Section: Medicine

Original Research Article

# CHANGES IN LIPID PROFILE IN CHRONIC KIDNEY DISEASE PATIENTS ON HEMODIALYSIS

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**ABSTRACT**

**Background:** To evaluate changes in lipid profile status in CKD patients on hemodialysis.

**Materials and Methods:** Patients with confirm cases of chronic kidney disease satisfying following inclusion criteria and having exclusion criteria were taken up for the study. The patients underwent a comprehensive clinical and lab investigation for study. Personal characteristics like age, sex, weight height, address was noted. Patients were enquired for presence of family history of chronic kidney disease or whether patient is undergoing dialysis for the chronic kidney disease, presence or absence of diabetes mellitus and endocrine status in patients of chronic kidney disease.

**Results:** There was a statistically significant decrease in high-density lipoprotein (HDL) and an increase in triglycerides (TG) and very-low-density lipoprotein (VLDL) levels in CKD patients on hemodialysis when compared with CKD patients.

**Conclusion:** Earlystage evaluation of dyslipedimia in CKD patients on haemodialysis may reduce the incidence of atherosclerotic cardiovascular diseases [ACVD].

**Keywords:** Dyslipedimia, CKD, Haemodialysis, Atherosclerotic Cardiovascular Diseases [ACVD].

## INTRODUCTION

Chronic kidney disease results when a disease process affects the structure or functional integrity of the kidney. Cardiovascular disease (CVD) is one of the major cause of mortality in patients with chronic kidney disease (CKD) and end-stage renal disease (ESRD) Hypertriglyceridemia is the most common plasma lipid abnormality in patients with renal failure, coexisting with cholesterol levels within the normal range. Lipid abnormalities are common in patients with renal disease, probably contributing to the high incidence of cardiovascular diseases in this population.[1,2]

Cardiovascular mortality is approximately 500 times higher in patients with age of 35 to 60-year-old ESRD patients than in individuals from the healthy population of the same age and race in Indian scenarios. Cardiovascular pathology in CKD patients can be explained by presence of many risk factor like hyperlipidemia hypertension DM smoking and obesity in being hyperlipidemia is one of the major risk factors for atherosclerosis. In previous done studies it was found that dislipidemia is associated with CKD disease and its prognosis and vice versa. Lipid profile status was also different in CKD patients those on hemodialysis then those on conservative management. The purpose of the study is to find out lipid profile changes in CKD patients on hemodialysis.[3-5]

## MATERIAL AND METHODS

**Place of Study:** Department of Medicine RKDF Medical College Bhopal

**Study Group:** Confirm cases of chronic kidney disease less than 60 years of age.

**Type of Study/Study Design:** Prospective study

**Duration of the study:** 15 months after approval from Institutional Ethics Committee in Govt.

Consent: Informed/ Written consent will be obtained from the patient to participate in this study

**Inclusion Criteria**

1. Patients with chronic kidney disease less than 60 years of age.
2. With known chronic kidney disease patient on hemodialysis.
3. Patients of chronic kidney disease on hemodialysis who give consent

**Exclusion Criteria**

1. Patients with acute renal failure
2. Nephrotic syndrome.
3. Patients on drugs affecting lipid metabolism.
4. Patients of chronic kidney disease with diabetes mellitus.
5. Patients of known case of hypothyroidism.
6. Cases of familiar hypercholesterolemia.

**Study Population:** Confirm cases of chronic kidney disease less than 60 years of age at Department of Medicine, RKDF Medical College, Bhopal MP.

**Sampling Technique:** Consecutive sampling technique will be used.

**Sample Size:** Number of patients presenting in the study period who satisfy the inclusion and exclusion criteria will be included in the study.

**Data Collection:** The following data will be safeguarded in a personal protected computer (MS Excel sheet) and collected in a structured case record form/ Performa

**Selection of Patients**

Patients with confirm cases of chronic kidney disease less than 45 years of age who presenting to Department of Medicine satisfying following inclusion criteria and having exclusion criteria were taken up for the study.

**Study Method:** The study will be conducted as per Good clinical practice guidelines and after due approval from the Institutional Ethics Committee. Patients meeting the eligibility criteria will be enrolled in the study after obtaining a written informed consent. The patients will undergo a comprehensive clinical and lab investigation for study through well-structured face to face interviews, at the hospital. Personal characteristics like age, sex, weight height, address was noted. Patients were enquired for presence of family history of chronic kidney disease or whether patient is undergoing dialysis for the chronic kidney disease, presence or absence of diabetes mellitus and endocrine status in patients of chronic kidney disease.

## RESULTS

Figure 1 shows the mean of different parameters of lipid profile of both the groups. The mean values of total cholesterol, TG, HDL, LDL, and VLDL in Group A were found to be 194.00 ± 6.12 mg/dl, 194.64 ± 21.20 mg/dl,39.99 ± 6.47 mg/dl, 101.94 ± 21.89 mg/dl, and 40.62 ± 4.80 mg/dl, respectively, and in Group B, the mean values of total cholesterol, TG, HDL, LDL and VLDL were found to be 217.60 ± 9.47 mg/dl, 240.20 ± 35.40 mg/dl, 35.23 ± 6.05 mg/dl, 120.22 ± 38.53 mg/dl, and 50.32 ± 8.00 mg/dl, respectively.

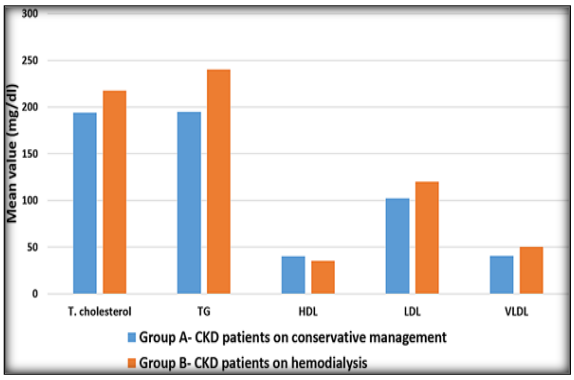


**Figure 1**

Table 1 shows the age and sex of the study participants. Their age varied from 28 years to 77 years with the mean age of 46.42±12.88 years. A total number of 105 subjects were included in the study and divided into two groups. Group A included 55 CKD patients on conservative management and Group B included 50 CKD patients on hemodialysis. CKD patients in both the groups were mostly in the age group of 41-60 years. The mean age of CKD patients on conservative management was 44.02±13.20 years and that of CKD patients on hemodialysis was 49.08±12.11 years. The difference in mean age between two groups was found to be statistically significant (P<0.05). In both the groups, male patients were more than females. Group A comprised 42 (76.4%) males and 13 (23.6%) females while Group B comprised 32 (64.0%) males and 18 (36.0%) females. The association of age and sex with CKD patients on conservative management and on hemodialysis was not significant

**Statistical Analysis**

The collected data was summarized by using frequency, percentage, mean & S.D. To compare the qualitative outcome measures Chi-square test or Fisher's exact test was used. To compare the quantitative outcome measures independent t test was used. If data was not following normal distribution, Mann Whitney U test was used. SPSS version 22 software was used to analyse the collected data. Different parameters of lipid profile were expressed in terms of mean±SD. Chi-square test was applied to see the association of age and sex with CKD patients on conservative management and on hemodialysis and the unpaired t-test was used to see the difference in the mean values of lipid analytes. A P-value of <0.05 was statistically significant.

**Table 1: Age and Sex of Patients in Both Groups**

| Variable | | Group A: CKD patients on conservative management | Group B: CKD patients on hemodialysis | Chi-square value | P valve |
|---|---|---|---|---|---|
| age | 30-40 | 16 | 12 | | |
| | 40-50 | 32 | 28 | | |
| | 50-60 | 7 | 10 | 1.132 | 0.56 |
| sex | Male | 42 | 32 | 1.924 | 0.16 |
| | **female** | **13** | **18** | | |

**Table 2: Lipid Profile of CKD Patients on Conservative Management and CKD Patients on Hemodialysis**

| Serum lipids (mg/dl) | Group A – CKD patients on conservative management (Mean ±SD) | Group B – CKD patients on hemodialysis (Mean ± SD) | P valve |
|---|---|---|---|
| Total cholesterol | 194.0 ± 6.12 | 217.60 ± 9.47 | <0.001 |
| TG | 194.64 ± 21.20 | 240.20 ± 35.40 | <0.001 |
| HDL | 39.99 ± 6.47 | 35.23 ± 6.05 | <0.001 |
| LDL | 101.94 ± 21.89 | 120.22 ± 38.53 | <0.05 |
| VLDL | 40.62 ± 4.80 | 50.32 ± 8.00 | <0.001 |

## DISCUSSION

Approximately 50% of hemodialysis (HD) patients die from cardiovascular events. One of the main risk factors for cardiovascular events is hyperlipidemia. Progressive renal failure is associated with lipoprotein abnormalities and dyslipidemia. However, dyslipidemia may not appear as hyperlipidemia (a rise in plasma cholesterol and/or low-density lipoprotein (LDL)) in the majority of HD patients. Uremic dyslipidemia has an abnormal apolipoprotein profile and composition. It is characterized by reduced concentrations of apo A-containing lipoproteins in high-density lipoprotein (HDL) and increased concentrations of intact or partially metabolized triglyceride-rich apo B-containing lipoproteins in very-low-density lipoprotein (VLDL), intermediate-density lipoprotein (IDL) and LDL.

Common lipid abnormality in HD patients is hypertriglyceridemia. Other lipid abnormalities seen in HD patients are high serum lipoprotein levels and a decrease in HDL levels. End Stage Renal Disease (ESRD) patients receiving hemodialysis are at a higher risk of developing dyslipidemia which is undoubtedly a predisposing factor of cardiac related disease in these patients. Different phenomenon such as loss or accumulation of various substances and dysregulation or alteration in number of metabolic pathways are responsible for aetiology and pathogenesis of chronic changes in chronic kidney disease (CKD). Haemodialysis or renal replacement therapy (RRT) does not correct the dyslipidemia of uraemia but may modify it.

Studies have shown that HD therapy has various effects on lipid profile. This gives rise to various differences, even though pathogenesis and lipid profile phenotype in HD patients are similar to the pre-dialysis period. One factor associated with HD therapy is membrane type. In one study, six weeks after transition from low flux membrane to high flux membrane,

Blankestijn et al observed a decrease in triglyceride and VLDL levels and an increase in HDL levels. Docci et al showed that polysulfone membranes have a more positive effect on lipid profile compared to cuprophan membranes. There are also studies showing that high flux polysulfone membranes reduce oxidized LDL. Schiffl and Lang analyzed the effect of dialysate purity on dyslipidemia. They showed that ultrapure dialysis fluids brought about an improvement in dyslipidaemia. Apart from dialysate purity, the effects of acetate or bicarbonate use on lipid profile have also been evaluated. It has been shown that use of bicarbonate dialysate can have positive effects on lipid profile. Another parameter thought to affect lipid profile during HD is heparin use. Heparin is known to cause lipoprotein lipase to be released from the endothelial surface. Chronic heparin use therefore leads to a decrease in lipoprotein lipase. Lipoprotein lipase is known to serve in the catabolism of triglyceride-rich lipoproteins such as chylomicrons and VLDL. The decrease in lipoprotein lipase in chronic heparin use gives rise to impairment in triglyceride-rich lipoprotein catabolism.

Studies analyzing the effect of unfractionated (UF) heparin on lipoprotein metabolism have produced controversial results. Mahmood et al. reported that heparin use during HD has no effect on lipoprotein lipase levels. However, there are also studies reporting that use of heparin has negative effects on both lipoprotein lipase and on lipid parameters. Another contentious issue is whether there is a difference in the use of unfractionated (UF) heparin and low molecular weight heparin (LMWH) in the effect on lipid parameters. Yang et al showed that the use of LMWH in diabetic hyperlipidemic HD patients caused a decrease in triglyceride and VLDL levels. In an evaluation of the effects on lipid parameters of type of HD membrane and heparin type used, Katopodis et al. showed that both membrane and type of heparin have no effect on lipid parameters. Today, the effect of both heparin use and type of heparin on lipid parameters is debatable. We think that there is a need for studies

analyzing the effect of HD therapy on lipoprotein metabolism in the HD patient group.

Raju DS et al, Tauqeer S et al evaluated effect of haemodialysis and frequency of dialysis sessions on serum lipids and biochemical profile in patients with chronic kidney disease. The objective of this study was to see the effects of haemodialysis and frequency of dialysis sessions on dyslipidemia and various biochemical markers in patients with CKD. Urea and creatinine were raised, and anaemia, hypocalcemia, hypoalbuminemia, hyponatremia, and hyperkalemia were observed. A significant elevation in serum total cholesterol, triglycerides, LDL and VLDL-C was seen. There was a reduction in HDL-C in pre-dialysis patients compared to controls. The difference between pre-HD and post-HD groups was unremarkable except for the serum potassium, chloride, urea, creatinine, total cholesterol, triglycerides and HDL-C. The effect of frequency of dialysis sessions was also not statistically significant. They concluded regular treatment with dialysis may partially compensate for loss of renal function and decrease the accumulation of toxic metabolites, but cannot revert the overall physiological deficit.

Albuquerque Filho NJ et al, Rehman S et al saw impact of duration of hemodialysis on lipid profile in end stage renal disease patients receiving hemodialysis. Objective of the study was to assess serum lipid profile in subjects having end stage renal disease and receiving maintenance hemodialysis and to compare it with normal healthy controls and also to assess the effects of duration of hemodialysis on the lipid profile. A significant rise in serum triglyceride content and total serum cholesterol of hemodialysis patients ($p < 0.01$) was detected as compared to healthy controls dyslipidemia was found to be evident in hemodialysis patients. The duration of hemodialysis sessions was found to affect the lipid profile of ESRD patients, which may play a role in higher incidence of atherosclerotic related cardiac events among these patients.

Nikolic D et al did a meta-analysis of randomized controlled trials effects of statins on lipid profile in chronic kidney disease patients. The authors investigated the impact of short- and long-term statin therapy on lipid profiles in CKD patients requiring or not requiring dialysis. They included all randomized controlled clinical trials that investigated the impact of statin therapy on lipids and lipoproteins. Several other studies on comparative study of lipoprotein (a) and lipid profile in chronic kidney disease patients also had similar results as ours. It was concluded that statin therapy significantly modifies the lipid profile in CKD patients not on dialysis therapy (with the trend to be more effective with longer therapy), and have less beneficial effect in patients on dialysis with the trend to be less effective with longer duration of therapy.

## CONCLUSION

Early stage evaluation of dyslipedimia in CKD patients on haemodialysis may reduce the incidence of atherosclerotic cardiovascular diseases [ACVD].

**Declarations**

**Funding:** None **Conflicts of interest/Competing interests**: None **Availability of data and material**: Department of Medicine RKDF Medical College Bhopal **Code availability**: Not applicable **Consent to participate**: Consent taken **Ethical Consideration**: There are no ethical conflicts related to this study. **Consent for publication**: Consent taken.

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