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# Evaluation of lipid profile in dialysis dependent chronic kidney disease

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**Abstract**
**Background:** Patients with end stage renal disease are at increased risk of cardiovascular morbidity and mortality. Dyslipidemia is an important risk factor of mortality and morbidity due to cardiovascular disease. The aim of the study was to evaluate the lipid profile in dialysis dependent chronic kidney disease.
**Methodology:** The study included 30 consecutive cases of dialysis dependent chronic kidney disease and 30 controls matched for age and sex. The patients were investigated for serum electrolytes, haemoglobin, fasting blood sugar, glycosylated haemoglobin, serum electrolytes and fasting lipid profile.
**Results:** The age and gender of the patient was comparable in both the groups ($p$>0.05). The majority of the patient in both cases and controls were in the age group of 51-65 year. Males predominated over females but distribution of both sexes was comparable in both the groups. Patients with CKD had a significantly higher number of patients with diabetes mellitus (10/30; 33%) compared to three (10%) in controls. 57% of the cases with CKD were hypertensive and significantly higher compared to 10% in controls. On ultrasonography, kidney size was found to be significantly reduced in size in 13 cases (43%) as a consequence of CKD. The eGFR was 6.67+3.03 in cases which was significantly lower compared to 76.73+25.35 in controls ($p$<0.05). Serum cholesterol was found to be within normal limit and comparable among cases and controls ($p$>0.05). Serum LDL was raised in 1 case of CKD and none in controls ($p$>0.05). Serum HDL cholesterol was found to be significantly lower than expected value in 19 cases (63%) compared to 8 controls (27%) ($p$<0.05). Serum TG level was significantly increased in 20 cases (67%) compared to 7% of controls. Serum VLDL was comparable in both groups ($p$>0.05).
**Conclusion:** CKD patients on hemodialysis are predisposed to dyslipidemia. Dyslipidemia may further aggravate renal failure and cardiovascular events. Hence it is important to treat dyslipidemia in these patients

**Keywords:** Lipid Profile, dialysis dependent and chronic kidney disease

## Introduction
Chronic kidney disease (CKD) is a public health problem with increasing prevalence, poor outcomes and high costs [1]. CKD as defined by the KDIGO, is kidney damage, either structural or functional or a persistent decrease in GFR to less than 60 ml/ min /1.73m$^2$ for ≥ 3 months with or without kidney damage [2].
The spectrum of dyslipidemia is distinct in patients with CKD and dialysis than general population. All lipoprotein classes are involved and varies according to stage of CKD [3]. In hemodialysis (HD) patients total cholesterol (TC) and low density lipoprotein (LDL) are relatively normal, triglycerides levels are elevated with a low high density lipoprotein (HDL) [4]. The increased levels of triglyceride rich lipoprotein can be attributed to impaired carbohydrate tolerance, enhanced hepatic VLDL synthesis and reduced catabolic rate [5]. The reduced catabolic rate results from decreased lipase activity due to enzyme pool depletion by heparinization in HD patients [6].
There are many factors responsible for decrease in HDL. Patients with impaired kidney function have decreased levels of apolipoproteins AI and AII. Also CKD patients have impaired activity of lecithin–cholesterol acyl transferase responsible for the esterification of free cholesterol in HDL and increased the activity of cholesterol ester transfer protein which transfers cholesterol esters from HDL to triglyceride-rich lipoproteins.

Also paraoxonase activity is also impaired resulting in impaired antioxidative and anti-inflammatory function of HDL [4]. The plasma LDL levels may not be elevated in advanced CKD patients on HD but shows qualitative changes leading to increased atherogenicity [3].
The study was aimed to evaluate the lipid profile in patients on hemodialysis in a tertiary care centre in east India.

## Methodology
The study was approved by institutional ethics committee and adhered to the tenets of declaration of Helinski. The cross sectional observational study was carried in a tertiary care hospital in east India. Informed written consent was taken from the study subjects. Patients more than twenty years of age and diagnosed as dialysis dependent chronic kidney disease were included in the study. Patients with renal transplant and on lipid lowering agents were excluded from the study.
Sixty study subjects were included: thirty healthy study subjects and thirty diagnosed cases of chronic kidney disease on hemodialysis. Demographic details, history of hypertension and diabetes, general and clinical examination along with fundus evaluation of the patient were performed. Serum lipid profile after overnight fasting, fasting blood glucose, glycosylated haemoglobin, complete blood count, serum urea, creatinine, serum sodium and potassium were assayed in a single laboratory. Glomerular filtration rate was estimated by Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation where GFR was calculated as $141 \times \min(Scr/\kappa, 1)\alpha \times \max(Scr/\kappa, 1)-1.209 \times 0.993Age \times 1.018$ [if female] × 1.159 [if black] where Scr is serum creatinine in mg/dL, κ is 0.7 for females and 0.9 for males, α is -0.329 for females and -0.411 for males, min indicates the minimum of Scr/κ or 1, and max indicates the maximum of Scr/κ or 1.Ultrasonography of the kidney was also performed [7].

## Statistical analysis
Data was entered in Microsoft excel spread sheet in Window 7 and analysed statistically using SPSS software version 22. The results were quantified in number and percentage. Fisher's exact test value was used. Results were considered significant if the 'p' value was below 0.05

## Results
### Demography and systemic parameters
The age and gender of the patient was comparable in both the groups ($p$>0.05). The majority of the patient in both cases and controls were in the age group of 51-65 year. Males predominated over females but distribution of both sexes was comparable in both the groups. Patients with CKD had a significantly higher no of patients with diabetes mellitus (10/30; 33%) compared to three (10%) in controls. 57% of the cases with CKD were hypertensive and significantly higher compared to 10% in controls. **Table 1** outlines demographic parameters. By comparing among cases and controls, on ultrasonography, kidney size was found to be significantly reduced in size in 13 cases (43%) as a consequence of CKD.

**Table 1:** Demographic profile of study cohort

| Parameters | CASES No. (%) | CONTROLS No. (%) |
|---|---|---|
| **Age Group (in years)** | | |
| 20-35 | 6 (20) | 7 (23) |
| 36-50 | 7 (23) | 8 (27) |
| 51-65 | 13 (43) | 12 (40) |
| >65 | 4 (14) | 3 (10) |
| **Gender** | | |
| Male | 20 (67) | 19 (63) |
| Female | 10 (33) | 11 (37) |

## Biochemical Parameters
The eGFR was 6.67+3.03 in cases which was significantly lower compared to 76.73+25.35 in controls ($p$<0.05). Glycosylated haemoglobin (HbA1c) value was found to be significantly elevated in 33% of cases compared to 10% in controls. Anaemia was found to be more prevalent in CKD patients and present in 26 cases (87%) and 14 (47%) controls ($p$<0.05). **Table 2** outlines the biochemical parameters in the study population.

**Table 2:** Biochemical parameters in the study cohort

| Parameters | Cases (Number %) | Controls (Number %) | P value |
|---|---|---|---|
| **RBS (mg/dl)** | | | |
| >200 | 10 (33) | 3 (10) | < 0.05 |
| <200 | 20 (67) | 27 (90) | |
| **HbA1c** | | | |
| >6.5 | 10 (33) | 3 (10) | < 0.05 |
| <6.5 | 20 (67) | 27 (90) | |
| **Serum Potassium (mmol/l)** | | | |
| <3.5 | 2 (7) | 0 (0) | <0.01 |
| 3.5-5 | 15 (50) | 30 (100) | |
| >5.0 | 13 (43) | 0 (0) | |
| **Serum Sodium (mmol/l)** | | | |
| <135 | 1(3) | 0 (0) | <0.01 |
| 135-150 | 27 (90) | 30 (100) | |
| >150 | 2 (7) | 0 (0) | |

**Electrolyte distribution among Cases and Controls**

Hyperkalemia was found to be present in 13 cases (43%) of CKD and none in control. Two out of 30 CKD cases (7%) were hypernatremic and 1 case (3%) was hyponatremic.

**Serum lipid profile**

Serum cholesterol was found to be within normal limit and comparable among cases and controls (p.0.05). Serum LDL was raised in 1 case of CKD and none in controls ($p$>0.05). Serum HDL cholesterol was found to be significantly lower than expected value in 19 cases (63%) compared to 8 controls (27%) ($p$<0.05). Serum TG level was significantly increased in 20 (67%) cases compared to 7% of controls. Serum VLDL was comparable in both groups ($p$>0.05). Table 3 outlines the distribution of lipid parameters in study subjects across different categories.

**Table 3:** Lipid profile in the study cohort.

| Parameters (mg/dl) | Range (mg/dl) | Cases No. (%) | Controls No. (%) | P value |
|---|---|---|---|---|
| Serum cholesterol | Optimal (<200) | 27 (90) | 29 (97) | >0.05 |
| | Borderline (200-239) | 3 (10) | 1 (3) | |
| | High risk (>240) | 0 | 0 | |
| Serum LDL | Optimal (<100) | 24 (80) | 28 (93) | >0.05 |
| | Borderline (100-129) | 5 (17) | 2 (7) | |
| | High risk (>130) | 1 (3) | 0 | |
| Serum HDL | Optimal (>60) | 0 | 0 | <0.05 |
| | Borderline (40-60) | 11 (37) | 22 (73) | |
| | High risk (<40) | 19 (63) | 8 (27) | |
| Serum TG | Optimal (<150) | 4 (13) | 26 (86) | <0.01 |
| | Borderline (150-199) | 6 (20) | 2 (7) | |
| | High risk (<200) | 20 (67) | 2 (7) | |
| Serum VLDL | Optimal (20-29) | 16 (53) | 17 (57) | >0.05 |
| | Borderline (30-40) | 11 (37) | 12 (40) | |
| | High risk (>40) | 3 (10) | 1 (3) | |

**Discussion**

The incidence and prevalence of chronic kidney disease (CKD) are increasing worldwide and are associated with poor outcomes. In patients undergoing dialysis more than half of the patients have cardiovascular disease (CVD) [8]. Dyslipidemia is an established risk factor for CVD and high TC, LDL, TG and low HDL values are important independent predictors of cardiovascular events in general population [4]. Dyslipidemia has also been associated independently with renal replacement therapy and rapid renal progression in CKD [9]. CKD with dialysis leads to both quantitative and qualitative lipid abnormalities resulting in specific dyslipidemia [4]. This study was aimed to study the pattern of lipid profile in patients on hemodialysis in stage 5 CKD.

Studies have reported higher incidence of ESRD in males compared to females [10, 11, 12]. In our study also there was male predominance with the male to female ratio was 2:1 in cases and 1.7:1 in controls. Diabetes has been associated with increased risk of ESRD and death associated with CKD [13]. In SEEK (Screening and Early Evaluation of Kidney Disease) study, 31.6% of the CKD patients had diabetes (12). In our study Diabetes Mellitus was found to present in 10 patients (33%) of CKD. The prevalence of anaemia has been reported as 67%-82% in the CKD stages 5 [14, 15]. In our study, anaemia was found in 87% cases of CKD.

Study have shown statistically significant positive correlation between renal echogenicity grading and mean longitudinal size [16]. Renal length has been considered a surrogate marker of renal function as it decreases with decreasing renal function. In our study, kidney size was found to be reduced in cases as a marker of decreasing renal function.

The classic lipid profile of CKD patient on dialysis mirrors that of predialytic renal failure comprising of hypertriglyceridemia, low HDLC, and low elevated lipoprotein [17]. TC and LDL are relatively normal [4, 18]. In a study 30.3% of the patients had total cholesterol level less than 160 mg/dl [19]. Another study observed that in CKD patients TG in serum is increased in 80% patients, HDL is decreased in 60% of CKD patients with no change in total cholesterol and LDL level [20]. Garg *et al*. observed that the 17% had TG in borderline high range (150-199 mg/dl) and 80% had TG in high range (200-499 mg/dl), 3% had high LDL levels and 87% had low HDL values <40 mg/dl and 13% had HDL values >40mg/dl [21]. Out of total 100 patients studied, 51% had TG found to be elevated in borderline risk and 14% had TG in high risk and 65% had HDL values <40mg/dl [22]. In concordance with these studies, total cholesterol was optimal in 90% of the patients with CKD while 10% of them had borderline values (200-239 mg/dl) in the present study. HDL cholesterol was found to be less than 40 mg/dl and hence high risk in 19 cases (63%) compared to 27% of the controls. 67% of the patients with CKD had TG greater than 200 mg/dl significantly higher when compared to 7% of the controls. Only 13% of the patients had optimal range TG which was significantly lower compared to 86% of the controls. Triglyceride level was in high risk range in 20 cases (67%) of CKD which was significantly increased compared to 7% of the controls. The distribution of patients and controls were comparable for LDL and VLDL in all the three categories (optimal, borderline risk, high risk).

**Conclusion**

Dyslipidemia in CKD patients on hemodialysis may predispose patients to cardiovascular events and may further accentuate renal failure. Hence it is pertinent to investigate and treat dyslipidemia early in the course of disease as it may prevent the further progression of renal damage.

**References**

1. Eknoyan G, Lameire N, Barsoum R, Eckardt KU, Levin A *et al*. The burden of kidney disease: improving global outcomes. Kidney Int. 2004; 66:1310- 1314.
2. Levey AS, Eckardt KU, Tsukamoto Y, Levin A, Coresh

J *et al*. Definition and classification of chronic kidney disease: a position statement from Kidney Disease: Improving Global Outcomes (KDIGO). Kidney Int. 2005; 67:2089-2100.
3. Kwan BC, Kronenberg F, Beddhu S, Cheung AK. Lipoprotein metabolism and lipid management in chronic kidney disease. Journal of the American Society of Nephrology. 2007; 18(4):1246-61.
4. Mikolasevic I, Zutelija M, Mavrinac V, Orlic L. Dyslipidemia in patients with chronic kidney disease: etiology and management. Int J Nephrol Renovasc Dis. 2017; 10:35-45. doi: 10.2147/IJNRD.S101808. PMID: 28223836; PMCID: PMC5304971.
5. Appel G: Lipid abnormalities in renal disease. Kidney Int. 1991; 39:169-183.
6. Arnadottir M: Pathogenesis of dyslipoproteinemia in renal insufficiency: The role of lipoprotein lipase and hepatic lipase. Scand J Clin Lab Invest. 1997; 57:1-11.
7. Levey AS, Stevens LA, Schmid CH *et al*. A new equation to estimate glomerular filtration rate [published correction appears in Ann Intern Med. 2011; 155(6):408. Ann Intern Med. 2009; 150(9):604-612. doi:10.7326/0003-4819-150-9-200905050-00006.
8. Cozzolino M, Mangano M, Stucchi A, Ciceri P, Conte F, Galassi A. Cardiovascular disease in dialysis patients. Nephrol Dial Transplant. 2018; 33(3):28-34. doi: 10.1093/ndt/gfy174. PMID: 30281132; PMCID: PMC6168816.
9. Chen SC, Hung CC, Kuo MC, Lee JJ, Chiu YW, Chang JM. Association of dyslipidemia with renal outcomes in chronic kidney disease. PLoS One. 2013; 8(2):e55643.
10. Neugarten J, Acharya A, Silbiger SR. Effect of gender on the progression of nondiabetic renal disease: a meta-analysis. J Am Soc Nephrol. 2000; 11:319-329.
11. Trivedi H, Vanikar A, Patel H, Kanodia K, Kute V, Nigam L. High prevalence of chronic kidney disease in a semi-urban population of Western India. Clinical kidney journal. 2016; 9(3):438-43.
12. Singh AK, Farag YM, Mittal BV *et al.* Epidemiology and risk factors of chronic kidney disease in India – results from the SEEK (Screening and Early Evaluation of Kidney Disease) study. BMC Nephrol. 2013; 14:114.
13. Collins AJ, Vassalotti JA, Wang C, Li S, Gilbertson DT, Liu J. Who should be targeted for CKD screening? Impact of diabetes, hypertension, and cardiovascular disease. American Journal of Kidney Diseases. 2009; 53(3):S71-7.
14. Shaheen FA, Souqiyyeh MZ, Al-Attar BA, Karkar A, Al Jazairi AM, Badawi LS. Prevalence of anemia in predialysis chronic kidney disease patients. Saudi Journal of Kidney Diseases and Transplantation. 2011; 22(3):456.
15. Valderrábano F. Anaemia management in chronic kidney disease patients: an overview of current clinical practice. Nephrology Dialysis Transplantation. 2002; 17(1):13-8.
16. Siddappa JK, Singla S, Mohammed Al Ameen SC, Kumar N. Correlation of Ultra sonographic Parameters with Serum Creatinine in Chronic Kidney Disease. J Clin Imaging Sci. 2013; 3:28.
17. Tsimihodimos V, Dounousi E, Siamopoulos KC. Dyslipidemia in chronic kidney disease: an approach to pathogenesis and treatment. Am J Nephrol. 2008; 28(6):958-73.
18. Reiss AB, Voloshyna I, De Leon J, Miyawaki N, Mattana J. Cholesterol metabolism in CKD. Am J Kidney Diseases. 2015; 66(6):1071-82.
19. Liu Y, Coresh J, Eustace JA *et al*. Association between cholesterol level and mortality in dialysis patients: role of inflammation and malnutrition. JAMA. 2004; 291:451-459.
20. Baria D, Joshi V, Shah T, Gandha K, Modi N. Impact of hemodialysis on lipid profile among chronic renal failure patients. International Journal of Scientific and Research Publications. 2013; 3(7):2.
21. Garg G, Chawla SM, Kaur S. A Clinical Study of Dyslipidemia in Patients of Chronic Kidney Disease. Intl J Bioassays. 2015; 4(3):3732-7.
22. Dhandapani E, Arun K, Manam A. Pattern of Dyslipidemia in Chronic Kidney Disease. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2015; 6(5):899-905.