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A Comparative study of variations of Lipid Profile in different stages of Chronic Kidney Disease and Hemodialysis

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ABSTRACT

Aim: Chronic kidney disease encompasses a spectrum of different patho-physiological processes associated with abnormal kidney function and a progressive decline in glomerular filtration rate. The term chronic renal failure applies to the process of continuing significant irreversible reduction in number of nephrons. The National Kidney Foundation and the Dialysis Outcome Quality Initiative advisory board has approved the development of clinical practice guidelines to define CKD and to classify stages in the progression of kidney disease. Cardiovascular disease is a major cause of morbidity and mortality among patients with chronic renal failure. The aim of this study is to analyze the pattern of lipid profile variations in CKD patients in stages 3,4 and stage 5 on hemodialysis. **Design/Methods:** This is a cross sectional hospital based study and 100 subjects were categorized according to National Kidney Foundation and the Dialysis Outcome Quality Initiative guidelines on staging of CKD. **Results:** A rising trend of triglycerides and VLDL levels were observed as the stage of CKD progressed, which was statistically significant too. HDL cholesterol level were found to be lower in CKD patients as stages progressed. Total cholesterol, LDL and HDL levels decreased in hemodialysis population. **Conclusions:** We conclude that lipid abnormalities in CRF accelerates the progression of the renal failure and predisposes to atherosclerosis, hence it is worthwhile detecting and treating hyperlipidemia in CRF patients early on.

KEYWORDS : Chronic Kidney Disease, Hemodialysis and Lipid profile

I. 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[1,2,3]. 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.

The majority (58 %) of patients with CKD die from cardiovascular causes, making CVD the leading cause of death in patients with CKD[4]. Therefore it is essential to study uremic dyslipidemia, since optimal treatment is essential for the prevention or delay of cardiovascular complications in patients with CKD. It is important not only to identify these patients early but also to treat their dyslipidaemias intensively before they develop ESRD[4].

An association between lipids and kidney disease was first noted by Virchow[7] 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[5,6]. Also there are reports available regarding accelerated atherosclerosis in chronic renal failure due to altered lipid metabolism.

The stages of CKD can be classified according to the glomerular filtration rate. In the present study the lipid profile variations in CKD patients in stages 3,4 and stage 5 on hemodialisis, are compared.

II. Materials And Methods

1.1. Chemicals:

Lipid Profile kits were purchased from Sigma chemical company, USA. All the other chemicals used were of analytical grade.

1.2. Experimental Design:

This study was conducted in department of General Medicine and Nephrology, in a tertiary Medical College Hospital in South India, over a period from January 2013 to June 2014. A subset of enumerated male and female inpatients 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 were noted. Laboratory investigations like basic blood profile, blood urea, serum creatinine, serum cholesterol, serum triglyceride, serum LDL, serum HDL and ultrasound abdomen were done in the selected patients. All procedures were performed according to institutional guidelines.

1.3. Biochemical analysis

Study of lipid profile by enzymatic method by using autoanalyser was done and GFR was calculated using Cockcroft and Gault formula (2003).

1.4. Ultrasonogram

Bilateral shrunken Kidneys[7] (<8.5cm) with loss of corticomedullary differentiation was taken as indicative of chronic renal failure.

1.5. Other Investigations

ECG, chest X-ray and complete blood counts were done.

III. Statistical Analysis

Data was analyzed using the SPSS software package, version 17.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed using range, mean, SD, and median, whereas qualitative data were expressed as frequency and percentage. P value was assumed to be

statistically significant at 0.05.

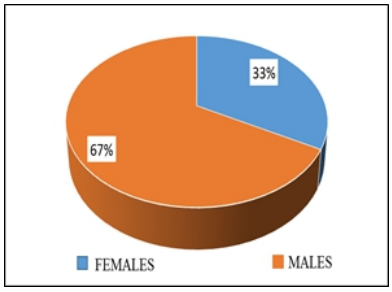
IV. ETHICAL CONCERN

Ethical clearance was obtained from the Ethical committee meeting conducted by the Institutional Ethics Committee approved on **25.9.12, No. INST .EC/E.C/33/2012-13.**

V. Results

1. Sex distribution in CKD patients:

Figure.1. Shows sex distribution of the study population, which included 67% males and 33% females.



2. Age distribution in CKD patients:

Age distribution among them is as follows. This table.1. Shows the age distribution of the 100 CKD patients studied. The mean age for the total number of patients was 57.28 yrs. The mean age for male and female patients were 56.7 yrs and 58.3 yrs respectively.

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

3. CKD patients on Dialysis

Table.2. shows that in this study population only 23 percent were on haemodialysis while the remaining 77 percent were managed conservatively.

Dialysis	Percent
No	77.0
Yes	23
Total	100

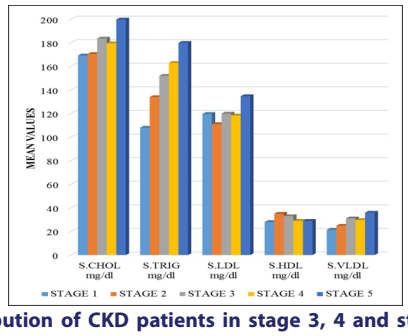
4. Stage wise distribution of CKD patients

Table.3. indicates the stage wise distribution of the 100 CKD patients in the study group. Majority of patients being in stage 5 followed by stage 3.

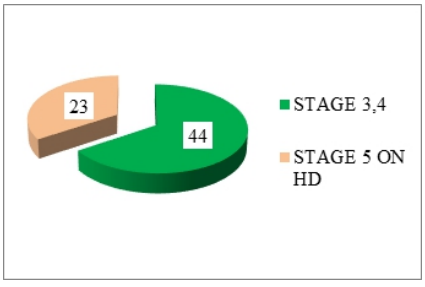
CKD Stage	Percent
Stage – 1	4.0
Stage –2	11.0
Stage-3	24.0
Stage – 4	20.0
Stage-5	41.0
Total	100.0

5. Lipid profile in CKD patients

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 the bar diagram. Total cholesterol value in CKD patients in each stage increased as stage progressed. The mean averaged 187.42 ± 63.35. However this difference was not statistically significant. (P > 0.223) Serum Triglyceride value in CKD patients in each stage increased as stage progressed. The mean averaged 161.7 ± 79.19. This difference was statistically highly significant. (P <0.001). Serum LDL value in CKD patients increased as stage progressed. The mean averaged 124.71 ± 57.83. However this difference was not statistically significant. (P >0.711). Serum HDL value in CKD patients showed marginal decrease as stage progressed. The mean averaged 30.75 ± 11.63. However this difference was not statistically significant. (P >0.326) Serum VLDL value in CKD patients increased as stage progressed. The mean averaged 31.73 ± 15.74. This difference was statistically highly significant. (P <0.001)

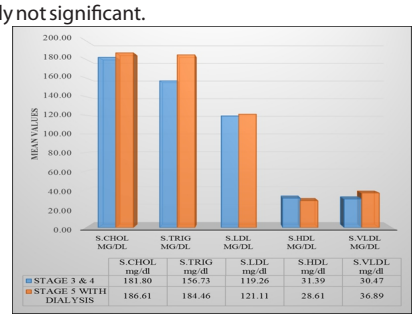


6. Distribution of CKD patients in stage 3, 4 and stage 5 on hemodialysis is depicted in figure 3.



7. Comparison of lipid fractions of CKD Patients in stage 3,4 and stage 5 on Dialysis

Figure.4. shows that the mean total cholesterol, TGL, HDL, LDL and VLDL in CKD patients in stage 3,4 was 181.80 ± 55.75 mg/dl, 156.73 ± 75.61 mg/dl, 31.39 ± 11.24 mg/dl, 119.26 ± 49.95 mg/dl and 30.47 ± 16.03 mg/dl. For patients in stage 5 on dialysis it was 186.61 ± 62.89 mg/dl, 184.46 ± 83.62 mg/dl, 28.61 ± 11.26 mg/dl, 121.11 ± 59.48 mg/dl and 36.89 ± 16.72 mg/dl respectively, this difference was statistically not significant.



VI. 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.

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[8] in their study showed no significant change in levels of total cholesterol.

There was increase of serum LDL in patients as CKD progressed but this was not statistically significant (P>0.711). 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[8] 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.

P.O.Attman et al[8] 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 $ApoA_1$/HDL. The slow fractional catabolic rate of Apo A_1 in patients with chronic renal failure could be a primary event resulting from a decrease in synthesis or secretion of Apo A_1.

There is significant raise in VLDL levels in patients as CKD stage progressed (P<0.001).

Gerald Appel et al [9]also showed increase in very low density lipoproteins (VLDL). In uremia, LDL lipoproteins are qualitatively altered.

The results of the comparative study of lipid profile in chronic renal failure patients in stage 3, 4 and stage 5 on hemodialysis.

Total cholesterol levels were marginally increased in stage 5 patients on hemodialysis as compared to patients in stage 3,4 but this difference was statistically not significant (P>0.749). HDL levels were decreased in stage 5 patients on hemodialysis as compared to patients in stage 3, 4 but this was also statistically not significant. (P>0.341). VLDL in stage 5 patients on hemodialysis as compared to patients in stage 3, 4 had increased but this was also statistically not significant (P>0.13). LDL values increased in stage 5 patients on hemodialysis as compared to patients in stage 3, 4 however this difference was statistically not significant. (P>0.893). There was moderate increase in triglycerides in stage 5 patients on hemodialysis as compared to patients in stage 3,4 but this was statistically not significant (P>0.174).

Increased serum triglyceride levels have been well documented by Alam et al.[10] Morena Marion et al[11] in their study on hemodialysis patients stated that hemodilaysis patients are exposed to several atherogenic factors resulting from qualitative and functional lipid abnormalities, including triglyceride rich particles, increased susceptibility to LDL oxidation and impairment of HDL protective effects.

Marion Morena et al [11] reported that there was increase in small, dense LDL sub-fractions in hemodialysis patients. Hypertrigly ceridemia observed in hemodialysis patient's results from a reduced lipolysis of TG-rich VLDL that leads to the accumulation of partially metabolized remnant lipoproteins (IDL and TG-rich LDL). This lipoprotein catabolism impairment is usually associated with reduced levels of HDL affecting reverse cholesterol transport. Such defect in atherogenic lipoprotein catabolism may predispose to the formation of small dense LDL particles, which appear to be more sensitive to ex vivo oxidation.

VII. Conclusion

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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