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Neelesh Kumar Maurya
Research Scholar, Institute of
Home Science, Bundelkhand
University, Jhansi,
Uttar Pradesh, India

Prof. NS Sengar
Professor, Department of
Medicine, MLB Medical College,
Jhansi, Uttar Pradesh, India

Dr. Pratibha Arya
Assistant Professor, Institute of
Home Science, Bundelkhand
University, Jhansi,
Uttar Pradesh, India

Impact of Hemodialysis on lipid profile among chronic renal failure patients (Regular and Non-Regular Haemodialysis)

Neelesh Kumar Maurya, Prof. NS Sengar and Dr. Pratibha Arya

Abstract

Chronic Renal Failure (CRF) patients are at risk of cardiovascular diseases due to the elevation of various forms of lipids. Many a time CRF patients live on hemodialysis on regular basis. Chronic renal failure (CRF) is complicated by characteristic dyslipidemias. We sought to evaluate the pattern of lipid profile in CRF patients with and without hemodialysis. Study were divided into 2 groups, Group-I: CRF patients who never undergone hemodialysis (24) and Group-II: CRF patients on hemodialysis (24). We obtained serum samples from patients in the morning after an overnight fast and were analyzed for total cholesterol (TC), triglycerides (TGs), HDL, LDL and VLDL. Significant change ($p < 0.05$) was found in Total cholesterol (TC), HDL-C, VLDL-C, HDL-C(level) between first and second group.

Keywords: Chronic renal failure, cardiovascular disease, Haemodialysis, CKD stage – 5

1. Introduction

Chronic renal failure (CRF) is a syndrome of constant renal impairment involving loss of both glomerular and tubular function^[1]. Progressive CRF not only leads to end stage renal disease (ESRD), but it is associated with high cardiovascular morbidity & mortality. In fact, patients with CRF are much more likely to die of cardiovascular complications such as dyslipidemias than to progress to ESRD^[2]. Dyslipidemias is a very common complication of Chronic Renal Failure (CRF). Disturbances in lipoprotein metabolism are evident even at the early stages of CRF and usually follow a downhill course that parallels the deterioration in renal function. Recently published studies indicate that dyslipidemias in these patients may actively participate in the pathogenesis of Cardiovascular disease (CVD) as well as in the deterioration of renal function^[3]. The characteristic lipid abnormalities seen in CRF patients are elevated triglycerides, normal/reduced total cholesterol (TC), decreased High Density Lipoprotein (HDL), normal Low Density Lipoprotein (LDL)^[4].

With the implication of plasma lipids in the pathogenesis of atherosclerosis and ischemic heart disease, it becomes worthwhile to study the behavior of various lipid fractions in CRF patients^[5]. CVD constitutes the major cause of death in patients with ESRD and it is still higher in hemodialysis patients than in post transplantation patients^[6]. ESRD Patients on hemodialysis have abnormalities in lipoprotein structure and metabolism and have a high incidence of cardiovascular diseases^[7]. CRF patients with CKD stage-5, their glomerular filtration rate have 15ml/min or less they need to kidney transplant or dialysis to survive.

The high coronary heart disease (CHD) prevalence in CRF patients is likely related to their high frequency of dyslipidemia. The characterization of the type of lipid and lipoprotein abnormalities should therefore be considered important in the management of CRF patients to prevent CHD. It has also been suggested that dyslipidemia may contribute to accelerate development of renal insufficiency. The characteristic lipid abnormalities seen in CRF patients are elevated triglycerides, normal/reduced total cholesterol, decreased High Density Lipoprotein (HDL), normal Low Density Lipoprotein (LDL). This disturbed lipid pattern accelerates the process of atherosclerosis and impairs the blood supply, further damaging the kidneys. While this process in heart and brain causes morbidity due to cardiovascular and cerebrovascular accidents^[8].

Lp(a) is a cholesterol-rich lipoprotein with structural similarities to LDL but contains apo(a), a glycoprotein with sequence homology to plasminogen. Lp(a) plays a causal role in the development of atherosclerosis and is a potentially modifiable cardiovascular disease risk factor in hemodialysed CRF patients^[9].

Correspondence

Neelesh Kumar Maurya
Research Scholar, Institute of
Home Science, Bundelkhand
University, Jhansi,
Uttar Pradesh, India

Cardiovascular disease constitutes the major cause of death in patients with ESRD and it is still higher in dialysis patients than in post transplantation patients due to abnormalities in lipids and lipoproteins structure and metabolism^[10].

Controversies exist regarding Lp(a) levels in CRF patients with and without hemodialysis. There are few studies that showed Lp(a) levels were elevated in CRF patients^[10, 11, 12]. Lp(a) levels were elevated in hemodialysed patients, Lp(a) levels were decreased after hemodialysis^[12, 14] and Lp(a) levels did not vary before and after hemodialysis^[9, 15]. With the implication of plasma lipids and lipoproteins in the pathogenesis of atherosclerosis and ischemic heart disease, it becomes worthwhile to study the behavior of various lipid fractions in CRF patients^[5]. Thus the present study was undertaken to compare the levels of lipid profile in CRF patients with and without hemodialysis

2. Materials and methods

This prospective, observational study was started at MLB, Medical college Jhansi department of internal medicine and dialysis unit. The patients were divided into two groups, both were suffering from chronic renal failure with CKD-5 stage in last 6-month. Twenty four patients were taken in each group. The group first with 24 patients undergoes with haemodialysis at regular interval, at least two times in a week. In Group second, all patients were having same condition as like group first but due to some reason they were unable to take haemodialysis at least once in a week.

5 ml of venous blood samples were collected in plain tubes after an overnight fast. After collection, the samples were allowed to clot for half an hour following which the samples were centrifuged and serum was analysed. Serum total cholesterol (TC), triglycerides (TGs), HDL cholesterol (HDL-C), LDL cholesterol (LDL-C), were measured colorimetrically using commercially available kits on fully auto analyzer of Clinical Biochemistry Laboratory. VLDL cholesterol concentration was calculated using Friedewald's Formula^[17].

3. Statistical analysis

Statistical data was recorded on Microsoft Excel programme. The comparison between two groups was done by unpaired t-test in Graph Pad Prism 7 software.

4. Results and Discussion

CRF is a worldwide health problem and is the leading cause of morbidity and mortality in the developed world. Patients with CRF are at high risk for CVD and cerebrovascular disease (CBVD), and they are more likely to die of CVD than to develop ESRD. CRF is associated with premature atherosclerosis and increased incidence of cardiovascular morbidity and mortality. Several factors contribute to atherogenesis and cardiovascular disease in patients with CRF, the notably among all is dyslipidemias^[18]. Chronic renal failure, per se, primarily affects the metabolism of high-density lipoprotein (HDL) and triglyceride (TG)-rich lipoproteins^[19]

In the present study we found hypertriglyceridemia in CRF patients with and without hemodialysis. This elevated triglyceride level is because of decreased activity of lipoprotein lipase (LPL) which hydrolyses triglycerides and also enhanced triglyceride synthesis in liver from free fatty acids released from fatty tissue and muscles^[20]. Table I revealed the biochemical parameters among CRF patients with and without hemodialysis.

Once haemodialysis commences, continuous haemodialysis patients develop atherogenic serum lipid profile. Total cholesterol (TC), HDL-C, Triglycerides, VLDL-C level was found elevated in regular haemodialysis patients as compared to irregular Haemodialysis patients. A number of factor are important in producing more atherogenic lipoprotein profile in continuous haemodialysis. There was significant change ($p < 0.05$) found in Total cholesterol (TC), HDL-C, LDC-C, VLDL-C, HDL-C(level) between first and second group as shown in the table 1.

Table I: The Biochemical parameters among CRF patients with and without hemodialysis (In Mean± Standard deviation)

Parameters Serum lipids (mg/dl)	Group -1 regular hemodialysis patients (N=24) (Mean ± SD)	Group -2 irregular dialysis patients (Mean ±SD)	Unpaired t- test	
			P valve	Significant difference ($p < 0.05$)
Total cholesterol (TC)	216.5 ± 9.589	193 ± 6.223	0.0472	YES
Triglycerides (TG)	207.4 ± 11.88	165.8 ± 11.6	0.0172	YES
High density lipoprotein (HDL)	46.29 ± 1.192	52.28 ± 1.189	0.0011	Yes
Low density lipoprotein (LDL)	111.9 ± 3.069	77.26 ± 3.187	<0.0001	Yes
Very low density lipoprotein (VLDL)	69.15 ± 3.747	34.29 ± 2.347	<0.0001	Yes

5. Conclusion

It is concluded that the number of dialysis increase the level of, Total cholesterol(TC) and Low density lipoprotein(LDL-C),Triglycerides(TG),Very low density lipoprotein(VLDL-C) level in regular CRF patients. HDL-C level decreases as compare to irregular haemodialysis patients. Dialysis patients need to cure of dyslipidemia. In irregular and regular patients, hypertriglyceridemia treatment is necessary that will improve the quality of life of CRF patients.

6. Acknowledgement

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