al	270.74	131.3	24.62	95.34	25.77

Anaemia in CKD:

In present study, the mean haemoglobin was 8.75 gm/dL. Similar to present study in a study conducted by Halal MP (2015) [12] et al mean Hb was 7.7 gm/dL. Also, similar findings were seen in a study conducted by Chaudhari T (2017) [8]et al, where the mean value of Hb was 7.80. Contradictory to our study, in a study conducted by DruekeTB (2006) [13] et al with the mean values were 11.06

Renal function tests in patients of CKD:

STUDIES	S. Urea mg/dL	S. Creatinine mg/dL	S. Sodium mEq/L	S. Potassium mmol/L
PRESENT	126.15	8.0	129.5	5.76
Raju SSK (2013) [9]et al	125.4	7.2	128	5.9
Chaudhari T (2017) [8]et al	124	8.42	139.5	5.11
Halal MP (2015) [14] et al	122	8.62	136.8	5.3
Maheshwari N (2010) [13] et al	118.6	7.67	124	5.8

Fundus Examination in Patients of CKD:

Studies	HTN Retinopathy (%)	Diabetic Retinopathy (%)	Mixed (%)	Normal (%)
Present Study	37.5	10	5	47.5
*Pathak AH (2020) [14] et al	40	28	15	-
MalleshwariB (2016) [15] et al	48	31	-	20
# Singh B (2019) [16] et al	30.4	9.38	24.22	32.8

*In a study conducted byPathak AH (2020) et al, 17% cases had vein occlusion, optic atrophy and retinal detachment.
#In a study conducted by Singh B (2019) et al, 2.8% patients had papilloedema and 0.8% patients had macular oedema.

Kidney size in patients of CKD:

In present study, the mean values of right kidney size and left kidney size as seen in USG were 7.7cms and 7.78 cms, respectively. Similar to our study, in a study conducted by Zhang WX (2014) [17] et al the mean values of right and left kidney size were 7.9 cms and 7.6 cms, respectively.

Contrary to our study, in a study conducted by Kodikara I (2019) [18] et al, the mean values of right kidney and left kidney size were 8.9 cms and 8.9 cms, respectively. In contrast to our study, in a study conducted by Makusidi MA (2014) [191] et al, the mean values of right kidney and left kidney size were 9.11 cms and 9.23 cms, respectively.

5. Limitations

Present study does not compare the caloric intake and the triglyceride levels. All patients of CKD were of Stage V (undergoing hemodialysis) hence stage wise effect on lipid profile could not be assessed.

6. Conclusions

Chronic kidney disease, due to its alteration in lipid metabolism can lead on to increased atherogenesis and contribute to mortality. The mean value of Serum Triglycerides and Total Cholesterol were highest in patients whose Serum Urea was>140. The reason may also be attributed to the fact that Dialysate has acetate which gets converted to Long chain Fatty Acids which then gets converted to cholesterol.

But the periodic monitoring and maintenance of lipid profiles within recommended range in CKD patients is required. Significant amount of change in lipid profile was found in patients of CKD; hence it is worthwhile detecting and treating hyperlipidemia in chronic renal failure patients periodically.

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